

## **Executive Summary**

### **I. Introduction**

The Garfield County Board of County Commissioners (BOCC) requested that the Colorado School of Public Health (CSPH) conduct a Health Impact Assessment (HIA) to address citizen concerns about health impacts of natural gas development and production in the Battlement Mesa Planned Unit Development (PUD). The two primary functions of the HIA are to:

- Identify ways in which Antero's proposed natural gas development project can affect the health of the Battlement Mesa residents.
- Develop a priority list of recommendations to minimize the potential health impacts of Antero's proposed project.

We worked with community members to identify the eight areas of concern: Air Pollution; Water and Soil Contamination; Traffic from Industry; Noise and Light Pollution; Community Wellness; Economic Impacts; Impacts on the Healthcare System; and Accidents and Malfunctions. Natural gas development in Battlement Mesa could, potentially, affect each of these eight areas of concern and human health. For example, trucks, drilling and hydraulic fracturing processes add sources of noise that would not exist were it not for natural gas development. Noise is also associated with various other health outcomes (e.g., stress, heart disease).

We used existing data sources to conduct quantitative and qualitative analyses in these eight areas of concern as well as describe the baseline conditions in Battlement Mesa. The baseline conditions are a one time "snapshot" of Battlement Mesa resident health and environmental quality. In addition to being useful for the HIA, the description of baseline conditions serves as a comparison point for any future studies. We also analyzed any existing relevant data to assess how the natural gas industry operations might affect each of the eight areas of concern.

The principal findings of the HIA are that health of Battlement Mesa residents will most likely be affected by chemical exposures, accidents/emergencies resulting from industry operations, and stress-related community changes. To address these potential health impacts, we provide more than 70 specific recommendations. These recommendations address the principal findings by focusing on pollution prevention, advancement of public safety and development of a Community Advisory Board. The following sections discuss these broad goals in the context of the principal findings, important remedies, and limitations of the HIA.

### **II. Possible Health Effects**

#### ***Possible Health Effects Due to Chemical Exposures***

We used a variety of information sources and methods to assess the possible impact of chemical exposures on the health of Battlement Mesa residents. The information sources included Garfield County air monitoring data and related reports, resident statements of health effects related to the nearby natural gas activities, and health studies that explore the effects of chemical exposures. The Human Health Risk Assessment (or HHRA, Appendix D) is one tool that puts this information together as an integrated analysis.

The risk assessment process is a method developed by scientists and policymakers to estimate how likely it would be for people to experience specific health effects (including, but not limited to cancer) as a result of being exposed to certain chemicals. We used a “screening” risk assessment methodology, as recommended by the U.S. Environmental Protection Agency when data gaps exist, to determine if chemicals exposures from Antero’s natural gas project in the Battlement Mesa planned unit development could adversely affect public health. This kind of risk assessment provides a way to compare different chemical hazards and different exposure routes in circumstances where information about specific exposure levels and health effects is limited. The HIA team also followed guidance from the U.S. Environmental Protection Agency on how to interpret the existing information.

The Human Health Risk Assessment used information from a variety of sources to conclude that natural gas processes release chemicals that are known to impact health; chemicals emitted into the air from natural gas processes are more likely to impact health than chemicals released into the water or the soil; exposures from air emissions are likely to be highest during well completion activities; and residents living near a well pad (defined as within ½ mile) are more likely to experience health effects than residents living farther away from a well pad (defined as greater than ½ mile).

For decision makers, the primary value of a risk assessment is in its capacity to rank the relative magnitude of exposures and prioritize actions. The Battlement Mesa Human Health Risk Assessment identifies which airborne chemicals most likely to impact health. This information can help guide decisions about where to focus pollution prevention efforts. Since the risk assessment indicates that in Battlement Mesa exposure to chemicals in the air is more likely to occur than exposure to chemicals in the water or soil, methods to reduce air pollution and monitor the air should be the focus of current and future pollution prevention.

### ***Possible Health Effects Due to Unsafe Industrial Operations in a Residential Neighborhood***

Natural gas development is potentially hazardous because it uses large numbers of heavy trucks for well pad construction, drilling and completion operations, maintenance activities and pipeline installations. Thus gas industry traffic can pose important safety concerns in residential neighborhoods. More vehicles and heavy truck traffic in school zones and on residential streets increases the likelihood of motor vehicle crashes, some of which could result in fatal and non-fatal injuries. Decreasing or eliminating industrial traffic on residential streets will reduce or remove associated safety risks.

Industrial incidents, such as accidents and malfunctions involving wells and pipelines near homes, place residents at increased risk of exposure to fires, explosions and uncontrolled chemical releases. Previous reports to the Colorado Oil and Gas Conservation Commission indicate that minor and major incidents occur in the course of natural gas processes. Prevention of well site accidents, pipeline breaches and other incidents will reduce the risk of injuries and illnesses to community members. Attention to preventing minor spills and accidents, tracking and analysis of near-misses, and analysis of incidents when they do occur will provide the information necessary to prevent a catastrophic event.

### ***Possible Health Effects Due to Community Changes***

Social norms (in other words, community members' sense of their "normal way of life") can be impacted in various ways, including:

- The presence of industrial activity in a previously non-industrial area
- A perceived loss of shared community ideals and cohesion
- Declining property values
- Impacts to the education system
- Sudden changes in population numbers, demographics and customs

Community impacts of the natural gas industry during the boom of 2003-2008 and decline of 2009 included increased crime and sexually transmitted diseases, declining property values and impacts on the educational environment. Some residents report that social norms in Battlement Mesa have been impacted by the proposal of the Antero project and have caused Battlement Mesa residents additional stress. The potential health effects of stress are difficult to quantify but should not be underestimated. Stress contributes to risk for heart disease, obesity, and other common chronic health conditions. Addressing impacts to the Battlement Mesa community can help address changes to social norms and potentially decrease health effects related to increased stress.

## **III. Remedies to address Principal Findings**

### ***Reduce the Likelihood that Battlement Mesa Residents will be Exposed to Industrial Chemicals***

At this time, there are no studies that document a "safe" distance between natural gas wells and homes, schools, and other places occupied by community members. Preliminary studies in the natural gas fields, results of air modeling from other industrial operations, and the laws of physics lead us to a basic conclusion: pollutant concentrations generally decrease with increasing the distance from an emission source.

Since each well pad is unique, it is difficult to determine one safe setback for all residences. This issue is further complicated by noting that multiple well pads in the same general area may impact the air in or around a residence. It is not known if current set back distances from a well

pad to residences are sufficient to protect the public from chemical exposures that may result in short or long term health effects. Therefore, steps should be taken to decrease emissions from all sources and wherever feasible increase the distance between well pads and roads and residences to and schools. We recommend that Antero be required to use the best available technology to reduce air emissions from gas production sites.

### ***Promote Safe Industrial Operations in a Residential Neighborhood***

Because Antero proposes to develop natural gas operations within a residential community, safe industrial operations are very important. Removal of industrial traffic from residential roads will reduce the safety hazard associated with heavy trucks within the planned unit development. Regular inspection of well installations, pipeline installations, maintenance procedures and other infrastructure is warranted. When major or minor incidents occur reports should be made to Garfield County Oil and Gas Department as well as Colorado Oil and Gas Conservation Commission. These reports should include plans for actions to prevent these incidents from happening in the future.

Clear emergency response policies and procedures particular to natural gas development in Battlement Mesa should be developed. Emergency response plans should consider schools, the assisted living facility, businesses and residents who may be impacted by an industrial emergency in the planned unit development because there are limited routes in and out of Battlement Mesa.

### ***Foster Effective Communication Between Stakeholders***

Natural gas development and production activities are projected to continue in Battlement Mesa for twenty to thirty years. Communication between Antero, the citizens of Battlement Mesa, the Battlement Mesa Company, and Garfield County officials will be crucial for addressing community concerns. We recommend that Garfield County establish a Community Advisory Board to foster better communication between stakeholders for the duration of the natural gas project. The BOCC should consider hiring someone trained in mediation, or some other form of alternative dispute resolution, to facilitate the community advisory board meetings. This expert could help the Community Advisory Board develop clear by-laws, responsibilities, meeting procedures and conditions for membership, among other things. The Community Advisory Board would provide a way for stakeholders to communicate issues that impact all parties. For instance, Antero could update community residents and Garfield County officials about changes to their development plans. The Community Advisory Board would also be a mechanism for providing input to how the million-dollar donation from Antero supports community and physical health. Mediation services should proceed as long as members agree that the services are useful.

## **IV. Information Gaps**

The HIA is based on data that already existed when the HIA began. Neither the health data nor the environmental data that were available to us were sufficient to make specific predictions

about expected health impacts. Without taking multiple individual measurements, it is difficult predict individual exposures and health impacts. Therefore, we were not able to forecast the specific numbers of people who could experience health effects or the magnitude of changes in disease rates.

***Filling Information Gaps***

We recommend the collection of baseline and ongoing air, groundwater, surface water, and soil data around well pads and the centralized water storage facility. Furthermore, this information should be publicly available. This information will provide baseline levels for comparison to (and thus direct feedback) the impacts of the Antero – Battlement Mesa project and allow for improvement of project best practices as the project goes through development, production, and reclamation periods. Environmental studies should further characterize air emissions and odor events and model exposures to residents living near natural gas operations. Monitoring and evaluation of exposure to air toxics, particulate matter, and ozone should be conducted.

We further recommend that Garfield County continue to support collection and analysis of baseline and ongoing health information. Health studies should include measurements related to physical health, lifestyle and social cohesion, education, crime, sexually transmitted infection, mental health and suicide, substance abuse, and economic impacts.

These environmental and health studies will help assess the impact of residential natural gas development on the environment, community, and individual health and the effectiveness of pollution control measures. It will provide valuable information for Garfield County to address community concerns about the impacts of natural gas development in residential neighborhoods.