

1 Introduction

This report summarizes the Battlement Mesa HIA commissioned by the Garfield County Board of County Commissioners (BOCC) with the Colorado School of Public Health (CSPH). The introductory section provides context for the HIA, a site description, and Antero Resources Corporation's (Antero) plans for Battlement Mesa.

1.1 The Battlement Mesa Community

The Battlement Mesa Planned Urban Development (PUD) is a 3,200-acre unincorporated jurisdiction divided into several neighborhoods, the names of which are:

- The Reserve
- Battlement Creek Village
- Willow Creek Village
- Willow Ridge Apartments
- Willow Park Apartments
- Eagles Point
- Valley View Village
- Fairway Villas
- Stone Ridge Village
- Monument Creek Village
- Canyon View Village
- Mesa Ridge
- Mesa Vista
- Tamarisk Village
- Tamarisk Meadows
- Saddleback Village

The community sits on a 500 foot mesa approximately to the south of Colorado River and mesas continue to rise above the community for another 500-1000 feet. There has been natural gas development and production going on for the last several years outside the PUD.

A 2005 academic study describes Battlement Mesa's transformation from a company town to a retirement community. Depending on the neighborhood, homes range from \$85,000 to \$450,000 in price and from 1,500 square feet to 4,400 square feet in size. While the community is often thought of as a "retirement community" (4), in fact there are also many families with children that live in Battlement Mesa.³

1.1.1 Parachute

Because the town of Parachute shares a zip code with Battlement Mesa, the HIA includes Parachute in several sections, including the health outcomes baseline analysis. Parachute is a small town adjacent to Battlement Mesa. Parachute sits at the base of the Parachute Creek valley, between the Battlement Mesa PUD to the south and a large natural gas field to the north, at an elevation of 5,000 feet. Both Interstate-70 and the Colorado River run through the town. Parachute has a population of approximately 1,300 people and there are small family ranches outside the town limits. There is significant industrial activity in Parachute Creek valley and on the surrounding mesas, including natural gas development and production, a gas processing plant and a bicarbonate of soda plant.

1.1.2 Demography⁴

According to the 2000 United States Census estimates, there total population of the Battlement Mesa/Parachute zip code was 5,041; 49.3 percent of the Battlement Mesa/Parachute population was female and 50.7 percent male. The median age was 37.5 years. 26.0 percent of the population were under 18 years of age, 7.2 percent under five years, and 19.8 percent were 65 years and older. For people reporting race in Battlement Mesa/Parachute, 93.4 percent identified as White, 0.5 percent as Black or African American; 9.7 percent of the population identified as Hispanic or Latino (of any race). In Colorado in 2000, 9.7 percent of the population was 65 years and over compared to 19.8 percent of the population in the Battlement Mesa/Parachute zip code.

Demographics
Population
Battlement Mesa/Parachute, 2000
Total population: 5, 041
Males: 2,487 (49.3)
Females: 2,554 (50.70)
Mean age 37.5
Garfield County
2000 Total population: 43,791
2009 Total population estimate: 56,298
% change 2000-2009: 28.6%

Demographics

Vulnerable populations Battlement Mesa/Parachute Under 18: 1,311 (26.0) Over 65: 998 (19.8) Total <18, >65: 2309 (45.8)

Although the Battlement Mesa PUD is often described as a “retirement community”, it is difficult to precisely define a “retirement community”. Several objective measures reflect the characteristics of Battlement Mesa’s population. In 2000, the percentage of Battlement Mesa residents, excluding Parachute, aged 65 years and older was approximately twice the national average (24.5 % vs. 12.4%, respectively). Furthermore, whereas 63.9% of the United States population (aged 16 years and older) was participating in the labor force, only 48.9% of Battlement Mesa residents were either working or looking for work in 2000.

While the lower labor force participation rate of Battlement Mesa residents and the higher proportion of people aged 65 years and over are likely indicators of a high retiree population in the PUD, almost half of the PUD residents aged 16 years and over were either working or looking for work. More than a quarter of the family households in Battlement Mesa had children under the age of 18 years (27.2%). So, while the Battlement Mesa PUD is home to higher proportions of people aged 65 years and over than the United States as a whole, the community is not homogeneously “retired.”

1.1.3 Economy

Currently, the Battlement Mesa community is entirely residential. The only businesses in the PUD support the local residents. While several natural gas operators drill extensively the area surrounding the PUD, there are currently only two natural gas wells in the PUD itself. The businesses within the PUD include:

- A grocery store
- Two gas stations
- Several medical facilities
- A public golf course
- Banks
- A café
- A recreation center (paid for by homeowner association dues)
- A local newspaper

In addition to the local businesses, the PUD is home to two churches (with five others in Parachute), a 40-unit assisted living facility in the Battlement Mesa PUD serving seniors of low to moderate income,³ and three schools – Underwood Elementary School (grades 1-3), St. John Elementary School (grades 4-5) and Grand Valley Middle School (grades 6-8). Battlement Mesa students attend the Early Childhood Center for pre-kindergarten and kindergarten and Grand Valley High School in Parachute for grades 9-12. These schools are all in Garfield County District 16.

1.2 Antero's Plan to Drill Within the Battlement Mesa PUD

The combination of technological advances (e.g. hydraulic fracturing), Federal and State economic incentives to develop natural gas resources and population growth in previously uninhabited (or sparsely inhabited) areas have contributed to a relatively new phenomenon. Whereas oil and gas development has historically taken place in locations that are geographically distant from human habitation (other than, perhaps, the housing for oil and gas workers themselves), it is increasingly common for drilling activities to occur in rural, suburban and urban areas close to where people otherwise unaffiliated with the industry live, work and play⁵. Throughout the country and in Garfield County, the residents in close proximity to drilling activities are raising concerns about the potential impacts drilling may have on air quality, water quality, public safety and public health⁶. The human health impact natural gas development and production has not been thoroughly studied.

In the Spring of 2009, Antero announced plans to purchase surface rights and mineral rights from the Battlement Mesa Community (BMC), as well as its intent to develop natural gas within the Battlement Mesa PUD⁷. The contract that establishes the PUD requires the Garfield County BOCC to review and any proposed land-use changes within the Battlement Mesa PUD through a *Major Land Use Impact Review* (also know as the MLUIR) process. The Garfield County BOCC has the authority to require modifications to the plans outlined in a given Major Land Use Impact Review application. Because its plans pertain to the Battlement Mesa PUD, Antero will submit a Major Land Use Impact Review to the BOCC before initiating their drilling activities. In addition to county review, Antero will also submit plans through a state permitting process, conducted by the Colorado Oil and Gas Conservation Commission (COGCC). Under a 2008 rule⁸, natural gas operators may submit Comprehensive Drilling Plans to COGCC⁹. If Antero submits a Comprehensive Drilling Plan to COGCC, COGCC will review the development project as a whole, which streamlines permitting for individual wells within Antero's project. The Comprehensive Drilling Plan has not been submitted as of the date of this HIA report. Antero has, however, entered into a legally-binding Surface Use Agreement with the BMC. This Surface Use Agreement outlines characteristics of its natural gas drilling plans for the Battlement Mesa PUD. While not as detailed as a Major Land Use Impact Review or Comprehensive Drilling Plan, the Surface Use Agreement between Antero and the BMC provides some information regarding Antero's plans for the Battlement Mesa project. Furthermore, Antero held several community meetings during 2009 and 2010 where plans for Antero's project were

described and the power point presentations from these meetings are available online¹⁰⁻¹¹. These sources of information plus information provided to the CSPH team are used to as a basis for this HIA. Appendix A includes a summary of the natural gas drilling process. Appendix B includes a review of energy development in the Piceance basin and the Surface Use Agreement between Antero and BMC.

1.3 Community Concerns

After Antero announced its intentions to drill within the Battlement Mesa PUD, community members living in Battlement Mesa expressed concern regarding potential environmental, health, and safety impacts. Citizen concerns have included but are not limited to:

- The proximity of drilling and gas production to homes, recreational areas and schools
- “Vulnerable” populations with diminished immune capacity
- Exposure to airborne volatile organic compounds (VOCs), diesel emissions, particulate matter (PM) and other air contaminants
- Exposure to fluids used in the fracking process, hydrocarbons and VOCs through soil or water exposure routes
- Potential increased risk of fires, explosions and/or motor vehicle crashes
- Changes in community “livability”

A grassroots advocacy organization, the Battlement Mesa Concerned Citizens (BCC) formed under a parent organization, the Grand Valley Citizens Alliance. In November 2009, the BCC submitted a citizen petition to the Garfield County BOCC requesting that BOCC require Antero to address health concerns before drilling for natural gas within the Battlement Mesa PUD (Attachment 1).

While the human health impacts of natural gas development and production have not been specifically studied using state-of-the-art public health epidemiologic research methods, there has been substantial research related to exposures of potential concern in the natural gas industry. For instance, drilling for natural gas has the potential to increase occupational and community exposures to VOCs such as benzene, toluene, ethyl-benzene and xylene (BTEX). Heavy metals released in drilling activities, particulate matter (PM) generated by transportation activities and diesel fuel combustion, and ozone precursors (ozone formation) are also known to be associated with natural gas development. Some constituents of fracking chemicals may pose health risks to workers or community members.

Sufficient exposures to these chemical compounds are associated with serious negative health outcomes such as lung disease in children and adults (i.e., asthma, chronic bronchitis, obstructive disease), cardiovascular disease, poor birth outcomes (premature birth, low birth weight), various cancers, and other long and short-term health issues¹²⁻¹⁶. Environmental contaminants to which

people may be exposed include air emissions, ground and surface water pollution and soil contamination. In addition, physical hazards can include increased truck traffic and domestic explosions associated with gas seepage into domestic water supplies. Social hazards can include a variety of community disruptions associated with boom-and-bust cycles, itinerant workforces and industrialization of residential areas¹⁷.

1.4 Initial Responses to Community Concerns

In response to community concerns, Antero has held several informational community meetings¹¹ and has responded to community concerns by modifying its some the drilling plans, for example the removal of drilling pad C (replaced by the Parks and Rec pad). The Surface Use Agreement between Antero and BMC includes some measures which are intended to reduce the impact on the community's health and quality of life.

Even before it commissioned the HIA, Garfield County had undertaken many steps in response to community concerns regarding natural gas development and production in the county. Garfield County Public Health Department (GCPH), the county health department, initiated and managed the Saccommano Report and currently manages on-going ambient air monitoring stations at several locations in Garfield County. The Garfield County Oil and Gas Department initiated and managed an intensive study water quality and hydrology of the Mamm Creek Gas Field. GCPH also has participated in numerous Colorado Department of Public Health and Environment (CDPHE), COGCC, and United States Environmental Protection Agency (EPA) air and water studies documenting:

- Air toxics (e.g. benzene) in ambient air, at levels higher than levels measured in a neighboring county with no gas development¹⁸
- Evidence of ground-level ozone formation, which once exceeded the EPA 8 hour standard of 75 parts per billion (ppb) in 2008¹⁹
- Ground water containing thermogenic methane in natural gas development and production areas²⁰⁻²²
- Trends in health impacts consistent with potential exposures (via a county-wide health assessment)²³
- Citizen concerns over oil and gas impacts to health (via county-wide surveys)²⁴

More recently, the BOCC instructed GCPH to address the BCC's concerns raised in its citizen petition. GCPH approached the CSPH with a request to collaborate on a HIA. Subsequently, the BOCC agreed to contract with the CSPH to conduct this HIA. Through funding from the Pew Health Impact Project, a Canadian HIA consultation firm with experience in resource development projects, Habitat Health Impact Consulting has provided technical assistance to the CSPH for this HIA.