The Battlement Mesa Health Impact Assessment

A case study and oral history of process and lessons learned

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Introduction

The Health Impact Assessment for Battlement Mesa, Garfield County, Colorado was performed between 2010 and 2012 and represents an important event in the history of monitoring and mitigating impacts from oil and gas development. It was the first Health Impact Assessment (HIA) of its kind in the area of oil and natural gas development, and occurred at the forefront of national and international interest in the health impacts from energy development activity. With almost no assistance from federal or state regulatory agencies, the project was initiated by local citizens; funded by the county commissioners of Garfield County, Colorado; and performed by the University of Colorado's School of Public Health. Ultimately, the HIA was completed, but its results were mired in controversy, as an inherently local process became wrapped in regional and national politics.

The timeline of events and lessons learned from this HIA experience will grow increasingly important as HIAs become more prevalent across the United States and in situations regarding oil and natural gas development. This paper offers an in-depth case study of the Battlement Mesa HIA, focusing less on the controversial findings of the report, and instead concentrating on the historical context, the regulatory process, and the project design and implementation of the HIA. This case study relies on primary documents; meeting minutes; newspaper stories; and 13 in-depth interviews and focus groups performed with Garfield County residents, current and former local government officials, outside observers, and HIA report authors. This case study tells the story of the Battlement Mesa HIA and lessons learned from this experience.

What is Health Impact Assessment?

Health Impact Assessment is an emerging tool in the process of planning and siting large land use activities. It is defined by the National Research Council as "essentially [a] structured process that uses scientific data, professional expertise, and stakeholder input to identify and evaluate public-health consequences of proposals and suggests actions that could be taken to minimize adverse health impacts and optimize beneficial ones" (NRC 2011). The National Research Council (2011) and others view the HIA process as an outgrowth of the National Environmental Policy Act (NEPA), the 1969 U.S. law which requires in-depth environmental, economic, and social impact analysis and mitigation recommendations to be publicly performed before of major land-use decisions involving federal land or financing.

HIAs are becoming more common in the U.S. and in other developed nations, although they are not required at the federal level (some states and municipalities do require HIAs in certain contexts) and a clear consensus does not yet exist regarding either the content of an HIA or the process by which it should be produced.

A Brief Summary of Findings and Recommendations of the Battlement Mesa HIA

The findings of the Battlement Mesa HIA are nuanced over the hundreds of pages contained in the final draft and appendices, and the authors conclude that residents will experience some degree of health impact, some of it with the potential to be severe. While the detailed findings are not the focus of this report, some of the main findings of the report include:

- The eight principal areas of health concern are 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.
- The principal health impacts are likely to be from chemical exposures, accidents/ emergencies resulting from industry operations, and stress-related community changes.
- Chemical exposure from contaminated air is the most probable method of exposure, and residents living within one-half mile of a well pad are more likely to experience health effects than residents living farther away.
- The HIA report contained an appendix called the “Health Risk Assessment” that proved to be the most controversial aspect of the report. The Health Risk Assessment, among other things, estimated the cancer risks from chemicals used in the energy development process to be 61 cancers per 1 million individuals, and the risk to residents within one-half mile of a well pad to be 93 per 1 million individuals. The report states that these risks substantially exceed the federal government’s target range for risk of 1 cancer per million people in the U.S., but is within the federal government’s generally acceptable range of 1 to 100 in a million.

Some of the more than 70 recommendations include:

- Wherever feasible, increase the distance between well pads and roads to residences and schools.
- Require the developer to use best available technology to reduce air emissions, including the successful public demonstration of air emissions reduction technology.
- Remove industrial traffic from residential roads.

- Institute regular inspection of well installations, pipeline installations, maintenance procedures and other infrastructure.
- Collect and make available the baseline and ongoing air, groundwater, surface water, and soil data around well pads and associated development.
- Disclose all chemicals that will be used on the well pads and keep a list of these chemicals publicly available.

The notion that the HIA was a ground-breaking endeavor and that results of the HIA might have implications for oil and gas activity occurring elsewhere was apparent almost immediately to the parties involved, as well as to many interested observers nationally and beyond.

Project Background

The unincorporated Colorado town of Battlement Mesa and the larger county of Garfield carry one of the more storied histories of natural resource development found in the American West. The story of the Battlement Mesa HIA cannot be told without discussing the historical context of Garfield County, Colorado, as this history and the learning experience of its residents have informed the county's approach to planning and mitigation around natural resource development. Without this experience the HIA may not have occurred at all.

Oil Shale and a Storied History

In addition to oil and gas development activity that has occurred for decades, Garfield County was home in the late 1970s and early 1980s to massive industrial development of the oil shale reserves found in northwest Colorado. In the midst of the Iranian oil embargo and associated energy crisis, major international firms embarked on developing the technology needed to extract and refine synthetic liquid oil from the solid, sticky rock formation known as oil shale found in this region. The process (not unlike the ongoing oil sands development in Alberta, Canada) required large workforces to mine and process the rock material. The undertakings employed thousands of worker in-migrants who overwhelmed the housing supply and municipal services of the surrounding Garfield County towns of Parachute, Rifle, and beyond.

In 1980, after several years of robust oil shale development, Exxon (then the largest corporation in the world) shocked Garfield County and the American West by announcing it would enter the oil shale business by purchasing the existing Atlantic Richfield oil shale holdings and construct a colossal oil shale processing facility that would dwarf the dozen or so developments ongoing by that time. The amount of production planned by Exxon would transform Garfield County and the

region into the world's largest construction site.[1] Exxon projected that as many as 875,000 workers would be needed locally once their plant was running at full capacity, a wholesale demographic, economic, and environmental transformation of the entire region (Gulliford, 2003). Exxon immediately announced plans to spend more than $1million per week for several years to turn Atlantic Richfield's modest Battlement Mesa worker camp into an entire new town of 25,000 people to house the first wave of new workers. The plans consisted of a diversity of housing and facilities, ranging from executive mansions to mobile homes connected by paved streets and municipal infrastructure, as well as a shopping center, police and fire station, recreation center, golf course, and other amenities (Gulliford, 2003). After the social and economic travails experienced during the 1970s in boomtowns throughout the American West, Exxon envisioned Battlement Mesa to be a demonstration of "lessons learned" and the gold standard for successful socioeconomic mitigation from natural resource development (Gulliford, 2003).

Less than three years later, on May 2, 1982 (a date that has become known as "Black Sunday") Exxon abruptly closed the facility and directly laid off the 3,000 workers employed by the company, and indirectly the many thousands of employees utilized by various subcontractors (Hanson and Limerick 2009). By that time, approximately 1,700 people called Battlement Mesa home, living in 33 single-family homes, 32 apartments, 465 trailer spaces, and 180 recreational vehicles. Meanwhile, foundations were poured and frames partially constructed for an additional 168 single family homes, while 400 apartment units were also in some stage of construction (Daily Sentinel, no date.).

A few years later, Battlement Mesa's population dropped to around 600, while Exxon started to advertise Battlement Mesa as a low-cost retirement destination (Miller and Blevins 2005). By 1989, Exxon sold the town to a real estate development company, at which point the town boasted an 18-hole golf course, a swimming pool, and a population that had returned to the pre-bust population of around 1,700, although the residents were no longer welders or roughnecks but instead "upscale retirees" (Miller and Blevins 2005). In 1995, Battlement Mesa was ranked by a retirement magazine as a top retirement destination in the United States.

[1] As an example of the project's scale, Exxon planned to pipe the requisite water needed more than 500 miles from the Missouri River in central South Dakota and then up and over the Rocky Mountains, a process that would require the construction of 3 dedicated 1000 MW coal-fired power plants alone (Gulliford, 2003).

Legacy of the Oil Shale in the HIA

Interviews with residents, elected officials, and government staff indicated that the saga of the Oil Shale Boom and Battlement Mesa informed the Health Impact Assessment in several important ways.

A Modicum of Local Regulatory Control

When Atlantic Richfield requested in March of 1975 that the Garfield County Commissioners re-zone 3,010 acres south of Parachute to allow for worker housing, the county commissioners declared the unincorporated area a "Planned Unit Development" or PUD. The PUD designation gave the county regulatory control over development in the area, and new changes to the PUD, such as oil and gas development, would require a special use permit (SUP) or major land use impact review (MLUIR) before the changes could take place. It is this requirement that later allowed the Garfield County Commissioners to require the HIA be produced before the natural gas development took place.

A Culture of Planning, Monitoring, and Mitigation.

A second, more general, impact is that the oil shale experience transformed Garfield County's approach to energy-related planning, monitoring, and mitigation. Cities professionalized their governance during the oil shale boom, and hired managers, administrators, and planning staff. The county hired several new planners and administrators that assessed fiscal impacts to the county and then applied for mitigation money available from the state Oil Shale Trust Fund and the energy companies themselves. County Administrator Roger Ludwig explained to writer Andrew Gulliford that Garfield County "changed from being a very typically rural Colorado county with fairly low levels of expertise" to an area of cutting-edge land use planning and socio-economic mitigation "copied by other counties and cities all over the country" (Gulliford 2003: 132). The region was the site of myriad local and regional planning efforts by in-house staff as well as hired consultants (including socioeconomic profiles and projections) in the following decades after the oil shale bust. Those following decades included a boom in amenity-led development in the southeastern portion of the county in the 1990s and early 2000s, and a boom in tight sands unconventional gas development that ramped up in the western parts of the county in the mid to late 2000s.

Wariness of the Bust

A related component is that the dramatic boom and then bust of the oil shale development led community leaders and residents to be more cognizant of the boom-bust nature of the natural gas industry that had prospered in the 2000s. This awareness variously took the form of

attempting to foster and accentuate the positive economic aspects of the development, to retain fiscal revenues generated by oil and gas so that funds would be available over the long term, and to not become overly-dependent on oil and gas as the only economic driver. One county official noted that "the community of Rifle, Colorado, which is kind of an old west mentality, also had some forward-thinking leaders that looked to: how do we make our community more vibrant, how do we improve the economy in our reach of the County, how do we get away from being totally driven by extractive industries whether it be mining, or oil and gas, fossil fuels? …so they're looking at diversifying the economy and getting it away from [the] strictly agriculture and extractive industry sector."[a]

Important Demographic Changes

Finally, the strategy of attracting retirees to take up residence in the Battlement Mesa community produced a more affluent and educated citizenry, one that had re-located from elsewhere around the country and was not directly affiliated with the energy industry. Relatedly, the eastern reaches of Garfield County experienced a dramatic boom in amenity-led development, especially during the period of the 1990s through the great recession circa 2008. Retirees, second-home owners, and employees of the vast tourism industry in neighboring Pitkin and Eagle counties began to "spill-over" into eastern Garfield County.

HIA Design and Implementation

Interview respondents indicated the design and implementation of the HIA in Garfield County was a process that had been long in the making; it was an outgrowth of a number of ambitious, largely citizen-led, monitoring and mitigation programs that were developed in Garfield County since at least 2004. The HIA conducted in 2010-2012 is a clear outgrowth of this early trajectory, as well as the catalyst for efforts that have continued since the conclusion of the HIA.

In 2004-2005, as gas drilling ramped up in the Garfield County area, there were a number of high-profile instances of environmental contamination, combined with a number of sensational stories of health problems associated with natural gas development. Additionally, the county was experiencing energy industry-related population growth that put stresses on local communities and governments. Respondents noted there was a perceived vacuum of regulatory authority and responsibility. "Early on, the industry really didn't come in with identifying and addressing the impact that they were going to have on this rural community and…so they were perceived as kind of just rolling over everybody. So we had (…) all kinds of different issues from a social standpoint. And from a health standpoint we had lots of folks concerned that they were

being exposed to toxic chemicals, that the water was being contaminated, that the air was being polluted. There were lots of strange odors floating around the community which led people to believe they were being exposed to toxic chemicals."[a]

Another observer noted that Garfield County residents were predisposed to be wary of the effects of drilling, "The other thing that was strikingly different in Garfield County versus Montana and some other places is the 'split estate' issue is so big in Garfield County because almost entirely these folks no longer have the mineral rights under their properties and so they didn't benefit from development."[f]

A Flurry of Community–Led Monitoring and Mitigation

In response, a group of local residents in 2004 organized to conduct an air pollution study that examined a range of possible contamination risks to residents who live proximate to drilling activity and determined what kind of an air monitoring program would be appropriate. According to a former county official, "some of the information that was coming out of that really led to people in the community becoming concerned about levels of toxics, air toxics, in the environment […] which gradually developed into the current air monitoring program" that is present in Garfield County today."[a] In 2005, Garfield County implemented a countywide air monitoring plan based on the report, as well opened a county-level office of public health and hired a public health officer to oversee the office and related health monitoring efforts.

Also in 2005, the Grand Valley Citizen's Alliance, a state non-profit environmental advocacy group, released a *Community Development Plan* that provided best management plans and resources to reduce leasing and drilling conflict among industry and residents in the region. A result of this plan was the Citizens Advisory Board, which still exists today, and was described by one former member as, "kind of a mix of industry representatives, some landowner/ homeowner representatives, participants from the County government, and others. It kind of functioned as sort of a roundtable to raise issues and try to communicate within a civil environment and try to find new ways forward for solution[s]."[f]

In 2007, the Garfield County Public Health Department (GCPH) published the *Ambient Air Quality Monitoring Study June 2005-May 2007*. Meanwhile, consulting firm BBC Research published the regional *Northwest Colorado Socioeconomic Analysis and Forecasts*, and two local scientists publicly presented the findings of their study of risks and health impacts from the natural gas industry in Garfield County.[i] In 2008, public health specialists from the Colorado

School of Public Health chose Garfield County as a case study in a white paper entitled *Potential Exposure-Related Human Health Effects of Oil and Gas Development.*

The Request for a Health Impact Assessment

On May 27, 2009, Antero Resources announced that it would be developing a 10-pad, 200-well project within the confines of the Valley Mesa Planned Unit Development that contains Battlement Mesa. “And that really upset a lot of folks because many of the folks that lived there believed that their land would never be developed, the PUD would never be developed. In fact many times we heard people say that, ‘that was never disclosed,’ or they were told that the mineral rights would never be developed or, you know, one thing or another. So people were very up in arms about it.”[a] The designation of a PUD required a special use permit (SUP) or major land use impact review (MLUIR) to be implemented by the county before the changes could take place, which allowed the county commissioners the legal authority to delay development while the health impact assessment was completed. An author of the HIA noted that “the citizens […] had figured it out that there was this clause in Battlement Mesa and that they were going to push the commissioners on this.”[c]

By October 2009, the Battlement Concerned Citizens (BCC), a committee of the Grand Valley Citizens Alliance (GVCA), presented a petition to the Garfield County Board of County Commissioners (BOCC) with some 400 signatures of residents from the Battlement Mesa community requesting “to defer any permitting decision related to natural gas exploration and/or production within the Planned Unit Development (PUD) of Battlement Mesa until a thorough study of public health, safety and welfare concerns associated with urban natural gas development has been completed” (GVCA). By November 9, 2009, the BCC provided a follow-up letter detailing specific concerns and requests, particularly the request for “the county and state to conduct a ‘Health Impact Assessment’ (HIA) before a Special Use Permit is approved to any company drilling within the Battlement Mesa PUD” (GVCA, 2010).

The BOCC were generally responsive to concerns of the Battlement Mesa residents, and as municipal officials observed, the responsiveness was in large part due to the fact that Battlement Mesa was not incorporated, and therefore a direct constituent of the county. A municipal official remarked, “The group was a small faction. It wasn’t necessarily representative, but the commissioners were certainly sympathetic because you have to remember Battlement Mesa is probably the largest unincorporated community in Garfield County. So [the commissioners] do spend a lot of time up there, spend a lot of resources up there and try to do what they can.”

Project Design and Scoping

The county commissioners tasked Garfield County Public Health (GCPH) with investigating the process required to perform the HIA and to develop an approach to the design and implementation of the HIA. In December 2009, based on the 2008 white paper that used Garfield County as a case study, GCPH contacted the Colorado School of Public Health (CSPH) to see if there was interest in performing the HIA. The GCPH and CSPH then began investigating what would be required to address the citizen concerns.

On February 2, 2010 the CSPH applied to the Pew Charitable Trusts Health Impact Project for $150,000 to conduct the HIA. Instead of waiting for the results of the grant application, the Garfield County Board of County Commissioners (BOCC) committed up to $257,000 of county general funds in mid-February 2010 to finance the HIA requested by the Battlement Mesa Concerned Citizens, as well as a plan to monitor environmental health over time (called the Environmental Health Monitoring Study, or EHMS).

Initial Design

In the winter of 2009-2010, the GCPH and CSPH met with a diverse group of stakeholders to design the HIA process and initial scope of work. Stakeholders included individual citizens and organizations from Battlement Mesa, county commissioners, several energy development companies, the Colorado Department of Public Health and Environment (CDPHE), and the Colorado Oil and Gas Conservation Commission (COGCC). According to the authors and officials working though the contracts at that stage, the health impact assessment initially was framed as "a process by which we gather information, assess specific health risks that have been identified in one manner or another by the community, by us, and then provide recommendations to the board to utilize in the course of making land use decisions."[b] According to a county official, initially the HIA was being framed as "a preliminary report for the commissioners […] It wasn't meant to be a comprehensive health study and it wasn't meant to be a study that would necessarily even be published."[d]

Despite the implications for drilling in other areas, the scope of the document was to be strictly limited to the proposed development in the Battlement Mesa PUD. Antero indicated it planned to submit development plans in September 2010, and therefore the target date for the first draft of the HIA was moved to September as well. The first draft was to be published in September 2010, and the final HIA report on April 30, 2011. The CSPH would report to the GCPH director, who would report to the county commissioners.

Deciding on a "NEPA" process

Most socioeconomic and planning assessments—including those previously commissioned by Garfield County—include public input in the writing of the reports, but they do not typically require multiple published drafts or include formal comment periods. In fact, the Environmental Health Monitoring Study (the other component of this process produced by the Colorado School of Public Health) simply was delivered to the commissioners in the form of a completed document. It was decided by the county and CSPH officials that the HIA would be different. It was to be modeled on the "NEPA process" for environmental impact statements; a well-defined public process that must include public scoping meetings, the publication of a first draft, a public comment period on the first draft, a formal response to all substantive comments received, followed by the publication of the second draft, a second round of comments and responses, and then a final document.

The HIA process is often conceptualized by public health professionals as a natural additive component to the NEPA process, and this framing influenced the design of the HIA (NRC, 2011). According to one HIA report author, "it was intentional on our part to follow [the NEPA] model and there are some guidelines that are out there. When [we were] looking into health impact assessments it seemed like that was the model that people were describing. You know at that time there was a HIA that had been done in Alaska on natural gas and the Native Population, and then there [were] a couple that were more urban planning kind of things, but very few that had been done in the United States. So, we were really kind of winging it. But it seemed to me that it also fit the needs also of what Garfield County was looking for in terms of having the stakeholder process."[c]

Formal Scoping

On February 3rd, 2010, the GCPH and CSPH held a Battlement Mesa Health Studies Stakeholders Meeting in Rifle, and performed scoping-like activities to determine the range of concerns of local residents. "The scope of the HIA, the eight areas of concern which is kind of what the HIA is built around, those eight areas of concern were identified through citizen meetings, their areas of concern and then somewhat of industry's as well."[c] The eight areas of concern listed in the report were health concerns associated with natural gas development and production: air emissions, water and soil contaminants, truck traffic, noise/light/vibration, health infrastructure, accidents and malfunctions, community wellness, and economics/employment.

By May 2010, due to contractual and organizational policy issues, the project was split into two separate processes: the HIA and the EHMS design. Another "Battlement Mesa Health Studies

Stakeholders Meeting" was held on June 15, 2010, and a white paper on the HIA process itself was released on July 27, 2010. Report authors and county officials noted that during this phase of the process Antero (the energy developer) was cooperating with the HIA. Antero provided a tour of facilities for CSPH staff, as well as provided detailed technical information. One author noted, "They were cooperative, they were busy; they had other things that they were doing too. But to the extent possible, they were by and large very cooperative with [the HIA] and supportive of the process to the extent that they could be. […] They clearly wanted to manage it, but I never got the feeling they were hiding anything or were hostile…at least initially, right up till after the first draft. We went down to Antero's office a couple of times in Denver and met with them, met with their Health and Safety people. They wanted to both be involved in the community and mitigate the perceived hazards**."**[b]

First Draft of the HIA

In May 2010, contracts were signed and the HIA Project began. The first draft of the HIA was released publicly by September 20, 2010, and was formally presented to the Garfield County Commissioners on October 4, 2010. A 30-day public comment period commenced, and the initial findings of the report received statewide news coverage, as well as mentions in media nationally and beyond. The public comment period closed on November 15, 2010 with 400 individual and organizational comments received. Commissioners complained that the process was becoming overly political.

After the first draft of the HIA was released in September, the CSPH continued to meet with stakeholder groups throughout the winter of 2010-2011, although the process had grown more contentious after the release of the first draft and the associated appendices that contained the formal health risk assessment. CSPH held a stakeholder meeting with Antero Resources and the Colorado Department of Public Health and Environment on January 7, 2011, and held a stakeholder meeting with the Battlement Mesa community January 19, 2011, a stakeholder meeting with West Slope Colorado Oil and Gas Association on January 31, 2011, and a full public stakeholder meeting with all parties and the Board of County Commissioners on February 14, 2011.

Limited Scope, unlimited implications

It became clear almost immediately to all parties involved that, despite a scope limited to the Battlement Mesa PUD, the HIA would be intensely scrutinized by outside organizations. The Garfield County HIA was to be among the first performed on oil and natural gas activities, and

would have implications for energy activity performed around the world, especially in areas where the development is contested and residents are sensitive to the possibility of health risks.

The report authors and government officials repeatedly stated that the results were not meant to be applicable to any other context than the Antero development of 10 well pads near Battlement Mesa. However, at the announcement of the intent to perform the HIA, environmental groups, impact assessment organizations, and industry associations had already begun pointing to the importance of the eventual findings of the HIA.

Initial Wariness…

One of the HIA authors indicated, "It became apparent that the industry was pretty wary of this becoming 'the model.'" Industry was afraid that "this would be something that would have to be done in every location before there was any drilling."[c]

Another HIA author indicated, "it was seen as precedent-setting which is why all the other oil and gas interests like the Western Slope Trade Group got involved and they all basically came in as stakeholders even though they weren't directly related to either what Antero was doing or planning to do in and around Battlement Mesa."[b]

There was a lot of attention: "[…] The HIA just became this magnet for everybody whether it was citizens, whether it was the industry and the media, and the local media feeding into it all."[c]

On election day, November 2, 2010, one county commissioner (out of 3 commissioners total) who particularly championed the funding of the HIA was voted out of office, replaced by a candidate who ran on a platform of loosening oil and gas regulations, scaling back county-level planning and zoning administration, and furthering a self-described "capitalist, pro-business approach" (Colson, 2010b).

In December 2010, the BOCC extended both CSPH contracts and provided an additional $97,000 in funding to support the additional HIA public review processes. On January 11, 2011, the new county commissioner was sworn in to office.

An industry trade association official had noted on October 12, "that there are those who seek to politicize the HIA process is no surprise, but the fact that it's happening before a final HIA is released is concerning." Before the first draft was even formally released, the county commissioners complained that the HIA was becoming a "political tool" for those in opposition to gas development (Colson, 2010a).

While Antero had been largely cooperative with the process, there was much negativity from other industry stakeholders. “They were trying to work the angle of ‘we don’t want this to become a model.’ They were starting to get worried from a larger picture.”[d]

Conversely, environmental and anti-industry groups were looking to use the results of the HIA to block development occurring in other parts of the county. “They wanted essentially to take the results of the HIA and plop it down into [somewhere else]. But you couldn’t do it; it was a totally different scenario.”

A resident supportive of the HIA indicated, “we saw it as a model for other areas […] because it was impossible to find another study in the country [so] it would be important for everyone to have access to that and be able to use that as a template or as a model as they move forward with trying to deal with natural gas issues. […] if you look at it and you look at the information that was included in the project, it’s really not as site specific as [the authors and officials] like to argue]. The issues are fairly similar across the various areas.” [e]

…and Then All-Out Hostility

Eventually, lawsuits using the draft HIA as evidence at trial were filed against Antero and other energy developers. One HIA author recalled, “once the lawyers became involved then it all became kind of ‘scorched earth.’ You know, [industry said] “we’re going to do everything in our power to discredit this process so it can’t be a credible issue if this comes to trial. Everybody lawyered up and went to town. There’s a very extensive groundwater modeling report, and then very extensive legal fees that were paid. I’m sure the cost [of the industry’s comments] exceeded what [the county] paid for the HIA itself…that’s one of the ironies.”[c]

Spokesmen for industry trade associations called the data being used “outlandish” (Colson, 2012) and the extensive formal comments to the county commissioners from Antero read like a legal brief, with the first sentences calling the study “seriously flawed” and “not adequate” (Antero, 2011).

Limited Scope, Unlimited Expectations

With the increased focus upon the outcome of the HIA, the expectations for what the HIA would or would not deliver quickly escalated out of control.

A county official explained: “The name ‘health impact assessment’ is itself a little bit misleading. People didn’t really understand it. I think people initially had this thought that we were going to

do this study and we were going to tell them exactly how gas was going to impact health without actually having done any, you know, without the project actually even happening."[d]

Indeed, the nuance of a health impact assessment and the nature of assessing risk from future events appeared to be lost on many residents. A major headline in the local newspaper, the Glenwood Post, read "Report finds possible health risks from drilling" and the paper received many letters from residents who interpreted the findings to mean that health risks were imminent (Colson, 2010). Statewide papers had headlines such as "Fracking air pollution threatens nearby residents, researchers say" (Webb, 2012). The story was picked up by wire services such as Bloomberg News, and similar headlines appeared in newspapers around the country (Polson and Efstathiou Jr., 2012).

A "mysterious" telephone survey regarding the HIA was conducted on 2,300 Garfield County residents, asking questions such as "are you concerned by the HIA findings that gas wells near residential areas may pose health hazards related to declining air and water quality, increased traffic, and other developments?" (Colson, 2010). It was later revealed that a Colorado non-profit was funding the survey to measure the level of anxiety produced in Garfield County residents by the HIA document itself.

Antero also interpreted the document as indicating health impacts from gas drilling were all but a forgone conclusion. In the official comments to the County on the second draft of the HIA, Antero stated that the document reflects "a predetermined assumption on the part of the HIA authors that gas operations are harmful to human health, rather than a scientifically valid and objectively confirmed set of findings that Antero's proposed operations will cause adverse health impacts to the residents of Battlement Mesa" (Antero, 2011).

Meanwhile, many of the public comments received conversely lambasted the HIA for being too soft on industry and not being more stringent in their characterization of health impacts. Commenters ranging from board-certified physicians, to physics professors, to local environmentalists, decried various aspects of the HIA as being too limited, shortsighted, or pro-industry.

> **"**If you look at the first set of comments on the risk assessment, there are lengthy comments both from the industry and from the citizen group's consultant that they hired and if you read through these comments neither one of them liked it. Neither one was happy with the result because it didn't support what they wanted."

> "We got [in the middle of] this pushing match between the Battlement Mesa's [hired] experts and the industry experts fighting over the health risk assessment and what it doesn't mean, are the methods correct, or whatever."[b]

Even some of the report's detractors admitted producing the HIA was a difficult task, "From my perspective, when it comes to scientific probability it was a heavily slanted and very thin factually supported document." But, on the other hand, the speaker conceded, "it's pretty tough to measure health impact when you've got nothing really going on up there."[i]

Lack of Data, Lack of Time, Lack of Funds

While both sides of the issue decried the use of inferior data, unfounded assumptions, and a lack of cutting-edge analytical techniques, the reality was that the world's first unconventional Oil and Gas Health Impact Assessment was to be completed for a cost of only $157,000 and take less than 12 months from start to finish. The first draft was to be completed in less than six months.

Furthermore, the formal Antero development plans from which the HIA was supposed to be built were never unveiled. "So the whole thing was supposed to be based on the plans which we never received and part of our charge by the county commissioners was to only use existing data and to conduct no new data collection. Obviously we didn't have the time to collect new data [anyway]. Of course hindsight is 20/20, but maybe at that point would have been the time to say, 'maybe we need to stop until we have a plan [from Antero]'[b].

An author of the report lamented,

> "It's supposed to be a quick and dirty policy tool [where] you take existing information and try to inform decisions as best you can. Which, given the relatively short timeframe, there's lots of places [where] there's basically no information. Where there's no data, we can't say yes or no, only 'here is a potential hazard'. We don't know what the exposures are, we don't know what the health effects are because the tracking data either doesn't exist or isn't collected in a way that allows us to analyze. All we can say is *if* people were to be exposed, the health effects *might* be this. A lot of what the HIA talks about, these are potential problems and potential mitigations."[b]

Official comments from industry show that another major point of consternation was that recommended changes were viewed as unrealistic or unfeasible, especially when the health impact was unproven. An author noted "We were asked to provide specific recommendations without consideration of cost or feasibility…which is another thing that made this, from the industry's perspective, controversial."[b]

Political Realities and Changing Economy

"When the first review was done, the industry came back and it was not just Antero. It wasn't really any local industries, it was: Williams, Encana, Barret, Colorado Oil and Gas Association, Western Colorado Oil and Gas Association. Yeah they all kind of banded together and said 'whoa, whoa, whoa this health risk assessment is very provocative' ".[a]

"Our contract was up and it was really a question of would we respond to the second round of public comments. Industry asked for and was granted by the commissioners an extension [for submitting comments] which essentially ran out the clock on our contract. They would have had to renew our contract."[b] The commissioners declined to renew or extend the contract.

According to a former county official, "The commission just left and said this is too controversial, we are going to shut this down and we are not going to accept your findings."[c]

However, the commissioners, while voting to end the relationship with the CSPH, still publicly called the study "useful" and "full of valuable information." In the June 6, 2011 letter addressed to CSPH from the county commissioners that terminated their formal relations with CSPH, the commissioners stated they were "committed to utilize the document as originally intended if and when a land use application is submitted relative to the HIA" (Martin, 2011). Still, during the same meeting, one commissioner offered a rationale for terminating the HIA by saying it had become "a political football. What I see coming down the pike is lawsuit after lawsuit after lawsuit with these things. It's an endless game of political one-upmanship." (Stroud, 2011)

With the slowdown in the economy starting in 2008, and the election of a new county commissioner in 2010, the political winds in Garfield County began to change. When it was once fashionable for residents to complain of the industry moving too fast, residents began to worry that the natural gas industry might leave the area for good. An author of a number of socioeconomic studies on the West noted on the Garfield County study, "There's some sort of ideal level and rate of development which makes everybody pretty happy and when things are going faster than that there's a natural tendency to want to slow things down and sort of catch your breath and get everything under control and better managed and so forth and when things are going slower then of course everybody wants to re-stimulate and drive more growth."[f]

2nd Draft (and the end) of the HIA

On March 1, 2011, the 2nd Draft of the HIA was released to the public, with a public comment period that officially closed on April 27, 2011, after an extension of the deadline for industry

comments. The second comment period solicited a much more scathing and aggressive commentary from industry and environmental groups, as well as threats of legal action. On May 2, 2011, the county commissioners voted unanimously not to extend the contract with CSPH and to conclude all work on the HIA immediately. The reports had been completed, however the abrupt end to the process, and lack of finalization thrusts the legitimacy of the report conclusions into limbo.

In December 2011, CSPH delivered the Environmental Health Monitoring Study design (EHMS) report and formally presented the report to the Board of County Commissioners on January, 4, 2012. The report contained study designs with the purpose of (1) filling information gaps identified in the Battlement Mesa HIA; (2) monitoring the environment in Battlement Mesa throughout Antero Resource's natural gas development project; and (3) monitoring the health of Battlement Mesa residents and the Battlement Mesa community throughout Antero Resource's NGD project. CSPH asserted that while these designs were motivated by proposed activities in Battlement Mesa, they also might be applied to other NGD areas in Garfield County.

When asked if they ultimately viewed the HIA as a success or failure, the report authors interviewed indicated that overall they were generally happy with the reports themselves, but deeply disappointed in the way the process played out:

> "We were shell shocked for like six months after we got done. We had slight sort of group PTSD on it just because it ended from our perspective kind of badly. Well the money was gone and we had to move on and do other things. We felt like we had been kind of cut out especially when we found out that this EPA Grant we had applied for had been canned. You know that sort of left a bad taste in our mouths."[b]

Said another:

> "I think in the short run, I believe we were scapegoats and that a lot of things that were blamed on us were probably, we were not responsible for.... But I think in the long run things are going to come out all right. On a wider state and national level I think the Health Impact Assessment went a long way in putting health right on the table along this issue and it's going to be hard to get it off the table at this point."[e]

Lessons Learned: Local vs. Non-Local Governance

In retrospect, the experience of the Battlement Mesa HIA illuminates both the opportunities and the challenges of a locally-governed impact assessment. One set of factors included the county-level control over drilling activity in the Battlement Mesa PUD; the active citizenry and responsive elected officials; and the rich local history of commissioning social, economic, and environmental impact assessment that fostered the emergence of the HIA effort. Conversely, a robust procedural framework administered by a third party (such as state or federal government), would have likely avoided many of the local politics, economic pressures, unrealistic timelines, and changing expectations that ultimately compromised the findings of the Battlement Mesa HIA. When asked to identify "lessons learned" from the process, interview subjects provided an array of lessons, most of which were closely related to the problems and promises of the locally-based governance structure.

Lesson 1: Clarify the Process, and Focus on the Immediate Stakeholders

All interview subjects, including the authors, county officials, and other community leaders did not decry the NEPA-type public process, and most were adamant that the public scoping meetings, as well as formal comment periods and allowing responses to the comments, were the correct way to proceed. However, the interview subjects noted the openness of the process was difficult to control and ultimately led to the demise of the project.

Authors and former county officials noted that limiting the influence of outside groups from both sides of the issue would have alleviated some of the political pressure:

> "We had gone through a really comprehensive conversation about how to make sure that we had people in place who weren't biased. […] Clearly stating and staying solid on the message that this HIA was focused on Battlement Mesa only and [taking] those other [non-local] stakeholders out of the picture would have been a really good step on our part because they're the ones that muddied the water. There were all of these things coming up […] between the two sides which then ultimately was the demise of the project […] because the commissioners

> said “well, we’re never gonna get through this so we’re just gonna stop funding it and it’s done”.[d]

Another report author noted, **“**When you’re doing this type of process in such a politically charged atmosphere…whatever you produce isn’t yours anymore. Once it’s out it doesn’t belong to you, it gets used by people in all sorts of different ways that you may have never conceived of.”[e]

Other perspectives included: “The process got taken over by outside interest groups and I’m not really sure how the best way to completely avoid that would have been, and also getting potentially pulled into legal proceedings on other matters in the County which we were not involved in.”[c]

And this additional comment:

> “I think one of the lessons for us is when you have a very local project that is then perceived to have regional or national impact, that’s when suddenly everybody else got very interested. I’ll point out that what was in our risk assessment in the HIA wasn’t any different than several risk assessments that the Colorado Department of Public Health and Environment had done. You can actually compare them and they’re not substantially different.”[b]

Lesson 2: More Transparency Regarding Stakeholder Influence

Relatedly, the authors of the HIA admitted that they could have done more to show transparency with the stakeholders they were meeting. The authors met in Denver with consultants that were hired by statewide industry associations, “which created a perception that we were meeting behind closed doors with the industry which I think fueled a certain level of distrust within the citizen group because some people felt excluded from certain meetings. And some of those [meetings] were [closed door], you know, but that wasn’t our intention.”[b]

Another author agreed, “The [meeting] we had with the state department was closed door, the one we had with the industry was closed door, and the one we had with the citizens group was open door. So, the industry was at that…So the perception of that was probably, from the standpoint of the citizens, not well received.”[e]

Lesson 3: Manage Expectations and Stick to the Scope

“We were found guilty of not doing things that weren’t in our scope of work,” one report author reflected.

> "They kept saying 'you should have done this and not the other thing', but they were all things that required either new data or extensive analysis that we didn't have the time or money to do, that were essentially outside the scope of work. [And] that would have been a scientifically just and reasonable thing to do, such as extensive air modeling. But we didn't have the resources or the time for that."[b]

"A lot of the controversy is around things that either people would have liked to have seen, wanted to see for one reason or the other," noted a report author[c].

Said another: "I think the citizens' expectations were different than the commissioners' expectations. I think the citizens' expectation was that there was going to be a recommendation out of the HIA to either proceed or not proceed with the project and the HIA did not come out with a recommendation either way on that."[e]

An author of the HIA indicated that in retrospect the authors should have been resolute in that "here's our original scope [of] work, we've met our scope [of] work to the extent that we could with the time and resources we had."[b]

Said one source:

> "We had 78 different recommendations that came out of the report but it was very clear that the recommendations were just that: recommendations to the county commissioners, they could take them or leave them. And that they could implement them to the extent they wanted to, when and if an application ever came in. So they knew, the commissioners knew, they didn't have to use any of the information.
>
> **"**We wouldn't have been the right people to do them anyway since a lot of them involved kind of technical approaches to natural gas development. But we read the literature to the extent that we could about, for example green completions and things like that, and tried [to] fit that in and the commissioners could take and leave them as they chose. If you read the executive summary it says that. One of the first things, it identifies who the decision makers are and it's the county commissioners. In fact I remember being in one of the meetings were we met, we met three or four times with the county commissioners, and having one of them quote that text back to us. We'd written it, and were very aware of it. I found that sort of an interesting process. I don't know if he was doing it to tell us that we should step back or just to assert his authority to the larger room."[a]

Lesson 4: The Need for Adequate Time

The authors wished they had more time, both to perform the analyses and to become more integrated in the community.

> "[If we were able to do it again,] I think we would have pushed harder for a more realistic timeline. […] Our promise was that this health impact assessment wasn't going to hold up the permitting process, but I think we really could have used some more time to establish relationships to, just to be more present in the County before all of this and pushing for a more realistic timeline. And as it turns out they […] never did submit permits."[d]

Said another:

> "I think one of the lessons for me in all this is not being present in the County where, you know, we felt we were out of the loop in a lot of the conversations. It was a four hour trip to come over [to Garfield County] and we weren't members of the community in the way a lot of the people were. Antero was there, other people they dealt with lived there, as well as some of the other stakeholder groups that imposed themselves on the process—so they had a lot more access, I felt like, than we did."[b]

In a separate interview, the first commenter above agreed:

> "Yeah. I think one of the biggest things was this sort of limited access to the commissioners because they were the big decision makers and if we would have been more thoughtful about it we would have at least taken the time to meet with them individually so that we could have a better conversation with them. You know in a public meeting everybody is very careful about how things are said especially in this kind of hot topic. Not that I think we had anything secret to impart to them but I think we just didn't have a good dialogue with them so I think it would have been important to establish a better dialogue."[d]

Lesson 5: The Need for a Standardized Framework

The HIA was decidedly a county effort. Mayors and former mayors of towns within the county indicated they had little to no role in the process beyond being spectators. One town official noted, "Well, we were interested in it, but it was a county issue…That was their role. We hadn't had the money to put up any type of monitoring equipment and even if we did, we didn't have the personnel to analyze it and do that sort of thing so it just wasn't something that we found necessary to duplicate their effort."[g]

A former official from another town noted, "My impression, and that of the city council, and the city staff, the county came and said, "the drilling is not occurring in your community so you're not

being impacted.' […] But we are all residents of the county as well, and I would have liked to have seen them maybe convene a little bit earlier on with the municipalities to look at the impact. [In retrospect], I think there are opportunities to build cooperative partnerships with municipalities."[h]

Nearly all respondents indicated that formalized contributions from other government agencies would have increased the legitimacy of the process. A former county official recalled,

> "[The state] were stakeholders in the process because the State Oil and Gas Conservation Division was going to be issuing permits so they would have a role, they regulate many of the environmental health impacts or they regulate the processes by which the impacts occur. We have a very small public health department. In fact this HIA probably should have been done by the State Health Department.…So we relied heavily on the expertise of the epidemiologists and toxicologists, not just for the HIA but on many of the things that [we] did, the technical experts in air quality and water quality and so on because we didn't have the capacity in Garfield County to deal with all of that. Then when we got into issues like around health data and so on we relied heavily on the State Health Department to help us with gathering the information. Early on, they expressed concerns about how we were going to use that information, how it was going to be interpreted, you know, all those kinds of questions which ultimately climbed, I think, to the [federal Environmental Protection Agency] level. We were also working with the State Health Department and we requested for them to review the risk assessment before it was put into the draft and they declined to do so."[a]

While the questions raised by some aspects of the HIA were noted by the EPA, the EPA was not involved, "because they didn't see that they had jurisdiction over it, it was a local issue essentially."[a]

Another county official recalled,

> "I think that [the county] didn't want industry to be involved with these studies because people didn't trust the industry. So if you have the industry guiding the study, then the outcomes, in many people's minds, could be questionable. The reason we hired this whole [outside public health agency] was because we wanted to find professionals who had no connection to the outcomes of the study. But I wish we could have some standardized approach to studies because you have to keep the industry and you have to keep politics out of it or you are not going to come out with conclusions that are objective and that are science driven. There is just too much for the industry to lose and they're a smart and capable and resource rich industry. They can adapt their technology to the results of studies, but they shouldn't be the ones leading the studies."[e]

From an author's perspective, there was hesitation about working on a HIA without federal or state support.

> "When we decided to go with this local [study], you know with Garfield County, and it not being federally owned and not [needing] to have to work with BLM there was some sort of disappointment I think among some of the groups that I've been talking with. We really didn't have any involvement with any of the federal agencies. The Colorado Oil and Gas Conservation Commission, the state agency, kept an eye on it, very carefully did not involve itself in it. So I think there was this very careful distancing that the COGCC did and I don't know really know what their internal thoughts were about it, but they considered it a local issue, involving only the local commissioners."[c]

In an academic article published in the *American Journal of Public Health*, several HIA authors explain a number of lessons learned:

> "An impartial third party should fund an HIA that has implications for high-stakes political manipulation. As part of setting the scope of the HIA, all stakeholders should provide the information to be evaluated and adhere to mutually agreed on deadlines. All stakeholders should agree on procedures for evaluation of new information and the costs of such additional evaluation. Stakeholders should be vetted carefully so that those whose interests are inconsistent with the goals of the HIA are not given a platform from which to undermine the process. Stakeholder meetings should be open to all stakeholders, so that all participants have equal access to the dialogue and to information being exchanged at the meetings" (Witter, et. al. 2013: e7).

Conclusions: The Need for an HIA Regulatory Framework

In the end, the Battlement Mesa HIA reports were, in large part, completed, although the abrupt finish and mire of political controversy leaves the legitimacy of the report results in limbo. Many who are sympathetic to the oil and gas industry reject the HIA reports wholesale, while many sympathetic to environmental causes see the HIA reports as not going far enough.

In a lengthy story, National Public Radio determined that, for these reasons, the CSPH "efforts failed" (Shogren, 2012). While the HIA authors delivered on the agreed-upon scope of work, the intense political focus by industry and environmental groups led to increasingly unrealistic expectations from a variety of stakeholders. The process abruptly ended amid a growing cloud of unmet expectations, legal wrangling, and political disagreements.

Health impact Assessments continue to increase in frequency in the United States, as they are becoming more viewed as a valuable step in the process of planning and siting of large projects. Many economic and environmental impact assessments prove to be controversial; however the focus of Health Impact Assessments takes on the additionally important and highly contentious topical area of public health. Numerous studies have demonstrated that industries will go to great lengths to dispute health claims made against their products (Michaels, 2008; Oreskes, 2010). In the case of oil and gas, billions of dollars of development are potentially at stake in any given permitting decision, and it is reasonable to assume that HIAs will come under extreme scrutiny.

The Need for an Oil and Gas HIA framework

A recognized framework is needed that sets procedures, timeframes, outcomes, and best practices for all parties in the context of oil and gas development.

Organizations such as the National Research Council, the Robert Wood Johnson Foundation, and the PEW Charitable Trusts have made early steps in advancing a non-legal framework for how to produce HIAs and what to expect during their development. In 2010, a document titled "Minimum Elements and Practice Standards for Health Impact Assessment" was produced by the North American HIA Practice Standards Working Group. Promisingly, the U.S. Environmental Protection Agency (USEPA, 2013) recently released a more in-depth "state of the art" HIA which includes a list of best practices and areas for improvement. Many of the areas of improvement in the document mirror problem areas encountered in the Battlement Mesa HIA.

Beyond the emerging best practices for HIA, it is clear that a framework for performing HIAs amid the challenges of operating in the context of oil and natural gas development must be developed. Such a framework can provide a constant and standardized process whereby the influence of local politics, personalities, and economic factors can be lessened, but must do so without sacrificing the authority of local municipalities to commission the HIA process. Oil and gas development includes an array of industry processes, timelines, chemicals, and factors that set it apart from other land use changes. Further, often a diverse range of stakeholders are involved, including local municipalities, as well as affected industry, residents, landowners, and other stakeholder groups, all of which must have the ability to provide input to both the process

and the results. Industry also deserves a robust procedure that can provide a predictable business environment, reasonable expectations, and avenues for recourse.

The NEPA process is an example of such a standardized process run by the federal government. NEPA, however, is limited to development on federal lands, and a NEPA review in cases like Battlement Mesa and many other contexts where HIAs are being performed would not apply. Perhaps a commonly accepted protocol can be developed over time as oil and gas activity moves forward in the United States and globally. Or perhaps over the course of many years, it eventually may be a combination of state laws and associated legal proceedings that determine best practices of HIA in the case of oil and gas.

Meanwhile, the methods used in the Battlement Mesa HIA have set the stage for this conversation and for additional monitoring and mitigation processes occurring across the United States. "We published a couple of papers based on our work… [in order to] get it to the broader scientific community. And I stand by our work. I think we've had an important national impact clearly because it's got people talking and thinking about the process."[b]

Nationally, the CSPH's work on the Battlement Mesa HIA has been recognized in scientific forums related to energy development and public health, and is viewed as an important first step in creating comprehensive HIA analyses. The published academic articles related to the Battlement Mesa HIA are among the most thorough and prominent available on the issue of energy development and public health. While interview subjects indicated that the specific data and recommendations were not transferable, the general scope and methods contained in the report will be useful in designing HIA assessments in other areas. One author noted, "So ultimately I think it was a success, it brought a lot of issues to light but it set the stage for future work."[a]

Locally, the substantive effects of the Battlement Mesa HIA are much more muted. The Antero project was never pursued, most likely due to economic considerations unrelated to the HIA. Health impacts, in general, have been brought to the forefront of local discussions related to the natural gas development, although the specific reference to the results of the Battlement Mesa HIA are unlikely to be well-received.

An outcome deemed successful locally and beyond was the Environmental Health Monitoring Study design (EHMS) that CSPH delivered to the county commissioners shortly after the end of the Battlement Mesa HIA. Unlike the HIA, the EHMS contained much less public engagement, no comment period, and was simply delivered to County Commissioners with little fanfare. The EHMS led to increased air quality monitoring, including a $1.77M study being performed by Colorado State University, of which $1M would be paid by the Garfield County commissioners, and the rest by ”gifts to CSU, including from oil and gas companies” (Lott, 2013:1) The emissions study is slated to conclude in the fall of 2015.

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