Community Action for Responsible Environmental Solutions Project
FACILITATION CONTRACT FINAL REPORT

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GARFIELD COUNTY PUBLIC HEALTH

ENVIRONMENTAL HEALTH FACILITATION CONTRACTOR

FINAL REPORT

1. INTRODUCTION

In 2008, Garfield County Public Health (GCPH) received a Level One grant from the Environmental Protection Agency, under Community Action for a Renewed Environment (C.A.R.E.) Program auspices. The C.A.R.E. Program is designed to help organizations take community-based action through partnerships to address the top-priority environmental health concerns experienced in the community. EPA's C.A.R.E. Level One grants assist a community in identifying its top environmental health priorities through a community consensus process. Level Two grants help create partnerships to address identified priorities. Information about GCPH's grant application and about EPA's C.A.R.E. grant program can be viewed in Appendix 11.2.

Some of the work of the GCPH C.A.R.E. grant was undertaken by the Garfield County Public Health Environmental Health staff, and some was designated for contract to consultants. In 2009, GCPH issued a Request for Proposal to hire a Facilitation Contractor to assist in conducting the aspects of the C.A.R.E. grant that would lead to a community consensus on priority environmental health issues for Garfield County. Royce Arbour, Inc., of Boulder, Colorado, was selected as the Facilitation Contractor through a competitive procurement process and began work in June 2009. The first several weeks were devoted to elaborating a plan of work that met Garfield County Public Health's needs and received EPA approval.

In August 2009, Garfield County Public Health named its C.A.R.E. grant-funded project "Community Action for Responsible Environmental Solutions," or C.A.R.E.S. The Royce Arbour project team worked with GCPH staff members to create the C.AR.E.S. project website, www.GarfieldCountyCARES.com, and its own email address, GarCoCARES@gmail.com. Information about the initiation of the C.A.R.E.S. project can be viewed at Appendix 11.3. The Facilitation Contractor's substantive work began in July 2009 and concludes with this *Final Report*, describing the work conducted through June 30, 2010.

1.1 Introduction to Garfield County

Garfield County, Colorado, extends from Carbondale on its eastern edge to the Utah border on the west. Incorporated communities are strung along Interstate 70 and the Colorado River. From east to west, they are Carbondale, Glenwood Springs, New Castle, Silt, Rifle, and Parachute. South of Parachute is Battlement Mesa, an unincorporated community of about 5,000. Small unincorporated areas – West Glenwood and Rulison – are also along I-70. The

large majority of the County's more than 55,500 residents (U.S. Census figure, 2008) live in these areas. Smaller settlements are on higher, rougher terrain away from the interstate and river. Much of the County is mountainous and relatively unsettled. Maps and demographic information about Garfield County can be viewed in Appendix 11.1.

Colorado's economic history can be described as "boom and bust" cycles generated by minerals extraction. In the 1800s, gold and silver, and in the 20th century, oil, natural gas, and coal, as well as lead, zinc, gypsum, building stone, molybdenum, and shale oil, took Colorado through such cycles. Garfield County's economic history is tied into petroleum extraction.

Although Garfield County continues to be impacted by boom and bust cycles because of minerals extraction, there are other economic forces with significant impact. The east end of Garfield County feels the impact of population growth because of the high cost of living in Pitkin County, adjacent to the east, in which are located the Town of Aspen and several major ski areas. People who cannot afford to live in Pitkin County settle in Garfield County and commute into Pitkin County. Interstate 70, which traverses Garfield County, is a major thoroughfare for all types of commerce as well as for cross-county travel. I-70 is the access route for sightseeing and recreation in Garfield County, adjacent counties, and the Western Slope of Colorado.

On August 1, 2005, recognizing the public need for an environmental health function, Garfield County Public Health expanded its service functions to include an Environmental Health (EH) staff, hiring Manager Jim Rada. By 2005, Garfield County was on its way to another boom due to renewed focus on natural gas drilling. Drilling activity engendered other business and economic activity, drawing new residents to the County. They required the full range of consumer products and services, further expanding the economy. Garfield County's newest episode of extraction-related activity, and the significant population growth accompanying it, had environmental health impacts. Impacts of extraction and population growth are felt strongly in the western part of the County, where gas well drilling occurs.

The EH staff has since grown to three, two of whom spend substantial time monitoring air quality and addressing air quality issues. The focus on air quality was derived from the desire to respond to concerns expressed by County residents about degraded air quality from gas well drilling activity. Garfield County Public Health's Environmental Health function has made use of grant funding to pursue its air quality work.

Gas wells have recently been proposed for drilling within the housing and services areas of Battlement Mesa. People living in Battlement Mesa generally oppose drilling there. Battlement Mesa was originally developed as worker housing from the mid 1970s to the early 1980s, as oil shale development boomed in the western part of the County. When interest in oil shale development waned after 1982, Battlement Mesa was recast as a resort and retirement community. Municipal services for its approximately 5,000 residents are provided by a municipal service corporation, not a local government.

Under Colorado law, ownership of the mineral rights and of the surface of the land are not one and the same. When there are two different owners of different aspects of the same parcel, the situation is called a "split estate". The two estates can be bought, owned, leased and sold separately, by different parties. Colorado law provides that surface access for development of the mineral estate must be allowed. Access includes clearing land of vegetation for drilling pads and retention ponds, grading dirt roads to pads, and heavy-vehicle traffic to and from pads to drill and finish wells.

EXECUTIVE SUMMARY

Garfield County Public Health (GCPH) applied for a Level One grant under the Environmental Protection Agency's (EPA) Community Action for a Renewed Environment (C.A.R.E.) Program. The intent of the C.A.R.E program is to help a community address its environmental health priorities through community-based action and partnerships. Level One grants are to reach community consensus on environmental health priorities. Level Two grants are to help a create community partnerships to address the identified priorities.

GCPH hired consultants to assist in reaching a community consensus on priority environmental health issues for Garfield County. Royce Arbour, Inc., of Boulder, Colorado, was selected as the Facilitation Contractor through a competitive procurement process in June 2009. Garfield County's project was named "**C**ommunity **A**ction for **R**esponsible **E**nvironmental **S**olutions," or Garfield County C.A.R.E.S.

Building on the collection of Garfield County resident concerns about environmental health assembled by Jim Rada and other GCPH staff members through presentations to civic organizations before a Facilitation Contractor was selected, the Royce Arbour project team members developed an engagement strategy to:

- collect additional County resident input on their environmental health concerns,
- assist a representative group of County residents to establish priorities among the issues,
- develop and sustain long-term working relationships between GCPH's Environmental Health staff members and Garfield County community partners.

To help Garfield County residents understand the focus of the project, Environmental Health concerns were defined by the project team as simply as possible:

"any environmental factors that may have a bad impact on human health, or have an impact on the natural world that is bad in the long term for human health and the environments in which people live.**"**

The reasons why Environmental Heath matters were also defined in easy-to-understand terms:

"because improvements in people's health are due more to changes in their environments, both indoors and outdoors, than to medical science and medicine."

The Environmental Health issues raised by Garfield County residents were put in priority order through a Delphi Exercise, with a respondent panel of Garfield County residents, selected to be representative of the County as a whole. A Delphi Exercise is a research methodology with a substantial supporting literature. It results in consensus among participants, which makes it ideal for community-oriented endeavors. The Delphi has been deployed in a variety of public health situations.

The respondent panel for the Delphi Exercise worked with a list of Environmental Health Issues identified by Garfield County residents. Respondents indicated their assessment of each Environmental Health Issue's importance on a 5-point Likert scale. The Colorado School of Public Health (CSPH) assisted the project by conducting the Delphi Exercise online using SurveyMonkey, an online research solution.

Public Open House meetings were held in the seven county communities – Battlement Mesa, Carbondale, Glenwood Springs, Newcastle, Parachute, Silt, and Rifle – which are the population centers of Garfield County. A total of 71 people offered their comments on the Environmental Health Issue priorities among that were established through the Delphi Exercise.

Here are ten conclusions drawn from the Garfield County C.A.R.E.S. project.

- CARE Level One Grant objectives were met.
- The project generated a prioritized list of Garfield County's Environmental Health Issues.
- Consensus on the priorities was reached by a representative panel of Garfield County residents.
- Extensive promotion and publicity yielded a modest turnout at public meetings.
- Public meeting input provided an indication of differences among the seven communities.
- The Environmental Health Issues are a rich source of information for public outreach and education.
- GCPH's Environmental Health staff should not be tasked with sole responsibility to address the priority Environmental Heath Issues.
- Partnering is a plausible way to accumulate resources for addressing the Issues.
- Stakeholder groups can be encouraged to organize and partner to address priority Environmental Health Issues.
- Garfield County presents a different model of environmental health concerns from other C.A.R.E. grantees.

There were 44 Environmental Health Issues identified by County residents, a great many different concerns to take into account, even arranged in priority order. To make addressing the issues more manageable, two different approaches were taken to present and analyze the Environmental Health Issues. The Environmental Health Issues are organized into:

- "clusters" that reflect just the concerns expressed by Garfield County residents and
- "groupings" that reflect environmental health programs and functions.

These 11 clusters derive from concerns that Garfield County residents brought forward:

- Individual Action Cluster
- Sustainable Communities Cluster
- Oil and Gas Exploration, Drilling and Production Cluster
- "Environmental Justice" Cluster
- Environmental Health Enforcement and Regulation Cluster

- Air Quality Cluster
- Water Quality Cluster
- Transportation Cluster
- Prevention of Hazards and Risks Cluster
- High EH Risk – Low Resident Concern Cluster
- Low EH Risk – High Resident Concern Cluster

The following seven groupings coincide with characteristic public health and environmental health functions or programs.

- Consumer Safety and Health
- Disease Control (could be combined with Consumer Safety and Health)
- Water
- Solid and Hazardous Waste
- Air
- Community Sustainability Planning
- Daycare and Schools

Both the clusters and the groupings create frameworks within which to address the priority environmental heath issues in Garfield County. Which framework is better to use depends on whether the Garfield County community, or the GCPH Environmental Health staff, should take action to address an Environmental Health Issue priority.

EPA's C.A.R.E. grant envisions stakeholders in the community becoming engaged as a force to address their own environmental health priorities. Therefore, the *Final Report* recommendations reflect the Garfield County community's concerns, reflected in the Environmental Health Issue clusters, as the primary framework. The goals of making recommendations are to help:

- Garfield County residents become empowered to make informed decisions and adopt behaviors that protect and enhance the health of individuals, families, communities and the environment.

- Garfield County Public Health to become a credible, trusted source of information and coordination that will help promote such behavior change in the County.

The overarching recommendation is that Garfield County Public Health be the one to initiate a series of coordinated campaigns over the next five years, and that the Garfield County community become engaged so that it provides the sustained emphasis that bring these campaigns to success. Political and administrative considerations should be taken into account in deciding where to begin.

The overarching mechanism is to direct social marketing campaigns to segments of the Garfield County community. The aim of the campaigns is motivating segments of the County with the best chance to impact a particular Environmental Health Issue Cluster to take action on

Environmental Health Issues and in turn motivate others with whom they have influence to do likewise.

These recommended campaigns are:

To address the Air Quality Issue Cluster:	No Idling Campaign.
To address the Oil and Gas Exploration, Drilling, and Production Issue Cluster:	My Company CARES Initiative.
To address the Sustainable Communities Issue Cluster:	Best Practices Consortium.

The C.A.R.E.S. project was presented to and discussed with the Garfield County Board of Health, the same individuals serving as the elected Garfield County Board of Commissioners, at its regular monthly meetings on July 20, 2009, and June 21, 2010.

This is the project's *Final Report,* together with *Appendices*. If more information is needed, please contact:

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3. STRUCTURE of the FACILITATION CONTRACT FINAL REPORT

The *Final Report* contains an introduction and Executive Summary preceding this section on the structure of the *Final Report*. It is followed by sections on the Findings, Conclusions, and Recommendations. Next comes the Methodology of the Project.

To read an overview of the project, one can consult the Executive Summary. The reader who wishes to see how the work was conducted should focus on the Methodology section. The reader who is interested in what Garfield County can do next should consult the Recommendations section. Issues that were identified and ranked in priority order by Garfield County residents are listed in the Findings section.

There are extensive *Appendices*, with its own Table of Contents and header pages detailing what is in each appendix. The materials in the *Appendices* are cited in the *Final Report* sections that deal with the information they contain. The *Appendices* have been provided to Garfield County Public Health in electronic form. The documents of the *Appendices* are in Portable Document Format (.pdf) for ease in accessing and using them.

4. FINDINGS

The Findings of the Garfield County C.A.R.E.S. project include

- a priority list of Environmental Health Issues that were offered by Garfield County residents,
- information on the representativeness of the panel of Garfield County residents that put the issues in priority order, and
- additional insights from public meetings held in each of the seven Garfield County population centers.

4.1 Priority Ranking of Environmental Health Issues

Here are the Environmental Health issues raised by Garfield County residents. They listed in priority order. Where two or more bear the same rank, the Issue Statements have the same priority. The method for arriving at these priority rankings, a Delphi Exercise with a representative panel of Garfield County residents serving as respondents, is described at 7. Methodology in this *Final Report*.

The Environmental Health Issues themselves were developed from input on the concerns of members of the general public. The only input on the Issue Statements from environmental health professionals was to insure that the statements are factually accurate, as best can be determined. A set of guidelines was developed to insure that the statements were similarly structured, faithful to the concerns expressed by County residents, and understandable to the

general public.

Environmental Health Issue	Ranking
RESPONSE to ENVIRONMENTAL EMERGENCIES to protect human health should be part of emergency preparedness plans.	**1**
NOT ENFORCING ENVIRONMENTAL LAWS and REGULATIONS leads to environmental health problems.	**2**
BACTERIA and OTHER CONTAMINANTS in FOOD, due to unsafe food handling in retail food establishments and homes may transmit illness.	**3**
METH LABS create risks of fire and explosion and toxic chemicals that contaminate the interiors of buildings where meth labs are located and are challenging to clean up.	**4**
EXPOSURE to BENZENE from gas wells in proximity to residences may cause or worsen human health problems, such as nerve and bone marrow damage.	**5**
CHEMICALS USED in HYDRAULIC FRACTURING of natural gas wells may contaminate soil, ground water, and drinking water supplies.	**6**
POLLUTION of COLORADO RIVER WATER, used for human consumption, may occur if drilling takes place too close to the river.	**7**
FOCUS on SUSTAINABLE COMMUNITY PLANNING helps people take steps toward energy efficiency, zero waste, energy-conserving transportation, green building, and natural resource conservation.	**8**
USING RADIOACTIVE MINE TAILINGS as CONSTRUCTION FILL allows leaching into soils and ground water with negative human health impacts.	**9**
DRIVERS USING CELLPHONES or OTHER DISTRACTIONS threaten the safety of others on the roadways.	**10**
ODORS and FUMES emitted from gas wells close to residential housing causes some residents to feel ill in and around their homes.	**11**
GAS WELL EMISSIONS into the AIR, including flaring and venting, release known and unknown substances which may cause human health problems.	**12**
WALKING and CYCLING PATHS and RECREATION OPPORTUNITIES would encourage physical activity essential to maintaining good health.	**12**
WASTE PITS at DRILLING SITES and BURYING WASTE PIT LINERS on SITE may leach, contaminating ground and surface water, and harm human health.	**13**
HOUSEHOLD WATER WELL CONTAMINATION by bacteria and other organisms, due to mining activity, grazing animals, leaking septic systems or storm water runoff, may cause serious illness.	**14**
HOUSEHOLD HAZARDOUS WASTE, including pharmaceuticals and personal care products, fluorescent light bulbs, paint, cleaning products, etc., may contaminate drinking water.	**15**
IMPROPER DISPOSAL of GARBAGE and LITTER on both public and private lands may contaminate water and shelter animals that carry disease to humans.	**16**
GROUND-LEVEL OZONE formed as a result of driving, fueling, solvent use, industrial emissions, etc., is a harmful air pollutant that affects human health.	**17**
DISEASES like Rabies, West Nile Virus, Hantavirus, and Plague are transmitted to humans by insects and animals.	**18**
EMISSIONS from manufacturing and industry sources, vehicles, open burning, forest fires, fireplaces, lawnmowers, and many other sources, creates outdoor air pollution that can be a human health hazard.	**19**
NOT ENFORCING LABOR LAWS and REGULATIONS leads to unsafe working conditions.	**20**
RADON, a radioactive gas found in soil, rock and water from naturally occurring uranium, with long exposure, can lead to lung cancer when it accumulates in homes where families spend time.	**20**
HEAVY LARGE-VEHICLE TRAFFIC on roads not constructed for them creates road damage and may be hazardous for other vehicles and roadside activity.	**21**
RELEASE of RADIOACTIVE CONTAMINANTS into water, soil, and air from drilling where a nuclear device was once detonated may cause health problems. {Note: There was such a nuclear detonation in Garfield County.}	**22**
MORE PEOPLE UNDERSTANDING the IMPACT of ENVIRONMENTAL FACTORS on human health in Garfield County would improve residents' health.	**23**
EXPOSURE to LEAD from paint in older homes, imported children's toys, and tailpipe gases in high-traffic corridors may harm the growth and development of children, including exposure before they are born.	**24**
FARM ANIMAL ILLNESS and REPRODUCTION should be recognized as warnings about environmental exposures with potential to impact human health.	**25**

Environmental Health Issue	Ranking
NOISE POLLUTION can produce stress reactions, such as increases in blood pressure, pulse rate, and hormone secretion, that over time damage people's circulatory systems.	**26**
EMISSIONS that may include Volatile Organic Compounds (VOC's) such as drilling next to Battlement Mesa golf course could affect the health of golfers and residents.	**27**
SMALL SOLID PARTICLES of DUST, created by construction, land development, crushing gravel, mining, and traffic on paved and unpaved roads, lodge deep in people's lungs and cause health problems.	**27**
NOT DEALING PROMPTLY with BEDBUG, TICK and COCKROACH INFESTATIONS lets them spread to other housing units and affects the health of other people.	**27**
WATERBORNE and WATER-RELATED DISEASE TRANSMISSION may be caused by storm water runoff picking up dangerous materials from households, construction sites, agricultural production, and other locations.	**28**
INFECTIOUS DISEASE spreads more easily when people are not fully immunized.	**29**
TRANSIENT HOUSING SITES may be sources of soil and water contamination that have bad effects on human health.	**30**
INDOOR AIR POLLUTION accumulating in high concentrations from cleaning products, fireplaces, stoves, paints, solvents, cigarette smoke, and chemicals used in building materials and home furnishings can contribute to a variety of health problems including asthma.	**31**
INCONSISTENT HANDLING of WORKPLACE INJURIES, ILLNESSES and EXPOSURE to HAZARDOUS MATERIALS makes it hard to develop comprehensive occupational health and safety programs.	**32**
LIGHT POLLUTION at night may interfere with normal daily cycles that regulate and maintain human health.	**33**
ELECTROMAGNETIC FIELDS from power lines and transmission towers may have human health consequences, potentially including cancer and other hazards.	**34**
ULTRAVIOLET (UV) RADIATION, whether from the sun or tanning beds, is the major cause of skin cancer.	**35**
OVERCROWDED HOUSING leads to the spread of contagious illnesses.	**36**
FLUORIDE in public drinking water supplies prevents tooth decay.	**37**
LEAVING ROAD KILL to DECAY on roadsides may cause health issues in humans.	**38**
MAGNESIUM CHLORIDE used on roads to melt snow and ice and reduce dust is a health concern for some individuals.	**39**
MORE OUTDOOR TOILETS would reduce the possibility of contaminating surface waters and causing illness.	**40**

4.2 Characteristics of Garfield County Delphi Respondents

Garfield County residents carefully selected to be representative of the Garfield County community served as respondents on the Delphi Exercise panel. During each round of the Delphi Exercise, demographic information characterizing the respondent panel was collected. The demographic items were minimal, so as not to be too intrusive. Most of the demographic items had to do with where in the County they lived and worked. The 2008 census data indicate that the average commute to work for Garfield County residents is 30 minutes. {See Appendix 11.1.2} Because the County's communities are relatively small, such a long commute would take place between communities, suggesting that people live and work in different parts of the County.

Two different types of location items were included. In one, the choices divided the County into quadrants using I-70, which bisects the county east to west, and a north-south line east of the Town of Silt, roughly midway across the county. The other type of respondent location items related to about proximity to one of the County's seven population centers.

The respondent group represents the various geographic areas of the County appropriately . The fact that a small number of respondents who work in the County do not live there seems an accurate representation of the actual situation in Garfield County. The north-south line dividing the County in quadrants was Interstate 70 and the east-west dividing line was drawn just east of the Town of Silt.

Respondents **LIVE** in or closest to:

North of I-70, east of Silt	South of I-70, east of Silt	North of I-70 Silt and west	South of I-70 Silt and west	I don't live in Garfield County
24.3%	**29.7%**	**18.9%**	**13.5%**	**13.5%**

Respondents **WORK** in or closest to:

North of I-70, east of Silt	South of I-70, east of Silt	North of I-70 Silt and west	South of I-70 Silt and west	I don't work in Garfield County
8.1%	**40.5%**	**29.7%**	**21.6%**	**0**

Respondents indicated the community in the County closest to where they lived and worked. More respondents work in the larger County communities. Viewing the next two data sets together confirms that Carbondale has a high proportion of residences, compared to its business and commercial areas. Some communities provide residential areas for the workforces of other communities.

The community Respondents **WORK** in or closest to is:

Battlement Mesa	Carbondale	Glenwood Springs	Newcastle	Parachute	Rifle	Silt
8.1%	**5.4%**	**25.1%**	**2.7%**	**13.5%**	**29.7%**	**5.4%**

The community Respondents **LIVE** in or closest to is:

Battlement Mesa	Carbondale	Glenwood Springs	Newcastle	Parachute	Rifle	Silt
8.1%	**18.9%**	**21.6%**	**8.1%**	**8.1%**	**18.9%**	**8.1%**

Respondents were asked how long they had lived in the County, given that population growth spurts related to boom times have been a factor. Interestingly, respondents who have lived in the County for 20 or more years formed the largest grouping, followed by those who have lived in Garfield County less than five years. The smallest group consisted of respondents who have lived in the County for five or more years but less than ten years.

Less than 5 years	5 or more years but less than 10 years	10 or more years but but less than 20 years	20 or more years
29.7%	**10.8%**	**18.9%**	**40.5%**

Respondents were asked for their ages, within broad ranges. By comparison, 2008 Census figures show that 27% of County residents are under 18, and 9% are over 65. {See Appendix 11.1.2}.

Under 21	21 to 39	40-64	65 or more years
0	**18.9%**	**67.6%**	**13.5%**

4.3 Open House Findings

At public Open House meetings held in the seven population centers of the County, 71 people came to view the Environmental Health Issues list, offer their comments on the priorities, and engage GCPH and Royce Arbour staff members in discussion about the C.A.R.E.S. project. Holding Open House meetings provided an opportunity to find out whether meeting attendees from the different communities in the County held distinctive views, or a single County-wide common view, on the importance of the various Environmental Health Issues.

Comments from the Open House meetings confirmed that the communities do have differing views on priorities of Environmental Health Issues. Attendees seemed generally to be concerned with the Environmental Health issues with which they have more direct experience.

On the west end of Garfield County, in Battlement Mesa, where the largest number of people attended an Open House, comments focused on gas well drilling and chemicals. Gas well drilling occurs in the western part of Garfield County, and drilling within the Battlement Mesa community has been a topic of community discussion. There were also comments about the Battlement Mesa community's attention to sustainability and sanitation issues. Parachute's Open House comments likewise tended to focus on gas well drilling.

On the east end of Garfield County, Carbondale's Open House comments focused on the immediate town setting, addressing emissions from local businesses, food sanitation and indoor environments. Carbondale is a residential community and the location of a number of restaurants serving Carbondale residents and patrons from Garfield and Pitkin counties.

In the center of Garfield County, Newcastle's, Silt's and Rifle's Open House comments also focused on these communities' town settings. These communities' attendees made comments on clean water, recycling needs, recreation opportunities, existing efforts to build sustainable communities, as well as some comments about gas well drilling and related issues. The Glenwood Springs Open House drew the fewest attendees and no comments.

A transcription of the Open House comments, organized by the community in which each of the Open House meetings was held, is reproduced following the *Final Report.* This version of the comments from the Open Houses includes the text of the Environmental Health Issue Statements to which the comments refer. The comments are also contained in the *Appendices*, but the version in the *Appendices* was inadvertently reproduced without the text of the Environmental Health Issue Statements.

5.0 CONCLUSIONS

5.1 Ten C.A.R.E.S. Project Conclusions

Here are ten conclusions drawn from the C.A.R.E.S. project conducted in Garfield County in 2009-10.

CARE Level One Grant objectives were met.

The priority listing of Garfield County Environmental Health Issues conformed to the goals and expectations of the EPA C.A.R.E. Level One grant and sets the foundation for future actions to address these priority issues in Garfield County.

This project generated a prioritized listing of Garfield County's Environmental Health issues.

The C.A.R.E.S. project shows that representative Garfield County respondent opinions coalesced, reaching substantial consensus on Environmental Health Issues.

A Delphi Exercise produced consensus on the panel of representative Garfield County residents.

Respondents' ratings of the importance of Environmental Health Issues evolved and converged over the three rounds of the Delphi Exercise.

Extensive promotion and publicity yielded a modest turnout at public meetings.

Hundreds of people had helped to develop the results of the C.A.R.E.S. project. The priority order of the Environmental Health Issues was brand new information, less than a week old, and therefore newsworthy. The Open House meetings were held at convenient times and places and widely publicized through news releases, newsletters, website, and other channels for outreach to both the general public and communities interested in Garfield County's environmental health issues. Still, the 71 people attending the Open House meetings are fewer than the more than 80 notices posted in public places.

This result confirms the GCPH, Royce Arbour, and town managers' and city manager's past experience that holding public meetings is not the most effective and efficient way to seek community input on broad public policy issues. Public meetings work better, in our collective experience, when the issue to be addressed is narrower in scope and when there is a compelling reason for people with a particular stake in the narrow issue to attend.

The fact that more people by far attended the Battlement Mesa Open House than attended the other communities' Open Houses, as well as the comments they made, indicated a predominant concern with gas well drilling activities. Battlement Mesa residents saw the Open House as a venue to address this particular concern.

Public meeting input provided an indication of community differences.

The topics of Open House comments on Environmental Health issues varied across the seven population centers in the County. {See Appendix 11.7.4.3.} Each community on its own may find this information useful in deciding how to address priorities of particular concern to its residents.

The Environmental Health Issues are a rich source of information for public outreach.

GCPH can foster interest among participants in the C.A.R.E.S. project activities and other Garfield County citizens by conveying details of the Environmental Health Issues priority list over time, focusing on a few issues at a time.

Stakeholder groups can be encouraged to form and partner to address priority Environmental Health issues.

One of the goals of EPA's Level One grant is to create and maintain active stakeholder groups that will take responsibility to address priority environmental health issues. After the completion of the C.A.R.E.S. project, County stakeholder groups should be amenable to forming partnerships that continue work to address the Environmental Health issue priorities with GCPH EH staff. This is in addition to the several interest groups, civic and non-profit associations, and government agencies that are already engaged. The various groups can help the general public remain aware of this work on environmental health priorities and interested in forthcoming actions.

Garfield County presents a different model of environmental health concerns.

Rather than a predominant environmental health concern, plausibly centered on a single significant hazardous waste site, Garfield County's citizens see many important issues. This large county with a small population consists of seven very different communities, and its minerals extraction industry impacts stretch for miles.

GCPH's Environmental Health should not be tasked with sole responsibility to address issues.

The three-person Environmental Health staff of GCPH are the only environmental health professionals available to address all types of environmental health issues in the County. Carbondale citizens and Silt employees volunteer in advisory/action groups on environmental issues. The State of Colorado Department of Public Health and the Environment has jurisdiction, in the absence of municipal service capabilities, but does not station employees in Garfield County to address environmental health or other issues under its jurisdiction.

There are significant environmental heath challenges embodied in the list of priority issues. GCPH in general, and the three Environmental Health staff members in particular, have limited capability to address all the priority environmental health issues identified in this project.

Partnering is plausible as a way to accumulate resources for addressing the issues.

Addressing priorities for the County as a whole will require establishing new forums for interaction. Out of them, partnerships of common interest and pooled resources can augment the small GCPH Environmental Health staff's capabilities.

5.2 Handling 44 Environmental Health Issues

The Environmental Health Issues are numerous. A few can be addressed in any given time period, but not all of them at once. Even with the Environmental Health Issues in priority order, it is not obvious where to begin addressing them. To assist in deciding what to do, the Environmental Health Issues were organized to facilitate Garfield County in taking action.

Two different approaches were used for presentation and analysis of the Environmental Health Issues. The Environmental Health Issues are organized into:

- "clusters" that reflect just the concerns expressed by Garfield County residents and
- "groupings" that reflect pubic health and environmental health programs and functions.

Both the clusters and the groupings create frameworks within which to address the priority environmental heath issues in Garfield County. Which framework is better to use depends on whether the Garfield County community, or the GCPH Environmental Health staff, should take the lead in action to address particular Environmental Health Issues.

EPA's C.A.R.E. grant envisions stakeholders in the community becoming engaged as a force to address their own environmental health priorities. Therefore, the *Final Report's* recommendations reflect the Garfield County community's concerns as the primary framework. The goals of making recommendations are to help:

- Garfield County residents become empowered to make informed decisions and adopt behaviors that protect and enhance the health of individuals, families, communities and the environment.

- Garfield County Public Health to become a credible, trusted source of information and coordination that will help promote such behavior change in the County.

The overarching recommendation is that Garfield County Public Health be the one to initiate a series of coordinated campaigns over the next five years, and support the Garfield County Community becoming engaged so that community partnerships provide the sustained emphasis that brings these campaigns to success. Political and administrative considerations should be taken into account in deciding where to begin.

In public health, helping the community and the general public to understand how public health experts view concerns and issues is important. Similarly, there is great value to experts in

grasping the concerns of the community and the general public and in understanding how they estimate risks.

The project team considered whether to provide expert commentary on environmental health concerns in Garfield County as they were framed into Environmental Health Issue Statements. A determination was made that expert input would come at the analysis and recommendation stage of the project and be included as part of the *Final Report*.

In public health, including environmental health, one of the most significant actions that can be undertaken is community outreach and education. Having the perspectives of County residents – as they currently exist – is valuable information, providing insights on the direction and extent of community outreach and education efforts that GCPH, and its EH staff, may determine would be helpful next steps. Expert commentary will be most helpful as next steps are considered. Following the completion of the Garfield County C.A.R.E.S. project, the next phase of activity is for Garfield County residents to decide what the next steps should be in addressing the County's Environmental Health priority issues.

5.3 Environmental Health Issues Clusters

The emphasis for the clustering approach is on facilitating segments of the Garfield County community to take action to address Environmental Health Issues: to prevent the environmental heath impacts where possible, or to remediate them where prevention is not possible or successful, or to mitigate the impacts, if they cannot be avoided. Issues could have been clustered differently, if the purpose for grouping them were different from facilitating the County community's efforts to address these issues. The clusters are not mutually exclusive; some issues appear in two or more clusters. The GCPH Environmental Health staff members would coordinate and support work that is being led by other segments of the Garfield County community.

Eleven Environmental Health Issue clusters were identified. They are defined, listed, and briefly discussed here.

5.3.1. Individual Action Cluster: Action by individual people, to a greater extent than action by government via legislation, regulation and enforcement, would be effective in beginning to address these issues promptly.

Individual Action Cluster	Priority
BACTERIA and OTHER CONTAMINANTS in FOOD, due to unsafe food handling in retail food establishments and homes, transmit illness.	3
DRIVERS USING CELLPHONES or OTHER DISTRACTIONS threaten the health and safety of others on the roadways.	10
WALKING and CYCLING PATHS and RECREATION OPPORTUNITIES would encourage physical activity essential to maintaining good health.	12
HOUSEHOLD WATER WELL CONTAMINATION by bacteria and other organisms**,** due to mining activity, grazing animals, leaking septic systems or storm water runoff, may cause serious illness.	14
HOUSEHOLD HAZARDOUS WASTE, including pharmaceuticals and personal care products, fluorescent light bulbs, paint, cleaning products, etc., may contaminate drinking water.	15
I**MPROPER DISPOSAL of GARBAGE and LITTER** on both public and private lands may contaminate water and shelter animals that carry disease to humans.	16
GROUND-LEVEL OZONE formed as a result of driving, fueling, solvent use, industrial emissions, etc., is a harmful air pollutant that affects human health.	17
DISEASES like Rabies, West Nile Virus, Hantavirus, and Plague are transmitted to humans by insects and animals.	18
EMISSIONS from manufacturing and industry sources, vehicles, open burning, forest fires, fireplaces, lawnmowers, and many other sources, create outdoor air pollution that can be a human health hazard.	19
RADON, a radioactive gas found in soil, rock and water from naturally occurring uranium, with long exposure, can lead to lung cancer when it accumulates in homes where families spend time.	20
MORE PEOPLE UNDERSTANDING the IMPACT of ENVIRONMENTAL FACTORS on human health in Garfield County would improve residents' health.	23
EXPOSURE to LEAD from paint in older homes, imported children's toys, and tailpipe gases in high-traffic corridors harms the growth and development of children, including exposure before they are born.	24
NOISE POLLUTION can produce stress reactions, such as increases in blood pressure, pulse rate, and hormone secretion, that over time damage people's circulatory systems.	26
NOT DEALING PROMPTLY with BEDBUG, TICK and COCKROACH INFESTATIONS lets them spread to other housing units and affects the health of other people.	27
WATERBORNE and WATER-RELATED DISEASE TRANSMISSION may be caused by storm water runoff picking up dangerous materials from households, construction sites, agricultural production, and other locations.	28

Individual Action Cluster	Priority
INFECTIOUS DISEASE spreads more easily when people are not fully immunized.	29
INDOOR AIR POLLUTION accumulating in high concentrations from cleaning products, fireplaces, stoves, paints, solvents, cigarette smoke, and chemicals used in building materials and home furnishings can contribute to a variety of health problems including asthma.	31
LIGHT POLLUTION at night may interfere with normal daily cycles that regulate and maintain human health.	33
ULTRAVIOLET (UV) RADIATION, whether from the sun or tanning beds, is the major cause of skin cancer.	35

5.3.2. Sustainable Communities Cluster: Action at the level of the community – city, town, developed area – is likely to be effective in beginning to address these issues promptly.

Sustainable Communities Issue Cluster	Priority
RESPONSE to ENVIRONMENTAL EMERGENCIES to protect human health should be part of emergency preparedness plans.	1
NOT ENFORCING ENVIRONMENTAL LAWS and REGULATIONS leads to environmental health problems.	2
FOCUS on SUSTAINABLE COMMUNITY PLANNING helps people take steps toward energy efficiency, zero waste, energy-conserving transportation, green building, and natural resource conservation.	8
WALKING and CYCLING PATHS and RECREATION OPPORTUNITIES would encourage physical activity essential to maintaining good health.	12
HOUSEHOLD HAZARDOUS WASTE, including pharmaceuticals and personal care products, fluorescent light bulbs, paint, cleaning products, etc., may contaminate drinking water.	15
GROUND-LEVEL OZONE formed as a result of driving, fueling, solvent use, industrial emissions, etc., is a harmful air pollutant that affects human health.	17
EMISSIONS from manufacturing and industry sources, vehicles, open burning, forest fires, fireplaces, lawnmowers, and many other sources, create outdoor air pollution that can be a human health hazard.	19
RADON, a radioactive gas found in soil, rock and water from naturally occurring uranium, with long exposure, can lead to lung cancer when it accumulates in homes where families spend time.	20
MORE PEOPLE UNDERSTANDING the IMPACT of ENVIRONMENTAL FACTORS on human health in Garfield County would improve residents' health.	23

Sustainable Communities Issue Cluster	Priority
NOISE POLLUTION can produce stress reactions, such as increases in blood pressure, pulse rate, and hormone secretion, that over time damage people's circulatory systems.	26
SMALL SOLID PARTICLES of DUST, created by construction, land development, crushing gravel, mining, and traffic on paved and unpaved roads, lodge deep in people's lungs and cause health problems.	27
WATERBORNE and WATER-RELATED DISEASE TRANSMISSION may be caused by storm water runoff picking up dangerous materials from households, construction sites, agricultural production, and other locations.	28
INDOOR AIR POLLUTION accumulating in high concentrations from cleaning products, fireplaces, stoves, paints, solvents, cigarette smoke, and chemicals used in building materials and home furnishings can contribute to a variety of health problems including asthma.	31
LIGHT POLLUTION at night may interfere with normal daily cycles that regulate and maintain human health.	33
OVERCROWDED HOUSING leads to the spread of contagious illnesses.	36
FLUORIDE in public drinking water supplies prevents tooth decay.	37

5.3.3. Oil and Gas Exploration, Drilling and Production Cluster: Garfield County residents distinguish between environmental health impacts of gas well drilling, completion and production, including air quality, and other air quality issues that impact human health. Where residents expressed a concern as connected directly to oil and gas exploration, drilling and production, it is clustered here. Although all of the issues related to oil and gas appear here, some of these issues also appear in other clusters.

Voluntary action to prevent, remediate or mitigate the environmental health risks of these issues by the organizations engaged in gas well drilling, completion and production activities are likely to be effective most quickly in beginning to address these issues. It would take years before these issues could be addressed through new legislation, regulation and enforcement actions.

Oil and Gas Exploration, Drilling and Production Issues Cluster	Priority
EXPOSURE to BENZENE from gas wells in proximity to residences may cause or worsen human health problems, such as nerve and bone marrow damage.	5
CHEMICALS USED in HYDRAULIC FRACTURING of natural gas wells may contaminate soil, ground water, and drinking water supplies that are essential to human health.	6
POLLUTION of COLORADO RIVER WATER, used for human consumption, may occur if drilling takes place too close to the river.	7
ODORS and FUMES emitted from gas wells close to residential housing causes some residents to feel ill in and around their homes.	11

Oil and Gas Exploration, Drilling and Production Issues Cluster	Priority
GAS WELL EMISSIONS into the AIR, including flaring and venting, release known and unknown substances which may cause human health problems.	12
WASTE PITS at DRILLING SITES and BURYING WASTE PIT LINERS on SITE may leach, contaminating ground and surface water, and harm human health.	13
HEAVY LARGE-VEHICLE TRAFFIC on roads not constructed for them creates road damage and may be hazardous for other vehicles and roadside activity	21
RELEASE of RADIOACTIVE CONTAMINANTS into water, soil, and air from drilling where a nuclear device was once detonated may cause health problems.	22
Oil and Gas Exploration, Drilling and Production Issues Cluster	**Priority**
EMISSIONS that may include Volatile Organic Compounds (VOC's) such as drilling next to Battlement Mesa golf course could affect the health of golfers and residents.	27
SMALL SOLID PARTICLES of DUST, created by construction, land development, crushing gravel, mining, and traffic on paved and unpaved roads, lodge deep in people's lungs and cause health problems.	27
WATERBORNE and WATER-RELATED DISEASE TRANSMISSION may be caused by storm water runoff picking up dangerous materials from households, construction sites, agricultural production, and other locations.	28

5.3.4 Environmental Justice Cluster: These issues are likely to affect certain subsets of the community to a greater extent because they are correlated with economic, social, and political disadvantages. "Environmental Justice" is a term used over the last three decades to describe disparities that lead or contribute to unequal and deleterious environmental health impacts being experienced by segments of society, and efforts to alleviate unequal and unfair distributions of environmental health burdens. EPA's website says environmental justice "will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work".

Environmental Justice issue Cluster	Priority
RESPONSE to ENVIRONMENTAL EMERGENCIES to protect human health should be part of emergency preparedness plans.	1
NOT ENFORCING ENVIRONMENTAL LAWS and REGULATIONS leads to environmental health problems.	2
DISEASES like Rabies, West Nile Virus, Hantavirus, and Plague are transmitted to humans by insects and animals.	18
NOT ENFORCING LABOR LAWS and REGULATIONS leads to unsafe working conditions.	20
NOT DEALING PROMPTLY with BEDBUG, TICK and COCKROACH INFESTATIONS lets them spread to other housing units and affects the health of other people.	27
INFECTIOUS DISEASE spreads more easily when people are not fully immunized.	29

Environmental Justice issue Cluster	Priority
TRANSIENT HOUSING SITES may be sources of soil and water contamination that have bad effects on human health.	30
INDOOR AIR POLLUTION accumulating in high concentrations from cleaning products, fireplaces, stoves, paints, solvents, cigarette smoke, and chemicals used in building materials and home furnishings can contribute to a variety of health problems including asthma.	31
INCONSISTENT HANDLING of WORKPLACE INJURIES, ILLNESSES and EXPOSURE to HAZARDOUS MATERIALS makes it hard to develop comprehensive occupational health and safety programs.	32
ULTRAVIOLET (UV) RADIATION, whether from the sun or tanning beds, is the major cause of skin cancer.	35
OVERCROWDED HOUSING leads to the spread of contagious illnesses.	36

5.3.5 Environmental Health Enforcement and Regulation Cluster: These Environmental Health Issues are already the subject of legal authority to enforce standards and regulate activity. Garfield County residents focus on these issues because current enforcement and regulation do not relieve the concerns of residents.

Residents suggested or implied that there is a need for other Environmental Health Issues to become the subject of legislation, regulation and enforcement. In larger municipal areas, issues may be addressed via enforcement and regulation that are not currently addressed this way in Garfield County. Mandatory recycling is an example. Framing legislation, enlisting support sufficient to enact it, developing regulations derived from it, and putting enforcement into place is a time-consuming effort.

Environmental Health Enforcement and Regulation of Environmental Laws Issues Cluster	Priority
NOT ENFORCING ENVIRONMENTAL LAWS and REGULATIONS leads to environmental health problems.	2
BACTERIA and OTHER CONTAMINANTS in FOOD, due to unsafe food handling in retail food establishments and homes, transmit illness.	3
POLLUTION of COLORADO RIVER WATER, used for human consumption, may occur if drilling takes place too close to the river.	7
DRIVERS USING CELLPHONES or OTHER DISTRACTIONS threaten the health and safety of other on the roadways.	10
HOUSEHOLD WATER WELL CONTAMINATION by bacteria and other organisms**,** due to mining activity, grazing animals, leaking septic systems or storm water runoff, may cause serious illness.	14

Environmental Health Enforcement and Regulation of Environmental Laws Issues Cluster	Priority
IMPROPER DISPOSAL of GARBAGE and LITTER on both public and private lands may contaminate water and shelter animals that carry disease to humans.	16
GROUND-LEVEL OZONE formed as a result of driving, fueling, solvent use, industrial emissions, etc., is a harmful air pollutant that affects human health.	16
NOT ENFORCING LABOR LAWS and REGULATIONS leads to unsafe working conditions.	20
HEAVY LARGE-VEHICLE TRAFFIC on roads not constructed for them creates road damage and may be hazardous for other vehicles and roadside activity	21
NOISE POLLUTION can produce stress reactions, such as increases in blood pressure, pulse rate, and hormone secretion, that over time damage people's circulatory systems.	26
SMALL SOLID PARTICLES of DUST, created by construction, land development, crushing gravel, mining, and traffic on paved and unpaved roads, lodge deep in people's lungs and cause health problems.	27
WATERBORNE and WATER-RELATED DISEASE TRANSMISSION may be caused by storm water runoff picking up dangerous materials from households, construction sites, agricultural production, and other locations.	28
INCONSISTENT HANDLING of WORKPLACE INJURIES, ILLNESSES and EXPOSURE to HAZARDOUS MATERIALS makes it hard to develop comprehensive occupational health and safety programs.	32

5.3.6 Air Quality Cluster: These issues all affect air quality independent of oil and gas exploration, drilling and production. Garfield County residents distinguish between impacts of gas well drilling, completion and production and impacts on air quality, so that was the way Environmental Health Issues were clustered. A single issue may appear in more than one cluster. Where county residents expressed an air quality concern that they see as connected directly to oil and gas exploration, drilling and production, it is clustered there.

Existing state and federal law and regulation regarding air quality is extensive. The GCPH EH staff has focused a great deal of attention and effort on air quality over the last five years. Air quality monitoring capabilities are in place in Garfield County, although there is never complete certainty that every source of air pollution is being identified. GCPH EH staff member Paul Reaser outlined the GCPH EH activities as follows:

Garfield County Actions to Date regarding Oil and Gas Sources:

Ongoing Ambient VOC Monitoring, Hazard Investigations (i.e. human health risk/health impact assessments, update emissions inventories, etc.), Community Education/Outreach/ Awareness, Mobilizing Partnerships, Development of Policies (i.e. Air Quality Management Plan), Compliance Assistance (CDPHE/COGCC), Evaluating Results, and Implementing New Technologies (e.g. school bus retrofit).

Garfield County Actions to Date regarding Emissions from Manufacturing and Industry Sources and Small Solid Particles of Dust:

Ongoing Ambient PM10/2.5 Monitoring, Hazard Investigations (i.e. human health risk, update emissions inventories), Community Education/Outreach/Awareness, Mobilizing Partnerships, Development of Policies (i.e. Air Quality Management Plan), Compliance Assistance (CDPHE), Staff Training (opacity), Evaluating Results, and Implementing New Technologies (e.g. school bus retrofit)

Garfield County Actions to Date regarding Ground-Level Ozone (O3), Nitrous Oxides, Well Emission and Stationary Sources:

Ongoing Ambient Ozone Monitoring, Hazard Investigations (i.e. human health risk, update emissions inventories), Community Education/Outreach/Awareness, Mobilizing Partnerships, Development of Policies (i.e. Air Quality Management Plan), Compliance Assistance (CDPHE), Evaluating Results

Air Quality Issue Cluster	Priority
GROUND-LEVEL OZONE formed as a result of driving, fueling, solvent use, industrial emissions, etc., is a harmful air pollutant that affects human health.	17
EMISSIONS from manufacturing and industry sources, vehicles, open burning, forest fires, fireplaces, lawnmowers, and many other sources, create outdoor air pollution that can be a human health hazard.	19
RADON, a radioactive gas found in soil, rock and water from naturally occurring uranium, with long exposure, can lead to lung cancer when it accumulates in homes where families spend time.	20
INDOOR AIR POLLUTION accumulating in high concentrations from cleaning products, fireplaces, stoves, paints, solvents, cigarette smoke, and chemicals used in building materials and home furnishings can contribute to a variety of health problems including asthma.	31

5.3.7 Water Quality Cluster: These issues all affect water quality. The communities of Garfield County are situated adjacent to waterways, all but one next to the Colorado River. The Roaring Fork River, which joins the Colorado River at Glenwood Springs, is next to Carbondale.

Water is perhaps the predominant environmental concern in Colorado, as in much of the western United States, because water is scarce and growing more scarce, because rights to water are owned, and because demand for water increases with population growth and minerals extraction activity.

Water Quality Issue Cluster	Priority
HOUSEHOLD WATER WELL CONTAMINATION by bacteria and other organisms**,** due to mining activity, grazing animals, leaking septic systems or storm water runoff, may cause serious illness.	14
WATERBORNE and WATER-RELATED DISEASE TRANSMISSION may be caused by storm water runoff picking up dangerous materials from households, construction sites, agricultural production, and other locations.	28
FLUORIDE in public drinking water supplies prevents tooth decay.	37

5.3.8 Transportation Cluster: These issues all involve vehicle use, notably, petroleum-powered vehicles. This cluster overlaps air quality, because vehicle activity generates air pollution, both from exhaust and from dust. It overlaps water quality because in Garfield County, roads and waterways are typically adjacent and a vehicle accident could cause spillage into a waterway. It overlaps oil and gas drilling because drilling involves prolonged periods of heavy vehicle traffic on newly created dirt roads.

Transportation Issue Cluster	Priority
RESPONSE to ENVIRONMENTAL EMERGENCIES to protect human health should be part of emergency preparedness plans.	1
FOCUS on SUSTAINABLE COMMUNITY PLANNING helps people take steps toward energy efficiency, zero waste, energy-conserving transportation, green building, and natural resource conservation.	8
DRIVERS USING CELLPHONES or OTHER DISTRACTIONS threaten the health and safety of other on the roadways.	10
HEAVY LARGE-VEHICLE TRAFFIC on roads not constructed for them creates road damage and may be hazardous for other vehicles and roadside activity	21
NOISE POLLUTION can produce stress reactions, such as increases in blood pressure, pulse rate, and hormone secretion, that over time damage people's circulatory systems.	26
SMALL SOLID PARTICLES of DUST, created by construction, land development, crushing gravel, mining, and traffic on paved and unpaved roads, lodge deep in people's lungs and cause health problems.	27
INFECTIOUS DISEASE spreads more easily when people are not fully immunized.	29

5.3.9 Prevention of Hazards and Risks Cluster: The values inherent in the practice of environmental health focuses on prevention first, as does public health, with mitigation and remediation as options when prevention is not possible or fails. The expectation always is that environmental health issues could be most effectively addressed by preventing their negative impacts.

Prevention of Hazards and Risks Issues Cluster	Priority
RESPONSE to ENVIRONMENTAL EMERGENCIES to protect human health should be part of emergency preparedness plans.	1
FOCUS on SUSTAINABLE COMMUNITY PLANNING helps people take steps toward energy efficiency, zero waste, energy-conserving transportation, green building, and natural resource conservation.	8
WALKING and CYCLING PATHS and RECREATION OPPORTUNITIES would encourage physical activity essential to maintaining good health.	12
HOUSEHOLD HAZARDOUS WASTE, including pharmaceuticals and personal care products, fluorescent light bulbs, paint, cleaning products, etc., may contaminate drinking water.	15
GROUND-LEVEL OZONE formed as a result of driving, fueling, solvent use, industrial emissions, etc., is a harmful air pollutant that affects human health.	17
RADON, a radioactive gas found in soil, rock and water from naturally occurring uranium, with long exposure, can lead to lung cancer when it accumulates in homes where families spend time.	20
MORE PEOPLE UNDERSTANDING the IMPACT of ENVIRONMENTAL FACTORS on human health in Garfield County would improve residents' health.	23
EXPOSURE to LEAD from paint in older homes, imported children's toys, and tailpipe gases in high-traffic corridors harms the growth and development of children, including exposure before they are born.	24
NOISE POLLUTION can produce stress reactions, such as increases in blood pressure, pulse rate, and hormone secretion, that over time damage people's circulatory systems.	26
LIGHT POLLUTION at night may interfere with normal daily cycles that regulate and maintain human health.	33

5.3.10 High Environmental Health Risk – Low Resident Concern Cluster: Although some issues did not come to the top of the residents' priority listing, they are of concern to the environmental health profession because negative impacts on human health can in fact be prevented. These issues present opportunities to use outreach and education approaches to help Garfield County residents better understand what environmental heath risks do affect people's health.

Radon, priority 20, is dangerous over the long-term, affecting the health of people who are continuously exposed in their homes. Radon can be effectively mitigated once testing discovers

it. Some mitigation measures can be expensive, which could limit individuals' ability to address a radon issue, once it is discovered. There are federal programs that can help with radon testing and mitigation costs.

Overcrowded housing, priority 36, is often correlated with inadequate attention to sanitation for the number of people living in close quarters. The environmental health issues arising from inadequate sanitation can be addressed through zoning, housing inspection, and social services agencies as well as individuals learning how to better attend to sanitary conditions in their living quarters.

Indoor air pollution, priority 38, in people's homes is typically more harmful to their health than anything in air outdoors, unless there is a specific air pollution issue in the near vicinity. Indoor air pollution from smoking, household cleaners, building material choices, etc., must be addressed by individuals living in the home.

High Environmental Health Risk – Low Resident Concern Issue Cluster	Priority
DISEASES like Rabies, West Nile Virus, Hantavirus, and Plague are transmitted to humans by insects and animals.	18
RADON, a radioactive gas found in soil, rock and water from naturally occurring uranium, with long exposure, can lead to lung cancer when it accumulates in homes where families spend time.	20
MORE PEOPLE UNDERSTANDING the IMPACT of ENVIRONMENTAL FACTORS on human health in Garfield County would improve residents' health.	23
FARM ANIMAL ILLNESS and REPRODUCTION should be recognized as warnings about environmental exposures with potential to impact human health	25
INFECTIOUS DISEASE spreads more easily when people are not fully immunized.	29
INDOOR AIR POLLUTION accumulating in high concentrations from cleaning products, fireplaces, stoves, paints, solvents, cigarette smoke, and chemicals used in building materials and home furnishings can contribute to a variety of health problems including asthma.	31
ULTRAVIOLET (UV) RADIATION, whether from the sun or tanning beds, is the major cause of skin cancer.	35
FLUORIDE in public drinking water supplies prevents tooth decay .	37

5.3.11 Low Environmental Health Risk – High Resident Concern Cluster:

Some issues that were close to the top of the residents' priority listing are not at the top for environmental health professionals. The actual impacts, today, in Garfield County, are not as significantly negative for human health as other impacts are. These issues present opportunities to use outreach and education approaches to help Garfield County residents better understand what environmental heath risks do affect people's health.

An example of an environmental concern that experts would assess as not constituting a significant health risk is roadside animal carcasses. People may not like to see them, but they are not hazardous to human health. Animal remains are a natural occurrence, quickly removed by scavengers and the elements.

Meth labs are an example of an environmental health concern that experts agree has less significance today, because the problem is much less prevalent than a few years ago. Garfield County residents rated meth labs as the fourth highest priority. Because public attention was drawn to these dangerous operations, ingredients have been removed from off-the-shelf commerce, clean-up operations have been standardized, and law enforcement has focused on shutting down meth labs. Although each meth lab is as dangerous as ever, the incidence of meth labs, and thus the risk from them, is substantially reduced from a few years ago. Garfield County residents, it appears, need an update on the extent to which the environmental health threat of meth labs has been reduced.

Low Environmental Health Risk – High Resident Concern Issue Cluster	**Priority**
METH LABS create risks of fire and explosion and toxic chemicals that contaminate the interiors of buildings where meth labs are located and are challenging to clean up.	4
POLLUTION of COLORADO RIVER WATER, used for human consumption, may occur if drilling takes place too close to the river.	7
USING RADIOACTIVE MINE TAILINGS as CONSTRUCTION FILL allows leaching into soils and ground water with negative human health impacts	9
TRANSIENT HOUSING SITES may be sources of soil and water contamination that have bad effects on human health.	30
ELECTROMAGNETIC FIELDS from power lines and transmission towers may have human health consequences, potentially including cancer and other unknown hazards.	34
LEAVING ROAD KILL to DECAY on roadsides may cause health problems in humans.	38
MAGNESIUM CHLORIDE used on roads to melt snow and ice and reduce dust is a health concern for some individuals.	39
MORE OUTDOOR TOILETS would reduce the possibility of contaminating surface waters and causing illness.	40

5.4 Traditional Public Health Programmatic Groupings

The second approach to grouping Garfield County residents' issues coincides with the organizational structure and programmatic emphases that in past decades have characterized public health and environmental health professional endeavors. This grouping could make it conceptually easier for public health staff members to take the lead in addressing the Environmental Health Issue priorities, as distinguished from GCPH EH staff members coordinating and supporting work that is being led by other segments of the County community.

The programmatic groupings include Consumer Safety and Health, Disease Control (could be combined with Consumer Safety and Health), Water, Solid and Hazardous Waste, Air, Community Sustainability Planning, and Daycare and Schools. The programmatic groupings of issues are, perhaps, more nearly exclusive, although there is some overlap. Some groupings contain essentially the same Environmental Health Issues as the clusters described above.

5.4.1 Consumer Safety and Health Grouping	**Priority**
BACTERIA and OTHER CONTAMINANTS in FOOD, due to unsafe food handling in retail food establishments and homes may transmit illness.	3
METH LABS create risks of fire and explosion and toxic chemicals that contaminate the interiors of buildings where meth labs are located and are challenging to clean up.	4
DRIVERS USING CELLPHONES or OTHER DISTRACTIONS threaten the safety of others on the roadways.	10
NOT ENFORCING LABOR LAWS and REGULATIONS leads to unsafe working conditions.	20
EXPOSURE to LEAD from paint in older homes, imported children's toys, and tailpipe gases in high-traffic corridors may harm the growth and development of children, including exposure before they are born.	24
NOT DEALING PROMPTLY with BEDBUG, TICK and COCKROACH INFESTATIONS lets them spread to other housing units and affects the health of other people.	27
ULTRAVIOLET (UV) RADIATION, whether from the sun or tanning beds, is the major cause of skin cancer.	35
OVERCROWDED HOUSING leads to the spread of contagious illnesses.	36

5.4.2 Disease Control Grouping	Priority
BACTERIA and OTHER CONTAMINANTS in FOOD, due to unsafe food handling in retail food establishments and homes may transmit illness.	3
EXPOSURE to BENZENE from gas wells in proximity to residences may cause or worsen human health problems, such as nerve and bone marrow damage.	5
HOUSEHOLD WATER WELL CONTAMINATION by bacteria and other organisms, due to mining activity, grazing animals, leaking septic systems or storm water runoff, may cause serious illness.	14
IMPROPER DISPOSAL of GARBAGE and LITTER on both public and private lands may contaminate water and shelter animals that carry disease to humans.	16

DISEASES like Rabies, West Nile Virus, Hantavirus, and Plague are transmitted to humans by insects and animals.	18
NOT ENFORCING LABOR LAWS and REGULATIONS leads to unsafe working conditions.	20
FARM ANIMAL ILLNESS and REPRODUCTION should be recognized as warnings about environmental exposures with potential to impact human health.	25
NOISE POLLUTION can produce stress reactions, such as increases in blood pressure, pulse rate, and hormone secretion, that over time damage people's circulatory systems.	26
NOT DEALING PROMPTLY with BEDBUG, TICK and COCKROACH INFESTATIONS lets them spread to other housing units and affects the health of other people.	27
WATERBORNE and WATER-RELATED DISEASE TRANSMISSION may be caused by storm water runoff picking up dangerous materials from households, construction sites, agricultural production, and other locations.	28
INFECTIOUS DISEASE spreads more easily when people are not fully immunized.	29
LIGHT POLLUTION at night may interfere with normal daily cycles that regulate and maintain human health.	33
ELECTROMAGNETIC FIELDS from power lines and transmission towers may have human health consequences, potentially including cancer and other hazards.	34
MAGNESIUM CHLORIDE used on roads to melt snow and ice and reduce dust is a health concern for some individuals.	39

5.4.3 Water Grouping	**Priority**
CHEMICALS USED in HYDRAULIC FRACTURING of natural gas wells may contaminate soil, ground water, and drinking water supplies.	6
POLLUTION of COLORADO RIVER WATER, used for human consumption, may occur if drilling takes place too close to the river.	7
USING RADIOACTIVE MINE TAILINGS as CONSTRUCTION FILL allows leaching into soils and ground water with negative human health impacts.	9
WASTE PITS at DRILLING SITES and BURYING WASTE PIT LINERS on SITE may leach, contaminating ground and surface water, and harm human health.	13
HOUSEHOLD WATER WELL CONTAMINATION by bacteria and other organisms, due to mining activity, grazing animals, leaking septic systems or storm water runoff, may cause serious illness.	14
HOUSEHOLD HAZARDOUS WASTE, including pharmaceuticals and personal care products, fluorescent light bulbs, paint, cleaning products, etc., may contaminate drinking water.	15

IMPROPER DISPOSAL of GARBAGE and LITTER on both public and private lands may contaminate water and shelter animals that carry disease to humans.	16
RELEASE of RADIOACTIVE CONTAMINANTS into water, soil, and air from drilling where a nuclear device was once detonated may cause health problems.	22
WATERBORNE and WATER-RELATED DISEASE TRANSMISSION may be caused by storm water runoff picking up dangerous materials from households, construction sites, agricultural production, and other locations.	28
TRANSIENT HOUSING SITES may be sources of soil and water contamination that have bad effects on human health.	30
FLUORIDE in public drinking water supplies prevents tooth decay.	37
MORE OUTDOOR TOILETS would reduce the possibility of contaminating surface waters and causing illness.	40

5.4.4 Solid and Hazardous Waste Grouping	Priority
METH LABS create risks of fire and explosion and toxic chemicals that contaminate the interiors of buildings where meth labs are located and are challenging to clean up.	4
USING RADIOACTIVE MINE TAILINGS as CONSTRUCTION FILL allows leaching into soils and ground water with negative human health impacts.	9
WASTE PITS at DRILLING SITES and BURYING WASTE PIT LINERS on SITE may leach, contaminating ground and surface water, and harm human health.	13
HOUSEHOLD HAZARDOUS WASTE, including pharmaceuticals and personal care products, fluorescent light bulbs, paint, cleaning products, etc., may contaminate drinking water.	15
IMPROPER DISPOSAL of GARBAGE and LITTER on both public and private lands may contaminate water and shelter animals that carry disease to humans.	16
TRANSIENT HOUSING SITES may be sources of soil and water contamination that have bad effects on human health.	30
LEAVING ROAD KILL to DECAY on roadsides may cause health issues in humans.	38

5.4.5 Air Grouping	Priority
EXPOSURE to BENZENE from gas wells in proximity to residences may cause or worsen human health problems, such as nerve and bone marrow damage.	5
ODORS and FUMES emitted from gas wells close to residential housing causes some residents to feel ill in and around their homes.	11

GAS WELL EMISSIONS into the AIR, including flaring and venting, release known and unknown substances which may cause human health problems.	12
GROUND-LEVEL OZONE formed as a result of driving, fueling, solvent use, industrial emissions, etc., is a harmful air pollutant that affects human health.	17
EMISSIONS from manufacturing and industry sources, vehicles, open burning, forest fires, fireplaces, lawnmowers, and many other sources, creates outdoor air pollution that can be a human health hazard.	19
RADON, a radioactive gas found in soil, rock and water from naturally occurring uranium, with long exposure, can lead to lung cancer when it accumulates in homes where families spend time.	20
RELEASE of RADIOACTIVE CONTAMINANTS into water, soil, and air from drilling where a nuclear device was once detonated may cause health problems.	22
EMISSIONS that may include Volatile Organic Compounds (VOC's) such as drilling next to Battlement Mesa golf course could affect the health of golfers and residents.	27
SMALL SOLID PARTICLES of DUST, created by construction, land development, crushing gravel, mining, and traffic on paved and unpaved roads, lodge deep in people's lungs and cause health problems.	27
INDOOR AIR POLLUTION accumulating in high concentrations from cleaning products, fireplaces, stoves, paints, solvents, cigarette smoke, and chemicals used in building materials and home furnishings can contribute to a variety of health problems including asthma.	31

5.4.6 Community Sustainability Planning Grouping	**Priority**
FOCUS on SUSTAINABLE COMMUNITY PLANNING helps people take steps toward energy efficiency, zero waste, energy-conserving transportation, green building, and natural resource conservation.	8
WALKING and CYCLING PATHS and RECREATION OPPORTUNITIES would encourage physical activity essential to maintaining good health.	12
HEAVY LARGE-VEHICLE TRAFFIC on roads not constructed for them creates road damage and may be hazardous for other vehicles and roadside activity.	21
NOISE POLLUTION can produce stress reactions, such as increases in blood pressure, pulse rate, and hormone secretion, that over time damage people's circulatory systems.	26
LIGHT POLLUTION at night may interfere with normal daily cycles that regulate and maintain human health.	33

5.4.7 Daycare and Schools Grouping	Priority
BACTERIA and OTHER CONTAMINANTS IN FOOD due to unsafe food handling in retail food establishments and homes may transmit illness.	2
EXPOSURE to LEAD from paint in older homes, imported children's toys, and tailpipe gases in high-traffic corridors may harm the growth and development of children, including exposure before they are born.	24

6. RECOMMENDATIONS

EPA's C.A.R.E. Level One grants create a framework of environmental health priorities, established by community consensus. EPA's C.A.R.E. Level Two grants are awarded to assist a community in taking action, once its priorities for environmental health have become clear.

Whether or not Garfield County seeks Level Two funding from EPA, the goals of making these recommendations are to help:

- Garfield County residents become empowered to make informed decisions and adopt behaviors that protect and enhance the health of individuals, families, communities and the environment.

- Garfield County Public Health to become a credible, trusted source of information and coordination that will help promote such behavior change in the County.

Some of the Environmental Health Issues identified by County residents may present risks that are not well understood. An example is radon in homes and other buildings. Geology suggests that parts of Colorado are at risk for radon problems, but whether Garfield County is at risk, more particularly what parts of the County are at risk, has not been determined. Nor has it been determined how much radon is accumulating in buildings, thus the extent of human exposure to the risks of radon is also unknown. Best environmental health practices indicate that if the risk is not well characterized, and the incidence of exposure is not known, resources when available should be devoted to understand the risks.

Community outreach and education is a formidable tool for best public health practice. Letting people know what experts know and making the information understandable and applicable in everyday life can have powerful impacts. An example, to prevent food-borne diseases, is conveying to everyone who prepares food the importance of cleaning and sanitizing knives and cutting boards after handling raw poultry, of carefully washing one's hands, and of washing all fruits and vegetables before eating them. Giving Garfield County residents easy access to staff expertise on recurring environmental health questions will be a responsive and interactive way to reach out and to educate.

6.1 Coordinated Campaigns to Motivate Behavioral Change

The recommendation is that Garfield County Public Health undertake a series of coordinated campaigns over the next five years to assure that several segments of the Garfield County community receive social marketing messages that will motivate them to take action and in turn motivate others with whom they have influence to take action. EPA's C.A.R.E. grants are a possible resource for Garfield County in funding these coordinated campaigns. Garfield County also has alternative resources, notably in the form of Supplemental Environmental Project

(S.E.P.) grants from the State of Colorado, to support addressing environmental health issues. Private foundation resources may also be helpful.

Garfield County should engage in a planning process that targets a few environmental health priority clusters at a time. The key aspects of the planning process are:

- Identify what will motivate behavior change in the segment of the population whose action will prevent, remediate or mitigate the negative human health impact associated with the environmental health priority or cluster that is targeted.
- Develop messages and identify messengers to motivate the adoption of the desired behaviors.
- Monitor pre-defined metrics that indicate whether messages are being received and whether behavior is being changed.
- Maintain social marketing effectiveness so that desired behavior modification continues.
- During the maintenance phase, turn attention to addressing another environmental health issue.

6.2 Considerations for Campaign Success

Efforts at behavior change must show success, and must show success early, or the efforts will fail. If one effort fails, others are less likely to be undertaken. Therefore, in changing behavior it is a best practice to "pick the low-hanging fruit" – to undertake an effort where early success can be assured, to the greatest extent possible. Social marketing efforts are cost-effective and low-cost compared to other behavior change strategies.

Political and administrative considerations should be taken into account in deciding on social marketing campaigns. In fact, they are often critical to projecting what will be successful. In making recommendations on where Garfield County Public Health should begin, the following considerations have been reviewed.

GCPH Environmental Health has already put a lot of effort into air quality issues.
GCPH Environmental Health has significant grant resources to address air quality issues.
GCPH Environmental Health must have additional resources to undertake new efforts.
Substantial resources should come from the Garfield County community, not just from GCPH.

Enacting legislation and regulation on environmental health issues will be too contentious, and therefore too time-consuming, to foster significant behavior change in the next five years.
Political pressure to address County residents' concerns about gas well drilling will increase.
Expectations for higher levels of municipal-service responses will increase.
Economic pressures will continue to be felt for most if not all of the next five years.

Voluntary action to address Environmental Health Issues can be motivated.
Voluntary actions can be effective.
Social pressure is an effective motivation for behavior change.
The goal of "sustainability" as a social pressure will gain credence and adherence.

People pick up on cues from those they are in contact with.
Electronic media provides a new means of social contact and influence.
Young people are quick to pick up on new ideas and social motivators.

6.3 Focus Environmental Health Issue Clusters for Campaigns

Here are Environmental Health issue clusters where Garfield County Public Health can make an impact and achieve success over the next year. GCPH EH should be the prime mover and can deploy resources remaining under its current C.A.R.E. grant to initiate such efforts, but should not undertake all the work. Volunteers – individuals, corporations, other government agencies, businesses, interest groups, students, etc. – should be encouraged become engaged on the issues and can provide much of the effort.

These Environmental Health Issue Clusters were selected for elaboration here in the Recommendations section because the issues are critical and susceptible to effective and prompt action:

1. The **Individual Action Issues Cluster** contains two of the top ten priorities, eight issues among the second ten priorities and five issues among the third ten priorities. The particular campaign relates to air quality, which has been a major focus of the County's Environmental Health function for the past five years.

2. The **Sustainable Communities Issues Cluster** contains three of the top ten priorities, five issues among the second ten priorities, and five issues among the third ten priorities. There are several multi-community efforts already in place, or now forming, in Garfield County to address community sustainability issues with environmental health impacts

3. The **Oil and Gas Exploration, Drilling and Production Issues Cluster** contains three of the top ten priorities, three of the second ten priorities, and five issues among the third ten priorities. The impacts of gas well drilling in the western part of the County have been the subject of intense public discussion and media coverage in Garfield County, the State of Colorado, and nationally during the conduct of the C.A.R.E.S. project.

6.3.1 Air Quality: No Idling Campaign

The first campaign combines both Individual Action and Air Quality and constitutes an example of social marketing strategic thinking. Social marketing mechanisms to support and motivate behavior change in the area of Air Quality, to reduce vehicle idling in Garfield County dramatically, are briefly outlined.

This is not a workplan, and no timeframes or resource allocations are included. Much more elaboration of social marketing mechanisms for this particular initiative is possible. Development of a detailed workplan with a timeframe and resource requirements, as well as an evaluation framework, should be undertaken.

A campaign analogous to this is working well for Rotary International's zero waste initiative, with individual Rotarians, their businesses, and Rotary clubs making pledges. Such a campaign could lead to widespread behavior change in Garfield County with favorable environmental health impacts.

Develop a pledge that fleet operators would make to eliminate vehicle idling.
Connect the campaign to the Garfield County C.A.R.E.S. environmental health issue list.
Identify vehicle fleets that operate in the County: city and towns, public transit operators, taxis, service and delivery vehicles, school buses, Colorado Mountain College, truck stops, etc.
Contact a few fleets that may be willing to accept this challenge
Secure one signatory fleet operator to the pledge.
Leverage this signer with other fleets.
Work with each signatory fleet operator to get their drivers and mechanics to sign a related pledge not to idle.
As fleets sign on, arrange to make no idling presentations to their drivers.
Engage citizen, employee, advisory, civic and interest groups to assist with the campaign.
Feature this campaign on the website.
Hold a contest to design a no-idling logo.
Provide no-idling logo keychains and pledge to drivers and mechanics of pledged fleet operators.
Invite individuals to take the no-idling pledge.
Solicit local merchant support, such as coffee shops to award free coffee to pledgers.
Engage college students, asking them to join and assist the campaign.
Prepare a PowerPoint presentation and train presenters.
Schedule presentation to civic groups and ask for voluntary pledges not to idle.
Provide presentation attendees with pledge cards to take home to their families.
Sponsor contests for various groups to get the most family pledges not to idle.
Engage a seniors group to spot-monitor fleet no-idling compliance.
Provide compliance feedback to fleet operators.
Create a Facebook page for the GCPH no-idling pledge.
Videotape driver and other interviews, asking if they have pledged, or will pledge, etc.
Post videos to YouTube and link to the project website and a Facebook page.
Connect no-idling to weather patterns that cause low-level air pollution fed by idling.
Report progress on air quality and pledge results via all mass media.
Seek feature coverage of the no-idling campaign.

6.3.2 Oil and Gas Exploration, Drilling, and Production: My Company CARES Initiative.

Oil and gas companies active in Garfield County have already shown that they are interested in engaging with County residents and lowering the levels of concern expressed about drilling and related activities. Several companies offered input as part of this project. Meetings should be arranged with as many of the companies as are willing, to share the Environmental Health Issue priorities information, and ultimately, to brainstorm what the companies are able and willing to do in response.

The chance of making progress with willing partners is too good to overlook. If progress must wait on legislation and regulation, much time will pass before any progress is made. Whatever the companies can find in their individual and collective interests should be framed less as a public relations or public information effort and more as a social marketing effort, one with early and near-certain successes. Residents are looking to see if companies will be *responsive* in addition to being responsible.

Because this is a very sensitive arena, no details have been or should be elaborated until companies are engaged in discussion. The largest companies should be approached with the idea that they can form the core of the an enlarging group of entities wiling to take steps without being, in any sense, "forced" to do so. If larger companies are willing to work in this manner, over time other companies will see the benefits of becoming engaged on the same basis.

6.3.3 Sustainable Communities: Best Practices Consortium.

The incorporated communities in Garfield County generally have participated in government membership organizations, such as the Northwest Colorado Council of Governments and the Colorado Municipal League, as a means of keeping current with how other communities handle pertinent issues. Current economic conditions are impacting their ability to maintain these memberships and participate in conferences and meetings. The Garfield County municipalities and municipal district do not have an umbrella venue or mechanism for active in-County collaboration. If a gathering of the minds could be convened by GCPH on the C.A.R.E.S. Environmental Health Issue priorities, the County provides an initial helping hand to a Best Practices Consortium on the Sustainable Communities Issues Cluster.

It seems likely that, in several different areas, one community may have taken steps that would be of interest to other communities; that insights, pitfalls, cost information, and expertise could be shared; and a best practices compendium might be developed. In small communities, in difficult times, not having to come up with answers alone can be a tremendous asset. Sustainable communities efforts can be elaborate or simple. The government agency can undertake action or facilitate citizen or civic association or encourage, even endorse, business action.

The communities in Garfield County are linked by geography, the clear interconnections across work and residence locales, a major transportation corridor, and many more common concerns

than the municipalities in other counties. This could be a significant mutual assistance opportunity for all of them.

The initiating mechanism could be a succession of one-on-one meetings with municipal managers to share the results of the C.A.R.E.S. project and discuss the potential impact of on collaboration sustainable communities and environmental health, with Garfield County communities sharing and supporting one another. The end in view would be an agreement on the part of each community that the top municipal manager or the manager's designee would agree to bring each community's top priorities and interest in environmental health into a 6-month or 12-month forum.

Over that time period, a focus on best practices and cooperation should lead to the communities' coming up with both joint efforts and supportive endeavors to address environmental health priorities. The type of initiatives that might be pursued could include: County-wide waste-stream recycling, home radon-testing campaign, extension of bike and walking paths throughout the County, safe-food handling information and demonstrations at County farmers' markets, and many others. Citizen board, employee action groups, and other organizations can be asked to support and staff the activities.

6.4 Evaluation

Social marketing, like any other marketing endeavor, needs evidence, metrics, and measurement to show that there was a positive effect from the activities undertaken. Because GCPH cannot staff all of the activity that may be put into motion, especially as new initiatives begin over time, it will need to establish linkages such that information is fed back to GCPH on what is done by all of the entities that partner to motivate behavioral change.

To the extent that the effort is public in nature, of interest to the general public, and apparent on the internet or in the local media, such as the no-idling campaign is likely to become, feedback will be easy to collect. When the effort is in initial stages or involves a higher degree of confidentiality, as with oil and gas companies and municipal governments, GCPH can essentially trade its good offices in making and reinforcing the connection for agreement, as formal as necessary, for a flow of information to GCPH so that it can track progress in addressing Environmental Health Issue progress across the County.

7. METHODOLOGY

The role of the Facilitation Contractor for the C.A.R.E.S. project was to assist the Garfield County community in expressing its **consensus** on priorities in the area of environmental health. Consensus is a distinctive type of decision-making. It requires a great deal more "agreement", however agreement is defined, than other decision-making approaches. Consensus means substantially more agreement than a simple majority, 50% +1, more than a super-majority, such as 67%. Consensus is achieved when very few or none of those involved in making the decision actively oppose the decision favored by a vast majority.

Wikipedia outlines characteristics of consensus decision-making:

> **Inclusive:** As many stakeholders as possible should be involved in the consensus decision-making process.
>
> **Participatory:** The consensus process should actively solicit the input and participation of all decision-makers.
>
> **Cooperative:** Participants in an effective consensus process should strive to reach the best possible decision for the group and all of its members, rather than opt to pursue a majority opinion, potentially to the detriment of a minority.
>
> **Egalitarian:** All members of a consensus decision-making body should be afforded, as much as possible, equal input into the process. All members have the opportunity to present, amend and veto or "block" proposals.
>
> **Solution-oriented:** An effective consensus decision-making method strives to emphasize common agreement over differences and reach effective decisions using compromise and other techniques to avoid or resolve mutually-exclusive positions within the group.

In smaller groups, consensus is typically achieved through extensive interpersonal interaction involving everyone who has a stake in the decision. In larger groups – and at 55,000 people, Garfield County is a "large group" – some degree of representation is essential to achieve a result in a reasonable period of time. The questions needing consideration included how to inform the population that will be affected by and may therefore care about the decisions, how to interest a large population in the issues to be decided, how interested the large population is and will become in the issues being decided, how to identify representatives, how many representatives to identify, how to insure that no one who could prevent consensus is left out of the process, how to achieve consensus, and how to announce the decision reached by consensus.

7.1 Engaging Garfield County Residents' Attention to Environmental Health

Building on Garfield County resident concerns about environmental health collected by Jim Rada and other GCPH staff members through presentations to civic organizations before a

Facilitation Contractor was selected, the Royce Arbour project team members developed an engagement strategy both to collect additional County resident input on environmental health issues and to develop and maintain a long-term working relationship between GCPH's EH staff members and an appropriately representative group of Garfield County community members.

A series of papers, of different lengths and amount of detail, were drafted to explain the C.A.R.E.S. project and provide contact information for GCPH and the Facilitation Contractor's project team. These papers were used as introductory emails and as leave-behind pieces to help contacts spread the word about the C.A.R.E.S. project to others. The papers proved particularly useful when given to city, town and interest organization executives, who used them, or abstracted information from then, to communicate to their constituencies, typically by email newsletter.

7.1.1 GarCoCARES Website and Email Input on Environmental Health Concerns

The engagement strategy included developing a website for the C.A.R.E.S. project and an email address through which visitors to the website could communicate with the project. Because the intent was to enhance the EH staff's working relationships throughout the County, Jim Rada, as EH Manager, was the visible individual associated with the project. The email address was identified as belonging to him, email messages were sent on his behalf, public information was disseminated under his name, and his name was on project materials distributed to the public. Jim accompanied the Royce Arbour project team members on most visits and conversations with Garfield County officials and residents.

It was apparent that concerns about "the environment" were better understood by many people than concerns about "environmental health". The following wording was developed and used throughout the project to explain what "Environmental Health" means, to help Garfield County residents focus on the subject of the C.A.R.E.S. project.

Environmental Health concerns involve "any environmental factors that may have a bad impact on human health, or have an impact on the natural world that is bad in the long term for human health and the environments in which people live.**"**

The reasons why Environmental Heath matters is "because improvements in people's health are due more to changes in their environments, both indoors and outdoors, than to medical science and medicine."

7.1.2 Listening Session Input on Environmental Health Concerns

In an expanding network of contacts, the project team contacted other Garfield County residents by telephone, email and in person, directing people to the project website to learn more about it and pointing out the project email address as an effective way to register their

thinking about environmental health concerns. Every email sent to the project email address was acknowledged and reviewed for expression of environmental health concerns.

Contacts who could help identify either environmental health concerns, or other persons who would like to present their environmental heath concerns to the project team, were selected. They were Garfield County community stakeholders knowledgeable about the environmental health concerns of Garfield County, plus additional people selected to insure broad input from Garfield County residents, community organizations, businesses, government agencies, and institutions.

The project team met with the chief appointed official in the county and each of the seven largest communities (county, town and city managers, municipal services corporation executive) to explain the project and to find out where a public meeting could be held in their community. In such conversations, other staff members, other organization representatives and other community residents who could provide input on environmental health concerns were identified. The project team followed up on these suggestions in person, by email and on the telephone.

It was unnecessary to ask questions. Garfield County Resident were quite willing to express their concerns about Environmental Health. To insure consistency, the following script was used in conversation:

GARFIELD COUNTY PUBLIC HEALTH
C.A.R.E.S. PROJECT LISTENING GUIDE

Fill in contact name, e-mail, phone, location.

_____

Following personal introduction of Project Team listener, state project purpose: To understand what Garfield County residents think are the most significant environmental health issues in Garfield County today.

In a conversation with {the County Commissioners / GCPH staff / other}, it was recommended that I contact you. They told me it would be very important for me to LISTEN to what you have to say about this topic. For this project, "environmental health" means factors or issues in the environment that have a direct impact on the health of human populations.

If you would be willing to help, I am ready to listen and take notes.

This extensive effort identified Garfield County community participants knowledgeable of environmental health issues, based on their active membership in various sectors of society, their residence and participation in communities within Garfield County, and previously expressed interest in environmental health issues. The intent was to assure that the full range of Garfield County's diverse population and viewpoints would be obtained.

7.2 Community Input on Environmental Health Concerns

Before Royce Arbour, Inc., was engaged as the Facilitation Contractor, GCPH Environmental Health staff had contacted civic and community organizations, made presentations concerning the C.A.R.E.S, project, and solicited input on what people at these gatherings thought were the most significant environmental health issues facing Garfield County. The comments were collected in a spreadsheet and transmitted to Royce Arbour project staff by GCPH staff. Royce Arbour project team members added concerns expressed by County residents with whom they were in contact.

7.2.1 Development of Environmental Health Issue Statements

Wording the environmental health concerns of the Garfield County residents to Environmental Heath "issues statements" was done with great care, with successive revisions by members of the Royce Arbour project team in consultation with Environmental Health Manager Jim Rada, who sought input from other GCPH staff members and conveyed it to the Royce Arbour project team.

The content of the Environmental Health issue statements came from thorough review of input from County residents. Individual Royce Arbour staff members drafted the language of the Environmental Health Issue Statements, and another member of the team reviewed each draft. The final draft was reviewed by GCPH.

A set of working guidelines for wording EH Issue Statements was developed and refined in the course of the project that guided the conversion of the draft statements to final versions. These guidelines can be viewed in Appendix 11.4.3.

The Issue Statements contain both the particular matter that was of concern to residents and the environmental health impact of the concern. The Royce Arbour project team focused on two main areas which were important in "wrapping words around" citizens' concerns and comments to turn them into Environmental Health Issue Statements.

One focus was fidelity to the expression of the issues, both as stated by the Garfield County residents who gave voice to the concerns and to the current state of scientifically-based information about the environmental health impacts of the concern.

Because there has been divisions of opinion across the County in relation to extraction-related public issues, it was important not to slant Environmental Health Issue Statements in any way, so that no one would see the C.A.R.E.S. project as taking sides in any arena. Adherence to guidelines results in statements where the concerns may be similar but the environmental heath impacts differ, as well as statements in which the environmental impacts are similar but the concerns differ. This is particularly true of air quality and water quality issue statements.

The other focus was understandability of the concern, stated as an issue, to others in the County who would be asked to say how important an issue was. Understandability first involved readability in English. A readability analysis was conducted, targeting an 8th grade reading level. The need to use words such as radon and benzene meant that the actual reading levels of the EH issue statements vary.

Understandability also involved translation to Spanish. According to 2008 census data, 25% of County residents have an Hispanic background. This is not a surrogate for Spanish or English literacy, but it does indicate the value of making the effort to insure this segment of the County's residents can participate in considering environmental health matters.

Once the issues were well-framed in English, they were translated into Spanish by Syntes Language Group. Syntes was given a description of Spanish speakers among the residents of Garfield County. The completed translation was reviewed by three Royce Arbour team members who speak Spanish, a Spanish-speaking Boulder attorney who has a degree in environmental studies and specializes in immigration law for clients from Mexico and Central America, and a GCPH staff member who does Spanish translation for GCPH's other staff members. No individual contacting the Royce Arbour project team made use of the Spanish translations, although having Spanish translations available for future use may be helpful.

7.3 Reaching Consensus

The 1995 Protocol for Assessing Community Excellence in Environmental Health (PACE EH), a methodology to guide local communities in the development and implementation of best practices in the field of Environmental Health, was adopted by NACCHO, The National Association of County and City Health Officials. Key informant interviews were a part of those best practices and have been even more widely used in the 15 years since 1995 than they were before. Thus, key informant interviews were included in the original plan of work submitted to GCPH by Royce Arbour, Inc., as Facilitation Contractor.

One of the very valuable aspects of such interviews is that using this process creates engagement on the part of the interviewees. An EPA C.A.R.E. Level One grant is to identify an engaged community that will become active and support further work to address environmental health priorities established through a community consensus process, should a Level One grantee seek additional EPA support through a C.A.R.E. Level Two grant.

The initial work plan for the Facilitation Contract involved conducting key informant interviews with 75-150 Garfield County residents. EPA representatives gave notice to GCPH that its grant award to GCPH could not be used to support project activities that involved asking more than nine people the same question and indicated that such a key informant interview approach would, in EPA's view, violate this requirement. This requirement derived from the federal Paperwork Reduction Act of 1995. Information on the significant provision of the Paperwork Reduction Act § 3502 can be viewed in Appendix 11.9.1.

The GCPH C.A.R.E.S. project faced a significant challenge in facilitating residents' consensus across the County regarding Environmental Health issues while complying with EPA's interpretation of the Paperwork Reduction Act. The EPA's C.A.R.E. grant guidance materials and results from other C.A.R.E. grantees indicate reliance on, and promotion of, insights developed in and from public meetings.

The experiences of GCPH, its Environmental Health staff, and Royce Arbour in other engagements, do not support this approach. GCPH and Royce Arbour's experiences with public meetings suggest that input from public meetings is not representative. There is generally, and increasingly, a very low level of public participation. Participation that occurs is skewed toward pre-established, even orchestrated, statements of positions on issues.

The C.A.R.E.S. project team learned County Commissioners, town and city managers, government staff members, volunteer board members, interest organization and business representatives, etc. also felt that holding public meetings did not result in useful resident input. They indicated that their public meeting input on any topic was meager and unrepresentative, no matter what efforts were made to attract attendance.

Instead of relying on public meetings to produce a consensus on environmental health issues, conducting a Delphi Exercise was proposed by the Royce Arbour project team and accepted by GCPH. Having previously employed the Delphi approach with success, Royce Arbour, Inc., found it well-suited to the CARE Level One effort. A Delphi Exercise is designed to build consensus through managed interactions by a respondent panel of distinctively knowledgeable people. Respondent panel participation is anonymous and completely open.

A properly conducted Delphi Exercise does not, in and of itself, involve asking questions, and no voting is involved. It does involve a respondent panel that offers input in successive phases. Participants need not assemble at the same time and place but can participate at a time of their choice over the course of several days. The Garfield County C.A.R.E.S. Delphi Exercise was conducted without asking any questions

7.3.1 Description of a Delphi Exercise

The objective of most Delphi applications is the reliable and creative exploration of ideas or the production of suitable information for decision making. A Delphi is a process for distilling opinion by means of a series of opportunities to provide input, interspersed with controlled opinion feedback. Delphi has been developed to make discussion possible and to prevent negative social behaviors that can inhibit the formation of consensus. Although Delphi exercises have been conducted for decades, the internet has made conduct of a Delphi Exercise even more convenient for participants and greatly enhanced its efficiency.

7.3.2 Rationale for Choosing a Delphi Exercise

Delphi is a research methodology with a substantial literature supporting it. The technique allows dealing systematically with a complex problem or task, is designed to develop consensus on the problems posed, enables refinement of views as work progresses, and produces information that can be used as a basis for decision-making. It results in consensus among participants, which makes it ideal for community-oriented endeavors. The Delphi has been deployed in a variety of public health situations.

The Delphi method facilitates the formation of a group judgment and recognizes human judgment as legitimate and useful input. Delphi is a method to be chosen for dealing with extremely complex problems for which there are no adequate models.

The Delphi Exercise approach resolves most of the major problems that inhibit broad-based community participation. Among these are the following:

- Issue overload: At any point in time, community residents are asked to attend to a variety of planning and problem resolution efforts soliciting participation. There are elections, referenda, school districts, non-profit and other organizations engaged in strategic planning, mandated review processes for regulation changes, and advocacy organization surveys. Delphi allows convenient participation to engage with minimal time commitment.

- Power relationships: In large meetings, high personal confidence levels are required for participants to articulate their views before the group, particularly when other participants are seen as more experienced, more vocal, and more determined or assertive. Such a dynamic disempowers youth, ethnic minorities, homebound individuals and other segments of a community. Delphi lets participation be anonymous, eliminating differences in relative social and economic power as a confounding factor.

- The "others will do it; you don't need me" syndrome: Decision-making by consensus requires that participants continue to be engaged throughout the decision-making process. Large public meetings can convey the message that "if I don't participate, it won't matter." Or, "if I do not attend, my participation is unwanted." Delphi keeps a representative group of individuals engaged until consensus is reached.

- Alienation: If individuals feel that their input is unwelcome for any of a wide variety of reasons, they cease participating. Reasons for alienation include disenfranchisement, frustration, social and economic class differences, differences in amounts of information, language barriers, unfamiliarity with the "corridors of power", and many others. In public meetings, one expression of opinion may have extremely negative impacts on other people's willingness to offer opinions, especially countervailing or opposing opinions. Delphi keeps everyone involved.

- Representation: Every community has divisions resulting from interaction on various past issues. A bit of conventional wisdom says "where you stand {on an issue} depends on where you sit." Insuring broad-based participation, to make certain of the welcome for every opinion from every part of the community, is critical. Any one viewpoint, that is left out means that a resulting determination does not completely reflect the entire community. Those who feel left out may seek to undermine the process and the result. Delphi helps achieve genuine consensus by rendering past divisions invisible during the consensus-building process.

More details on the Delphi methodology and the sources from which this description of a Delphi Exercise were drawn can be viewed in Appendix 11.5.

7.3.3 Conduct of the Delphi Exercise

The following ten steps were undertaken for the GCPH C.A.R.E.S. project's application of the Delphi method.

Formation of a team to undertake and monitor a Delphi Exercise on the subject of priority environmental health issues in Garfield County.

The Delphi Exercise team was drawn from three organizations: the Royce Arbour project team – Diana Royce Smith, Chuck Stout, Danielle Money– as GCPH's Facilitation Contractor, GCPH EH Manager Jim Rada and other GCPH staff members, and two people from the Colorado School of Public Health's Center for Public Health Practice, Lisa O'Reilly and Tim Byers.

Royce Arbour project team members secured the cooperation of the Colorado School of Public Health (CSPH) to conduct the Delphi. The CSPH is a joint effort of three Colorado higher education institutions: the University of Colorado, Colorado State University, and the University of Northern Colorado. CSPH is housed at the CU-Denver health sciences campus. One of CSPH's precepts is to contribute public health expertise and assistance to Colorado communities through the Center for Public Health Practice, as well as providing graduate education for public health practitioners. A Non-Disclosure Agreement (NDA) was executed between CSPH and Royce Arbour Inc., formally binding CSPH and its staff not to share with anyone or use the information provided or generated under the Delphi Exercise for any purpose other than assisting Royce Arbour, Inc. and Garfield County Public Health on this particular C.A.R.E.S. project. The NDA requirements survive the completion of the work on the project. The contents of the NDA can be viewed at Appendix 11.3.7.

CSPH funded and staffed the conduct of the Delphi Exercise without use of EPA funds. CSPH conducted the Delphi Exercise under the direction of Tim Byers, Associate Dean for Public Health Practice, with the assistance of staff member Lisa O'Reilly. Time spent by the

Royce Arbour project team on coordination with CSPH and efforts directly related to the Delphi Exercise were not charged to GCPH. Royce Arbour, Inc. bore the costs of its staff members Diana Royce Smith, Chuck Stout, and Danielle Money working on the Delphi Exercise.

Selection of a panel to participate in the exercise.

To create a panel of prospective respondents for the Delphi Exercise who accurately represent the entire County, the Royce Arbour project team identified characteristics for review by GCPH to be represented across the respondent panel. These characteristics typified key stakeholders in Garfield County's future. Delphi participants were selected to include participants from:

- interested parties from data already in the hands of GCPH environmental health staff members,
- the categories in which representative stakeholders were identified,
- community and civic leadership,
- suggestions from Garfield County associations, organizations, civic leadership and residents.

Here are the representative categories of Garfield County Residents:

Citizens Engaged in Environmental Health Issues	Latino Agency Representatives	People Pointed Out to Include (for particular experiences)
Education Representatives	Latino Community Members	Ranching Representatives
Elected Officials	Local Government Staff Members	Resort Managers
Environmental Interest Group Representatives	Non-Profit Organization Managers	Sand & Gravel Business People
General Business People	Medical Care Providers	Service Club Members
General Community Members	Media Representatives	Social Services Managers
Labor Officials	Oil & Gas Industry	Special District Managers

All 150 prospective respondents were slotted into one or more categories. The effort was to represent the categories adequately, not to include the same number of respondents in each category nor to weight the categories.

The Garfield County Board of Health, which is comprised of the members of the Garfield County Board of Commissioners, agreed to sign a letter to introduce the C.AR.E.S. project to County residents who would be asked to help develop the priorities among Environmental Health Issues. This letter, signed by all three Board of Health members (all three County Commissioners), was sent to each person invited to participate in the Delphi Exercise. The letter can be viewed at Appendix 11.5.2.

All prospective respondents were contacted by Royce Arbour project team members, in person or by email or telephone, to find out if they would participate in the Delphi exercise. Some did not respond to the contact, and some declined to participate due to lack of time or interest. Despite agreement to participate in the Delphi, some failed to provide input. A chart showing the individuals embodying these characteristics who participated in the Delphi Exercise and those who did not can be viewed at Appendix 11.6.6.

Development of the Round 1 Delphi instrument.

The concerns voiced by Garfield County residents about Environmental Health were categorized into groups by the Royce Arbour project team and carefully worded as "Environmental Health Issues". Duplicate concerns were consolidated or eliminated. Concerns about the environment, or some field other than environmental health, were eliminated. The resulting list of EH Issues was verified with Jim Rada, GCPH EH Manager, and his guidance was sought on wording concerns. The wording guidelines for the Garfield County Environmental Health Issues list can be viewed at Appendix 11.4.3.

Instructions in the Delphi Exercise to respondents were kept as simple as possible. The introductory text reads:

> Here is your first {second} {final} opportunity to share your thinking on Environmental Health issues in Garfield County. This is an effort to develop a consensus on the EH issues most important for Garfield County to address.
>
> Click on your Round One {Two} {Three} link here: <http:// et cetera >. This link is uniquely yours. Please do not forward this message.
>
> Please respond between now and the end of the day {day of week}, {month-day-2010}.
>
> Your responses are completely confidential. The group of respondents, including you, has been carefully developed to represent Garfield County residents.
>
> Look for {the next round} email, giving you another response link, on {day of week}, {month-day-2010}. Please respond by {month-day-2010}.
>
> Thanks for your participation!
>
> Garfield County Public Health and Royce Arbour, Inc., appreciate your agreement to be a respondent. We in the Colorado School of Public Heath, located at the University of

Colorado at Denver, are pleased to assist the Garfield County C.A R.E.S. project in conducting this study.

Please note: If you do not wish to receive further emails from us, please click the link below, and you will automatically be removed from our mailing list. <http:// et cetera >

The Delphi respondent panel was presented in Round One with the alphabetized list of 39 Environmental Health Issues identified by Garfield County residents prior to the beginning of the Delphi Exercise. The list of the original 39 EH Issues can be viewed at Appendix 11.4.2.

Following each EH Issue statement, respondents could indicate their assessment of its importance on a 5-point Likert-type scale. A Likert scale is a widely used research mechanism for respondents to indicate the extent to which they agree with a statement. Offering an odd number of response choices requires respondents to definitively state their position. The mid-point is essentially a "null" alternative; such a response says that the issue is neither important nor unimportant to the respondent.

Not at all Important Somewhat Unimportant Neutral Somewhat Important Very Important

In Round One of the Delphi Exercise, participants were given space to add up to three environmental health concerns, if they felt their concerns were not adequately represented by the 39 Environmental Health Issue Statements presented to them, and to rate the concerns they added.

In addition to rating the EH Issues, respondents were asked for a minimal amount of information about themselves. The information requested was predominantly geographical in focus, because there was the sense from conversation with County residents that geographic location was significant in people's perspectives in environmental health issues.

Respondents were asked where in the County they lived and worked. The choices divided the County into quadrants using I-70, which bisects the county running east and west, and the Town of Silt, roughly midway across the county:

North of I-70, east of Silt	South of I-70, east of Silt	North of I-70 Silt and west	South of I-70 Silt and west	I don't live {work} in Garfield County

Respondents were asked how long they had resided in Garfield County:

Less than 5 years	5 or more years but less than 10 years	10 or more years but but less than 20 years	20 or more years

Respondents were asked to indicate their ages within broad ranges:

Under 21	21 to 39	40-64	65 or more years

Respondents were asked which community in the County was closest to where they lived and which was closest to where they worked. This information was collected to help make sure that the locations for public Open House meetings would be convenient for individuals to attend. The choices were presented in alphabetical order:

Battlement Mesa Carbondale Glenwood Springs Newcastle Parachute Rifle Silt

Testing the instrument for proper wording.

Introductory text and the rating scale for the Delphi were developed by Diana Smith and Chuck Stout of the Royce Arbour project team, with review by and input from Tim Byers and Lisa O'Reilly of CSPH, who also reviewed and critiqued the draft issue statements. The revised drafts and decisions about what to include and how to word the draft issue statements were then reviewed by GCPH. Jim Rada and other GCPH staff members pretested the Delphi Exercise and its instructions.

Transmission of Round 1 to the Delphi Panel respondents.

To collect the Delphi Exercise data, aggregate it, and disseminate it in the next round within a relatively short time period, it was essential that the data be handled electronically. The Royce Arbour project team confirmed that prospective Delphi respondents who agreed to respond had email addresses, attesting to their ability to participate online. A separate invitation was emailed for participation in each round. As the end of the round's 8-day participation window approached, reminders were emailed.

Respondent panel receipt of email messages was monitored. When servers returned an email invitation as undeliverable, the prospective respondent was contacted by telephone to identify a functioning email address and the invitation to participate in Round 1 of the Delphi Exercise was resent to the corrected address, again monitoring the success of email delivery. The participation status for panel respondents in each round was monitored.

The Delphi Exercise was conducted online. The Colorado School of Public Health (CSPH) selected SurveyMonkey, an online research solution employed by 100% of the Fortune 100 , with over 4 million accounts, to power the Delphi Exercise. SurveyMonkey generates tables, graphs, and displays of collected data. Data collected by SurveyMonkey were exported to Microsoft Excel for analysis.

In conducting the Delphi exercise, several compliance protocols were observed.

To comply with EPA's guidance on the Paperwork Reduction Act: No question was asked.

To comply with CSPH Internal Review Board requirements: Each invitation to participate in the Delphi Exercise contained an "opt-out" provision so a prospective respondent could request to be removed from the email list.

To comply with CSPH Internal Review Board requirements: The identities of the Delphi participants were not available to CSPH staff members. Participant email addresses were loaded into SurveyMonkey by Royce Arbour staff. Corrections to email addresses were made by Royce Arbour staff. GCPH was not charged for this work by Royce Arbour staff.

To comply with Delphi Exercise best practices: Respondent anonymity was promised and delivered. Participation was limited to and tracked by the entered respondent email addresses. Only the Royce Arbour, Inc., project team members, not CSPH and GCPH staff, had access to the identities of Delphi panelists who agreed to participate and did respond.

Analysis of the Round 1 responses.

In Round One of the Delphi Exercise, participants were given space to add three issues, if they felt their concerns were not adequately represented by the issue statements presented to them, and to rate the issues they added. The 23 resulting comments were reviewed in the same way as other Garfield County residents' environmental health concerns. Many were comments about an environmental health issue already in the Delphi.

Review by the Royce Arbour project team and GCPH Environmental Health Manager Jim Rada resulted in modification to the wording of issue statements, as well as four additional issues being framed and added to the Delphi Exercise for the first time in Round Two. Details on all of the Round 1 concerns, as well as comments, modifications and additions, are in Appendix 11.4.

Preparation of the Round 2 instrument.

Minor wording changes to Environmental Health Issue statements used in Round 1 were made for Round 2 of the Delphi Exercise. Instructions to the respondents were modified only to reflect that this was Round 2, and the dates for response were different. One option to add an environmental health concern was offered in Round 2, whereas there were three options were offered to add them in Round 1.

The importance ranking for each Environmental Health Issue in the previous round was displayed in a graph next to the Issue Statement. Individual respondents are not able to see how they personally rated an issue on the previous round, although they may have recalled their individual assessments.

The new environmental health issue statements were added, in alphabetical order, at the end of the alphabetized list of the original EH issue statements included in Round 1. The final list of EH Issue Statements for Round 2 can be viewed at Appendix 11.4.5. The EH issue statements added in Round 2, on the basis of comments from Delphi respondent panel members in Round 1, were:

BEDBUG, TICK, and COCKROACH INFESTATIONS THAT ARE NOT PROMPTLY DEALT WITH may spread to other housing units and affect the health of other people.

INCONSISTENT HANDLING of ALL OCCUPATIONAL INJURIES, ILLNESSES and POTENTIALLY HAZARDOUS EXPOSURES makes it hard to develop comprehensive occupational health and safety programs.

LEAVING ROAD KILL to DECAY on roadsides may cause health issues in other animals and humans.

LEACHING from WASTE PITS at DRILLING SITES and BURYING WASTE ON SITE may contaminate ground and surface waters that can harm human health.

Transmission of Round 2 to Delphi respondents.

Round 2 of the Delphi Exercise was transmitted to the participant panel by email notice, just as in Round 1. A separate invitation for participation in each round was emailed. Receipt of email messages and the participation status of Delphi response panel members was monitored. In Round 2, there were no email messages that could not be delivered. As the end of the round's 8-day participation window approached, reminders were emailed. The participation status for panel respondents in each round was monitored. One participant completed only a portion of Round 2 and was contacted to find out why. After hearing again an explanation of the process for the Delphi Exercise, this participant completed round 3. The importance rankings for each Environmental Health Issue in the previous round was displayed in a graph next to the Issue Statement. Individual respondents are not able to see how they personally rated an issue on previous rounds, although they may recall their assessment.

Analysis of Round 2 responses.

There were fewer respondent comments or suggestions for the addition of Environmental Health concerns in Round 2. After Royce Arbour Project team members and Jim Rada examined the suggested additions, it was determined that no new Environmental Health concerns had been identified and no new EH Issue Statements were added.

Preparation of Round 3 instrument.

Instructions to the respondents were modified only to reflect that this was Round 3, and the dates for response were different. Whereas three options to add Environmental Health issue statements were offered in Round 1, and one option in Round 2, no option was offered to add issue statements in Round 3.

The importance ranking for each Environmental Health Issue in the previous round was displayed in a graph next to the Issue Statement. Individual respondents are not able to see how

they personally rated an issue on previous rounds, although they may have recalled their individual assessments.

Transmission of Round 3 to the respondents.

Round 3 of the Delphi Exercise was transmitted to the participant panel by email notice, just as Rounds 1 and 2 had been. A separate invitation and reminders were emailed to encourage participation. Receipt of email messages and participation status was monitored but no problems were found. The participation status for panel respondents in each round was monitored.

Analysis of Round 3 responses.

Of the 150 individuals invited to participate in the Delphi Exercise, 60-62 (varying by round), or 40%, agreed to become participants. Reasons for declining to participate, where they could be ascertained, ranged from the predominant "lack of time" to other work and personal commitments and to government staff members being laid off immediately prior to the initiation of the Delphi. Between 40 and 45 individuals participated in each round of the Delphi Exercise.

The GCPH Delphi Exercise had very positive participation:

100% of total respondents to the Delphi Exercise came through the email invitations,
60-67% (varying by round) of participants opened the email,
100% of openers clicked through to the Delphi Exercise, and
67-75% (varying by round) of those agreeing to participate actually participated.

By comparison, a recent email survey for a credit union's outreach campaign, soliciting input on customer service, yielded the following results[1]:

67.3% of total respondents came through the email invitation.
28.4% of recipients opened the email.
43.8% of openers clicked through to the {customer service} survey.

The collective opinions of respondents in a Delphi Exercise typically evolve over the course of the several rounds, indicating that seeing other respondents' views leads respondents to modify their own views. Successive rounds in a Delphi Exercise are typically reiterated as long as necessary to achieve stability in the results. Responses to this Delphi Exercise stabilized in Round 3.

The mean rating for 30 of the EH Issue Statements decreased across the rounds, indicating that respondents saw these issues as less important than in the beginning. The mean rating for 12 of

[1] "Email Invite and Q&A Format Double Survey Completion Rate: 4 Steps," RESULTS Section. www.marketingsherpa.com/article_print.html?id=31652, 6/24/10.

the EH issue statements increased across the rounds, meaning that respondents came to see these issues as more important than in the beginning. Ratings for two issues did not change.

This pattern suggests that individual respondents began the Delphi taking their own concerns into account. As they began to see how other respondents viewed the issues, their level of concern moderated for a substantial majority of the issues. Making more refined distinctions, respondent opinions on what issues were of greatest important to the County coincided to a greater degree than before the consensus-building exercise.

At the end of Round 3, a final analysis and weighting of the respondent opinion was performed in the following manner. The ratings for each EH Issue were weighted and summed, to give a value for each EH Issue Statement, and the values were arranged in rank order from highest to lowest. There were ties in values in a few instances.

To weight the ratings and arrive at a value for each EH Issue Statement, weights were assigned to each of the five possible Likert scale ratings. Ratings of "neutral" for each EH issue were given a null value through multiplication by zero, since the intent was to find out what the top priority EH issues are.

The number of respondents giving an EH Issue statement ratings of "Not at all important" were summed. The number of respondents giving the Environmental Health Issue Statement a rating of "Somewhat important" were summed, and so on, for each rating, for each issue. Summed ratings of "Not at all important" were multiplied by 1. Summed ratings of "Somewhat unimportant" were multiplied by 2. Summed ratings of "Somewhat important" were multiplied by 4. Summed ratings of "Very important" were multiplied by 5. The two sets of summed, weighted rankings for "Unimportant" and "Somewhat unimportant" were subtracted from the summed, weighted rankings for "Important" and "Very important". This yielded the summed, weighted, ranked priority rank order.

The weighting calculations were performed on two occasions. Once was immediately after the end of the Round 3 of the Delphi, to post the Environmental Health Issue Statements in priority order during the public Open House meetings. During preparation of the *Final Report*, the calculations and formulas in each cell of the spreadsheets were exhaustively rechecked.

Preparation of a report by the analysis team to present the conclusions of the Delphi exercise.

This *Final Report* presents the results and conclusions drawn from the GCPH C.A.R.E.S. Delphi Exercise.

8. Public Open House Meetings

Open House meetings were held to share the Delphi consensus on Environmental Health Issue Priorities and get additional public input on what are the most important environmental health issues for Garfield County residents. The meetings were held on the Monday through Thursday, May 17-20, 2010, following the completion of the Delphi Exercise which produced a consensus on environmental health priorities. A total of 71 individuals, other than Royce Arbour and GCPH staff members, attended the seven meetings.

8.1 Purpose of Open House Meetings

There was general agreement that it would be beneficial to hold open house meetings, providing an opportunity for anyone and everyone to voice their thinking. Perception is reality. It is important for the process of developing a consensus on EH Issue Priorities to be open and adequately representative and for there to be the perception that the process was open and adequately representative. An additional reason for holding Open House meetings was to honor the EPA's C.A.R.E. grant guidance materials promoting insights developed in and from public meetings.

The purpose of soliciting public input at Garfield County's Open House meetings was to get comments on the priorities developed through the Delphi Exercise. The major value of the public meetings held in Garfield County is to determine, based on priorities people expressed and comments they made at the Open House meeting, whether the concerns were the same, or different, across the seven County population centers.

It was hoped that issues of particular concern in one community could be inferred from attendance and comments at the Open House held in that community, providing additional insight on the extent to which priorities varied across the County. Because gas well drilling, as one example, impacts the communities in the western part of the County differently from the communities in the eastern part of the County, it was anticipated that it might be a more significant concern in the western part of the County.

Public meetings may attract people with strong and weak opinions, informed and uninformed opinions, objectively supported and unsupported opinions. People with equally relevant, or irrelevant, opinions do not attend public meetings, and there is no way to characterize those who did not attend. There was no way to identify – let alone control for – the extent to which participants in the Open House meetings were representative of County residents, whereas the Delphi Exercise respondent panel was selected to represent Garfield County residents.

For these reasons, the Delphi consensus information on Environmental Health Issues and Open House commentary on Environmental Health Issues were not merged. The list of priorities emerging from the Delphi Exercise consensus was not adjusted based on commentary at the Open House meetings. To have made changes would have been to increase the likelihood that

the priorities of the Environmental Health issues would be skewed in ways that cannot be identified or defended.

8.2 Open House Meeting Logistics

Open House meetings were held in each of the incorporated municipalities in Garfield County – Carbondale, Glenwood Springs, New Castle, Parachute, Rifle and Silt – and in Battlement Mesa. The meeting locations were picked in consultation with municipal managers in each community as ones where local residents were accustomed to attend public meetings, and that afforded easy access and plentiful parking. A list of Open House locations and times can be viewed in Appendix 11.7.1.

The meetings, except for one, were scheduled to begin in the late afternoon and conclude in the early evening. In Garfield County, residents tend live in one community and commute to another for work. Scheduling Open House meetings on weekdays, when someone working could stop in while in transit from work to home, was intentional, to enhance attendance.

The one exception, the Battlement Mesa Open House, was held in mid-afternoon. Battlement Mesa is a retirement community, and residents participate more readily in events taking place during the day. More people came to the Battlement Mesa Open House than attended the others.

Signage led Open House attendees from the outside door of the buildings to the Open House meeting rooms. Where there were several turns to make, signs and arrows marked the correct pathway to the Open House location. A minimum of three and a maximum of six individuals from GCPH and Royce Arbour staffed each Open House meeting.

8.3 Open House Meetings Structure

Attendees were personally greeted and asked to sign-in and provide contact information, if they were willing. Refreshments were offered. There was no formal presentation, no sit-down-and-listen aspect to the Open House meetings. Attendees were given the opportunity to review work on the priorities among Garfield County Environmental Health issues and asked for their input. Attendees typically spent 20-30 minutes at an Open House.

At each meeting, 44 posters, 18 x 24 inches in size, each presenting one Environmental Health Issue Statement in both English and Spanish, were arranged on the walls in consensus priority order. Attendees were told that the Environmental Health issues were identified by County residents and placed in priority order by a panel of County residents.

Open House attendees were provided with oral directions to use five green Post-it® notes to indicate their personal top priorities, and to use as many yellow Post-it® notes as necessary for additional comments they wished to make. The same directions in written form were posted on a wall near the sign-in table and provided on a handout card.

Attendees were given the handout card, green and yellow Post-it®s, and a pen. They were invited to converse with the individuals staffing a meeting if they wished to do so. The definition of "Environmental Health", using the same wording used on the www.GarfieldCountyCARES.com website, was posted on the wall at each Open House.

The hand-out cards provided the names and contact information for GCPH and Royce Arbour staff professionals working on the C.A.R.E.S. project as well as the project's website and email address. Samples of all Open House signage and guidance materials can be viewed in Appendix 11.7.3. Representative pictures taken at the Open Houses can be viewed at Appendix 11.7.4.2.

8.4 Inviting Open House Participation

Open House meetings were publicized on local radio stations, via on-air interviews, news coverage and public service announcements in English and Spanish. An op-ed column from Jim Rada and letters to the editor ran in the Glenwood Springs *Post-Independent*. Email newsletters and website notices were sent by Garfield County, many of the County municipalities, and various organizations newsletters and websites. Individual email announcements went out to several hundred people, including the 150 individuals asked to participate in the Delphi Exercise. GCPH employees placed posters in more than 80 highly-frequented locations across the County, in both highly populated and more remote areas, and spread word to their contacts. The cooperation of many businesses, governmental agencies, and especially the dedication of Garfield County Public Health employees was invaluable in getting word out. Details on the contents and the extent of notices of the Open Houses can be viewed in Appendix 11.7.2.

8.5 Results and Comments from Open House Meetings

The comments from each Open House meeting were transcribed and the priority and comment Post-its® from each community were counted and recorded. The sign-in sheets from each Open House, the priority and comment transcriptions, and Post-it® counts can be viewed in Appendix 11.7.4.

9. Presentations to the Garfield County Board of Health

The work on the C.A.R.E.S. project was presented to and discussed with the Garfield County Board of Health, who are also the individuals who serve as the Garfield County Board of Commissioners, at its regular monthly meetings on July 20, 2009, and June 21, 2010.