



To: Jason Legler

From: Dr. David Kisker, Ph.D.
Twin Peaks Partners LLC
Johnstown, CO 80534

Mr. Legler:

As requested, we have prepared the attached analysis of the requirements for a cryogenic natural gas processing to be compatible with nearby residential uses.

If you have any further questions or concerns, please contact me.

Regards,

A handwritten signature in black ink that reads "David W. Kisker". The signature is written in a cursive style with a large, looped initial "D".

Dave Kisker

I. Introduction

In this report, we consider the impact and mitigation requirements that should be applied to the Rimrock Energy Partners (REP) natural gas processing facility that is proposed near the Town of Pierce.

II. Background

Based on the community input regarding natural gas processing facilities that are sited around Weld County, there are numerous concerns that need to be considered when a quasi-judicial body is considering the granting of a permit to construct such an operation. Generally, these issues affect the quality of life of the surrounding property owners, potentially making the construction of such a facility incompatible with the surroundings, especially residences, but potentially other businesses as well.

The potential impacts of a gas processing facility, also known as a cryogenic compressor facility, generally fall into three categories: Compatibility, safety, and economic concerns. In the following sections these categories will be reviewed and potential mitigation (where possible) requirements suggested.

III. Compatibility

Definition: In many jurisdictions, compatibility is left undefined, which invariably leads to arbitrary assertions of compatibility. However, a relatively recent Amendment to the Development Regulations in Florida, if widely used, would add substantial clarity. In Florida Statute §163.3164(9) “compatibility” is defined as “***a condition in which land uses or conditions can coexist in relative proximity to each other in a stable fashion over time such that no use or condition is unduly negatively impacted directly or indirectly by another use or condition.***”

While the Town of Pierce does not provide any similar definition, compatibility can be described in terms of the nature and scale of the impacts of nearby industrial operations, or “disamenities” as described by economists, on nearby residents. Factors such as the size, noise, dust, light, emissions, traffic and hours of operation each play a role in the incompatibility of an operation such as the proposed REP facility with neighboring residential and agricultural land uses.

A comparison of compatibility factors associated with the proposed Rimrock facility and surrounding uses would lead any reasonable decision-maker to conclude that the REP facility cannot be considered to be compatible, as summarized in Table 1.

Compatibility Factor	Surrounding Uses	Proposed Rimrock Facility
Size	Typically less than 35 acres	640 acres
Hours	Dawn to dusk (agriculture)	24/7/365
Noise	Residential with occasional agricultural noise	Heavy industrial noise, up to 90dB
Dust	Very intermittent, limited	Substantial from traffic
Lighting	Negligible	Extensive and bright at times
Traffic	Negligible	Multiple site visits each day
Emissions	Negligible	Repeated, moderate frequency, e.g. flares

Table 1. Impact Comparison of Rimrock to Surrounding Areas

In many municipalities, the obvious disparities in compatibility-related impacts have resulted in the development and use of a so-called “compatibility matrix” as part of a comprehensive plan to prevent arbitrary or unfair decision-making by defining in advance which uses are compatible with each other. An example of such a matrix is below.

Land Use Category	REC	RCC	FEC	EI	GC	CEC	O	NC	SRH	SRM	SRL	CR	SRR	A/E	RRC
Regional Employment Center (REC)	○														
Regional Commercial Center (RCC)	⊗	○													
Flexible Employment Center (FEC)	⊗	⊗	○												
Industrial Employment (EI)	⊗	⊗	⊗	○											
General Commercial (GC)	⊗	⊗	⊗	⊗	○										
Community Employment Center (CEC)	⊗	⊗	⊗	⊗	⊗	○									
Office (O)	⊗	⊗	⊗	⊗	⊗	○	○								
Neighborhood Commercial (NC)	⊗	⊗	⊗	⊗	⊗	⊗	○								
Suburban Residential-High (SRH)	⊗	⊗	●	●	⊗	⊗	⊗	○							
Suburban Residential-Moderate (SRM)	⊗	⊗	●	●	⊗	⊗	⊗	⊗	○						
Suburban Residential-Low (SRL)	⊗	⊗	●	●	⊗	⊗	⊗	⊗	⊗	○					
Convenience Retail (CR)	⊗	⊗	●	●	●	●	●	●	●	●	○	⊗	⊗	●	
Semi-Rural Residential (SRR)	●	●	●	●	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	○	⊗	●
Agricultural Estate (A/E)	●	●	●	●	●	●	●	⊗	⊗	⊗	⊗	⊗	⊗	○	●
Regional Recreation Center (RRC)	⊗	⊗	⊗	⊗	⊗	●	●	●	●	●	●	●	●	●	○

LEGEND: ○ - Compatible ⊗ - Compatible with Mitigation Measures ● - Incompatible

Table 2. Land Use Compatibility Matrix. Source: Prince William County, VA

Because the Town of Pierce’s rules and regulations do not include a definition of compatibility or any objective standards, such as a compatibility matrix, it is reasonable to apply the concepts used elsewhere. When those definitions and standards are applied, it’s clear that placing this heavy industrial operation near the surrounding uses would not be considered to be compatible.

Compatibility—Mitigation

Occasionally, it may be desirable to site an incompatible operation near existing uses, despite the incompatibility. Usually, this would occur when siting is constrained by the need to be near a feature such as a river or mineral deposit. In this application, no such requirement exists, and, in fact, there would be many alternative suitable sites for the REP operation. Therefore, the application should be denied as being incompatible, or **extreme measures must be taken to make the operation compatible with the surrounding uses.**

For an approach to addressing compatibility in a substantial fashion, we can turn to Weld County. Because of the large amount of oil and gas activities in Weld County, the county has approved several facilities similar to the proposed REP facility. The recently approved application for an Anadarko facility to be constructed near Gilcrest (Weld County USR18-0019) can be used as a model for what is required to achieve compatibility. In summary, the following essential items are specifically addressed.

1. Noise
2. Lighting
3. Safety
4. Landscaping
5. Hours of operation and maintenance

The county required substantial mitigations in each of these areas, and these should also be included in any approval of the REP facility. Specifically, requirements should include:

Noise

- All plant compressors must be electrically driven.
- All compressors and generators must be enclosed in insulated metal buildings.

- All equipment must be sized appropriately to eliminate excess noise from excessively high gas velocity.
- Erection of a 25' sound wall to assure compliance with residential noise limits of 50dB at night.
- Limit routine maintenance that may require flaring to daytime hours only. Flaring can be a major source of noise.

Specifically, Weld County's requirement is as follows, development standard 25:

25 The facility shall adhere to the maximum permissible noise levels allowed in the Residential Zone, as measured at the property boundaries and as set forth in C R S §25-12-103 Sound from the facility shall not exceed 50 decibels at the property line or add to existing ambient noise outside the sound wall

Additionally, in the past, Weld County has also required continuous noise monitoring until the facility has demonstrated that the applicable noise requirement can be routinely achieved (e.g. USR15-0027). In the current case, noise monitoring equipment should be placed at the nearest neighbors' property lines, with real time access to the public and alerts to the authorities should the 50dB sound limit be exceeded.

For additional information on available sound management technology see the attached document from Southwestern Energy, Appendix A.

Lighting

First and foremost, it is recognized that the light design basis will minimize the required lighting to the extent that the plant can be safely operated during normal or upset conditions. To help define these lighting requirements, Anadarko has designed in two separate categories:

1. **ESSENTIAL Lighting System** – Dusk-to-dawn lighting that provides a lower level of illumination, but meets requirements for personnel safety, plant security, and basic operation of the plant. This will be low elevation lighting along foot paths and common accessed areas.
2. **DEMAND Lighting System** – Plant-operator-switched lighting that provides for increased illumination on an area-by-area basis to provide for nighttime work activities as required. Otherwise, Demand Lighting System will only be energized when needed.

All lighting will be engineering utilizing industry standards and aspects of the “dark sky” outdoor lighting standard to avoid excessive illumination. Light fixtures will be specified and installed to minimize outward light pollution. This will be accomplished with directional LED fixtures, fixtures aimed downward, fixtures equipped with glare shields,

as well as other common and accepted light mitigation fixture installation strategies listed within the design basis.

The final piece of light mitigation Anadarko proposes has been previously mentioned, the 25' sound wall. The defined Essential lighting system will largely include ground level, directional lighting. The wall will provide additional obstruction to prevent any undue light pollution.

Weld County requirements for lighting are covered under Development Standard 40.

- 40 Sources of light shall be shielded so that beams or rays of light will not shine directly onto adjacent properties Sources of light should not cause a nuisance or interfere with the use on the adjacent properties in accordance with the map Neither the direct, nor reflected, light from any light source may create a traffic hazard to operators of motor vehicles on public or private streets No colored lights may be used which may be confused with, or construed as, traffic control devices

Safety

Because of the very large volume of natural gas that is processed at facilities such as the proposed REP plant, safety is always a concern. In 2015, an Anadarko plant near Orla, TX suffered a massive explosion with injuries and fire that burned for several days. Even though these incidents do not occur frequently, they CAN occur, and surrounding emergency response agencies must be prepared to handle such a catastrophic failure. For that reason, it's surprising that none of the nearby emergency response organizations responded to the referral notice. Clearly, as in the case of the Anadarko explosion in Texas, the surrounding fire departments would be completely overwhelmed by such an incident.



Figure 1. Image of fire and explosion at Anadarko, Orla, TX.

Furthermore, although the population density of the area around the site is not especially high, in the event of a similar failure, an evacuation of nearby homes, schools and businesses would be required, due to both the explosive nature of methane and the toxic combustion by products, carbon monoxide and carbon dioxide. (See the Material Safety Data Sheet, Appendix B).

As a guideline, the Pipeline Association for

Public Awareness recommends a site-specific risk analysis to develop a suitable evacuation plan, but absent that, offers guidelines for suitable evacuation distances, depending on the characteristics of the facility. For example, a 24” pipeline operating at 1000 psi would require an evacuation perimeter of about 1/3 mile.

**Recommended Minimum Evacuation Distances For
Natural Gas Pipeline Leaks and Ruptures**
(Not applicable for Butane, Propane, or other Hazardous Liquids)

Pipeline Size (Inches)

	4	6	8	10	12	16	20	22	24	30	36	42
100	91	137	182	228	274	365	456	502	547	684	821	958
200	129	193	258	322	387	516	645	709	774	967	1161	1354
300	158	237	316	395	474	632	790	869	948	1185	1422	1659
400	182	274	365	456	547	730	912	1003	1094	1368	1642	1915
500	204	306	408	510	612	816	1020	1122	1224	1529	1835	2141
600	223	335	447	558	670	894	1117	1229	1340	1675	2011	2346
700	241	362	483	603	724	965	1206	1327	1448	1810	2172	2534
800	258	387	516	645	774	1032	1290	1419	1548	1935	2322	2709
900	274	410	547	684	821	1094	1368	1505	1642	2052	2462	2873
1000	288	433	577	721	865	1154	1442	1586	1730	2163	2596	3028
1100	302	454	605	756	907	1210	1512	1664	1815	2269	2722	3176
1200	316	474	632	790	948	1264	1580	1738	1896	2369	2843	3317
1300	329	493	658	822	986	1315	1644	1809	1973	2466	2959	3453
1400	341	512	682	853	1024	1365	1706	1877	2047	2559	3071	3583
1500	353	530	706	883	1060	1413	1766	1943	2119	2649	3179	3709
1600	365	547	730	912	1094	1459	1824	2006	2189	2736	3283	3830
1700	376	564	752	940	1128	1504	1880	2068	2256	2820	3384	3948
1800	387	580	774	967	1161	1548	1935	2128	2322	2902	3482	4063
1900	398	596	795	994	1193	1590	1988	2186	2385	2981	3578	4174
2000	408	612	816	1020	1224	1631	2039	2243	2447	3059	3671	4283
2100	418	627	836	1045	1254	1672	2090	2299	2508	3134	3761	4388
2200	428	642	856	1069	1283	1711	2139	2353	2567	3208	3850	4492

Table 1 – Evacuation Distance in Feet

Table 3. Recommended Evacuation Distance from Methane Pipeline Source: Page 34, “Pipeline Emergency Response Guidelines”, 2017, Pipeline Association for Public Awareness.

Therefore, a comprehensive evacuation plan as well as a suitable Emergency Response Plan must be a requirement for an application such as the REP facility.

The State of Colorado will also issue permits, primarily based on emissions, through agencies such as the CDPHE. However, an important component of monitoring an operation such as this is notification of the governing jurisdiction of any violations, releases, or other risks that occur on the site. Because of previous history at similar facilities, as well as concerns from the nearby residents, when the Anadarko facility near Gilcrest was approved by Weld County, two important Development Standards were imposed, #28 and 29. **It is recommended that this notification be required immediately.**

- 28 The facility shall notify the County of any revocation and/or suspension of any State-issued permit
- 29 The applicant shall notify the County upon receipt of any compliance advisory or other notice of non-compliance of a State-issued permit, and of the outcome or disposition of any such compliance advisory or other notice of non-compliance

Landscaping

In their application, especially the material on “visual impact” in their presentation from the Planning Commission meeting, it appears that REP plans to do some landscaping on the property. Based on what has occurred in similar locations, we recommend that the submitted landscaping plan be reviewed carefully to make sure that it will be effective with given elevation changes and sight lines. The types of visual simulations that have been provided in the REP application are typically misleading due to depth of field (photographic) issues.

Hours of Operation and Maintenance

One of the primary complaints by residents living near to the Gilcrest DCP operation is that activities that occur at nighttime, especially maintenance activities that involve flaring, generate substantial noise and are especially disruptive. As a result, Weld County imposed Development Standard 3 during the hearing on the Anadarko facility.

- 3 The hours of operation are 24 hours a day, seven (7) days a week. Scheduled maintenance events that include flaring shall occur during daylight hours

In addition, because there are no State-imposed noise limits during construction, it’s recommended that the hours of construction operation be limited to 6 AM to 8 PM, with no work occurring on Sunday.

IV. Safety

Several aspects of the safety of a plant such as that proposed by REP have already been covered, including the need for an effective Emergency Response and Evacuation plan. Inclusion of requirements for the availability of fire suppression materials, such as large quantities of water or even foam, is obvious, but there must also be a plan to notify residents and businesses as appropriate, both currently, and in the future as growth occurs in the area. Although the responsibility would lie with the Emergency Response services, REP must also bear responsibility for communication with the neighbors. This would likely include various electronic means to start with, and extend to a “reverse 911” type of phone system.

For their Gilcrest facility, Anadarko provided the following regarding Communications:

Communications Plan

Anadarko/Kerr McGee has a Stakeholder Relations team dedicated to assisting community members with concerns or questions.

This team is committed to providing the following communication during all phases of permitting, construction and operations. As part of the proposed Communications Plan staff is available for meetings upon request as well.

- Anadarko Colorado Response Line
- Notifications of upcoming activities
- Quarterly Check-in Meetings
- On-line Portal – Expected to be operational by end of Q1.



Proposed Communication Timeline

- Permitting Phase
 - Application Submittal
 - Planning Commission Hearing date
 - Board of County Commissioners Hearing date
- Construction Phase
 - Commencement of Construction
- Commissioning Phase
 - Introduction for when natural gas is introduced to the facility
- Operations Phase
 - *Stakeholder Relations Team/Anadarko Colorado Response Line – 866-248-9577*
 - *Integrated Operations Center (IOC), Platteville, CO – 970-506-5980*
 - Real-time remote monitoring of the facility
 - Staffed 24/7/365
 - Immediately pinpoints issues associated with field alerts and alarms
 - Enhances collaboration with local emergency response agencies

A similar, comprehensive plan should be adopted by REP, given the proximity to both residences and schools.

V. Economic Impact

The economic impact of the REP development can generally be considered in terms of both direct and indirect factors. Direct factors include any tax base that may be increased, jobs that may be generated, and such intangibles as the possibility of other industrial operations being attracted to this area as a result of the construction of the project. Indirect factors include such things as the leases for pipeline accesses that are paid to nearby landowners and potentially other local support for the Town of Pierce.

But, there are also costs, especially if mitigation is not sufficient or thorough.

In the remainder of this section, we will consider the “Real Estate Diminution Study” provided by Michael Smith. It should be noted that Mr. Smith routinely prepares these studies for Tetra Tech, just as he did here. He has previously prepared studies for Martin Marietta and Simon Construction as well as others, and now, Rimrock Energy Partners. **Remarkably, the pair-wise comparisons that he uses ALWAYS conclude that no matter what type of disamenity is nearby, it will not have any impact on property values.**

Of course, this is ludicrous on the face of it, and just doesn't pass the "smell test", given the extensive economics literature that explicitly demonstrates the negative effect on property values of such things as gravel pits, asphalt plants, rail lines, landfills, and even busy roads. But, it's worth looking at exactly why the pair-wise method is fundamentally invalid.

1. **In these studies, the criteria for selection are NEVER provided.** Even in the current study, Mr. Smith acknowledges that he had to look at "hundreds" of properties to find pairs that were suitable. In other words, without evidence to the contrary, Mr. Smith acknowledges that he "cherry-picked" the subject properties using unknown criteria. This issue alone makes the conclusions invalid.
2. **Mr. Smith is inconsistent in how he argues the claims regarding actual values.** For example, on page 23, regarding Pair #4, he minimizes the obvious 8% reduction in property value for the home near the gas plant by saying that "the smaller size of the home at 17723 Claire Lee Street would command a higher price per square foot, all else being equal."

But, then, in considering pairs 5,6 and 7, he ignores the fact that the smaller homes, this time being the ones in proximity to the gas plant, don't show this supposed "higher per square foot value" resulting from their reduced size. Thus, although his analysis shows that the pairs in 5, 6 and 7 are supposedly similar, he's ignoring a key factor, which, if his argument relating to Pair 4 is correct, evidently reflects a negative impact due to the proximity of these homes to the gas plant.

3. **Generally, the problem with paired studies is that because comparison homes are not selected randomly from among potential matching homes, and because of the small sample sizes, the comparison has no statistical validity and likely results in biased conclusions.** Moreover, many factors affecting property values are not accounted for in the analysis, and their omission further biases the results. For example, if Smith selected houses in the neighborhoods near heavy industry that were bought by out-of-state buyers who may not have had information about the nearby heavy industry or may have been under pressure to buy a house quickly and paid a higher price because of that lack of information or pressure, then the comparisons would clearly misrepresent the effect of the heavy industry on house values.

Based on an analysis of the economics literature, and in collaboration with Prof. Diane Hite, of Auburn University, who is an expert on the subject of the impact of disamenities on property values, we make the following additional observations.

4. **The paired sales analysis does not take into account other important factors that affect house values**, such as neighborhood characteristics, public school quality, distance from a central business district, or how much information the buyers had about the nearby industrial uses when they decided to purchase the home. Omitting these other factors biases the results. **Thus, the results that are presented are not credible.** In fact, in pairs 1 and 4, Smith even acknowledges that buyers had concerns about the plant, yet doesn't acknowledge that this would result in a lower valuation!!
5. ***Economists who study the effects of "disamenities" (gravel mines, landfills, etc) on residential property values use more sophisticated statistical models*** that include ALL sales records in the study areas, control for a wide range of factors that can also affect housing values, and address the statistical problems inherent in making simple, selective comparisons like those that Mr. Smith made.
6. ***Economists who have studied the effects of disamenities on residential property values consistently find that they have negative effects.*** That is, when statistical models account for differences in house characteristics as well as differences in neighborhood characteristics, property taxes, public school quality, and information effects, the distance to the disamenity affects the average house sales price significantly, and the effect is negative. That is, all other things equal, the closer a house is to the disamenity, the lower the sale price for the house.

See the Bibliography for the specific references used to draw these additional conclusions.

In summary, use of the pair-wise comparison method is not valid, and any assertion that there is no property value effect must be rejected.

VI. Conclusions

In this report, we have examined a wide variety of factors that indicate incompatibility between the proposed Pierce natural gas processing facility and the surrounding uses. We have also explored potential mitigation strategies to minimize these impacts, using the recently approved Anadarko application in Weld County near Gilcrest (Weld County USR18-0019).

Major additions to the Rimrock proposal should be required, including:

- Implement a 50dB sound limit at the neighboring property lines at all times
- Require continuous noise monitoring at the nearest property lines to assure compliance
- Require substantial sound suppression by using only electrically powered equipment
- Install all compressors and generators in insulated buildings;
- Enclose the entire active site with an engineered sound wall that is at least 25' high;
- Require that a detailed landscape plan be supplied, followed and maintained to mitigate the visual impact.
- Require that an emergency response and evacuation plan be supplied and approved for implementation
- Require approval from the various emergency response organizations, including Eaton, Nunn, Pierce and Windsor-Severance.
- Require a plan for continuous communication with the surrounding neighbors as necessary, as well as various restrictions on the operation, especially during the construction phase.
- Require that Rimrock pay the fees for an **independent consultant** to do a thorough evaluation of the economic costs to the surrounding property owners and propose a method to compensate those property owners.

There may be other desirable requirements that would further assist in mitigation of the incompatibilities of the Rimrock Energy Partners operation, but the above list is the minimum that should be implemented.

About Twin Peaks Partners, LLC

Twin Peaks Partners, LLC is a consulting firm in Johnstown, Colorado that specializes in a wide variety research and analysis. Our core competencies include economics, statistical analysis and land use practices as well as the physical sciences. Together, the Managing Partner, Dr. Ellen Eliason Kisker and Partner Dr. David Kisker have over 65 years of experience in data collection and analysis, scientific literature assessment and project management resulting in an extremely broad applicability of our knowledge.

In addition, when necessary, we call upon experts such as Professor Diane Hite, from Auburn University to assist in analysis and to achieve more detailed conclusions.