Attachment 7

Draft Rulison Sampling and Analysis Plan

Response to Comments

from

Luke J. Danielson
(Preliminary Comments)

Draft Rulison Sampling and Analysis Plan

The following provides Noble Energy Production, Inc., Williams Petroleum RMT, and EnCana Oil & Gas (USA), Inc. ("the Companies) responses to the Colorado Oil and Gas Conservation Commission (COGCC) general comments to the Companies Draft Rulison Sampling and Analysis Plan (SAP). These preliminary comments were prepared and submitted by Luke Danielson and his Expert Group on December 18, 2007. Responses to the comments outlined below will be incorporated into a revised SAP.

I. INTRODUCTION

Comment 1: I.1 We ask clarification of the time period during which this plan is to be finalized.

Response 1: **The Rulison SAP will be "finalized" on or before the end of January 2008. However, recognize that this SAP is a living document and is subject to periodic review and revision in the future.**

Comment 2: I.2 We strongly suggest that the public at large, particularly in the project area, be notified of this plan while still in draft, and be given a reasonable time to make comments.

Response 2: **This comment is outside the technical scope of the Rulison SAP.**

Comment 3: I.3 We ask what further opportunity will exist to work out the structure and details of this plan?

Response 3: **Revisions to the Rulison SAP will be submitted to Mr. Danielson at the same time as it is sent to the local, state, and federal agencies for review and comment. The SAP is a "living" document and is subject to periodic review in the future.**

Comment 4: I.4 What is the objective and focus of the plan?

Response 4: **The monitoring program described in the Rulison SAP is designed to verify that natural gas operations near Project Rulison are conducted in a safe and responsible manner, reflective of the environmental health and safety needs of the Companies employees, contractors, and the public. The monitoring program is developed to specifically screen for the potential migration of Project Rulison-related radionuclides from the test cavity to producing gas wells within a 3-mile radius of the site.**

Comment 5: I.5 What is government committing to as a part of this effort?

Response 5: **This SAP is being developed by outside consultants on behalf of three natural gas industry companies, with review and oversight by governmental agencies.**

Comment 6: I.6 How does this plan link to or feed into government's efforts?

Response 6: This SAP is being developed by outside consultants on behalf of three natural gas industry companies, with review and oversight by governmental agencies. Monitoring data developed under this plan will be reported to these agencies on a periodic basis. Government agencies are free to use the data as appropriate.

Comment 7: I.7 What is the ongoing role of the public and public organizations over the next decades?

Response 7: Monitoring data developed under this plan will be readily available to the public on the COGCC's website.

Comment 8: I.8 Where do we see in the plan any recognition that public involvement is desirable, or any specific mechanism for ongoing interaction with the public?

Response 8: The SAP is a technical document; as such, it provides the technical rationale and approach for collecting usable monitoring data at natural gas wells in the area. Monitoring data developed using the SAP will be readily available to the public on the COGCC's website.

II. PROCESS

Comment 1: II.1 We believe the plan should provide for an independent Monitoring Committee made up of representatives from companies, academia, local government, local organizations and others, which should meet periodically to review progress on the plan, and discuss how to improve its results, in the ISO spirit of "continuous improvement." This Committee should report annually (or more frequently if necessary) to the COGCC and its Director.

Response 1: This comment is outside the technical scope of the Rulison SAP.

Comment 2: II.2 We strongly recommend further work to develop the details of this plan to a level that is not possible in the limited period of time before the holidays.

Response 2: Revisions to the Rulison SAP will be submitted to Mr. Danielson at the same time as it is sent to the local, state, and federal agencies for review and comment.

Comment 3: II.3 The SAP should include monitoring wells located within the obvious hydrogeologic flow paths.

Response 3: The shallow hydrogeologic groundwater flow system is not directly connected to the Williams Fork Formation; the only channel of possible communication between the two would be through a vertical wellbore connecting both systems. As a result, monitoring of produced water and natural gas in the gas well provides the earliest warning of the potential

migration of Rulison-related radionuclides in the Williams Fork Formation. Thus, additional shallow groundwater monitoring wells are not necessary at this time.

Comment 4: II.4 The SAP should include monitoring of both radiological and routine water quality parameters-both inorganic and organic

Response 4: Both radiological and non-radiological analytes will be included in the revised Rulison SAP.

Comment 5: II.5 The Plan needs to provide at least three clearly stated organizational charts. The charts need to show: 1) levels of regulatory authority oversight, 2) data submittal recipients and schedule, and 3) emergency response notifications. The charts should include individual names and titles.

Response 5: The COGCC and CDPHE provide regulatory oversight as stated in the SAP. The revised SAP (Revision 0) issued on January 7, 2008 provides a reporting schedule in Section 4.7, and emergency contacts are listed in Appendix A.

Comment 6: II.6 The draft Plan needs to be reviewed by all stakeholders again after this round of comments.

Response 6: Revisions to the Rulison SAP will be submitted to Mr. Danielson and other stakeholders who have expressed interest at the same time as it is sent to the local, state, and federal agencies for review and comment.

III. SITE HISTORY AND PREVIOUS INVESTIGATIONS

Comment 1: III.1 Baseline / Nature and Extent of present ground water availability and water quality within the Rulison area has not been evaluated in any coordinated fashion. Despite the fact that a minimum of six water wells and numerous gas wells exist within the 3 mile radius of the Rulison test, we still do not have a coordinated, summarized study describing the baseline conditions---both water quantity and quality. Such a coordinated study would define ALL water quality constituents that are routinely regulated (inorganic and organic) plus those radionuclides that might reasonably be expected to migrate from the Rulison test site.

Response 1: The suggested study is outside the technical scope of the Rulison SAP.

Comment 2: III.2 The plan needs to make available all existing geologic information for all existing Tier I and Tier II gas wells that could either be used to verify or more closely estimate assumptions used by DOE in its modeling report. Was this information requested by DOE or offered to DOE during its model development.

Response 2: **The available geologic information for existing gas wells within the Project Rulison area are available in the COGCC's files. The Companies cannot comment on whether these data were requested by or offered to the DOE.**

Comment 3: III.3 The Plan states the monitoring is weighted to reflect a predominance of east west trending geologic structures. Geologic information, including all geologic information from all existing Tier I and Tier II wells needs to be presented to verify this statement.

Response 3: **Monitoring in the revised SAP (Revision 0) is no longer weighted based on the predominant geologic structures. The current monitoring scheme is equally weighted equally over twelve sectors.**

Comment 4: III.4 In Section 3.2, the authors reference data from two wells, BM35-21D and BM35-32A. The identity of these wells should be included on the maps provided.

Response 4: **The identity of all of the existing Tier I gas wells is now shown on the revised Figure 6 (previously Figure 3 in the Draft SAP).**

Comment 5: III.5 Any other wells for which there exist applicable analytical data should also be identified in this document and shown on the map, and the results provided or summarized on a well-by-well basis. It would perhaps be most useful to provide a tabular summary.

Response 5: **All gas wells within a 3-mile radius of Project Rulison are shown on the maps. Tabulating 35+ years of analytical data is outside the scope of the SAP.**

Comment 6: III.6 Since there are existing wells within the 3-mile zone and even within the 1/2-mile zone, it would seem likely that there exists associated geophysical data that would be useful in updating and evaluating the DOE model. We would like to know if any of this information in fact exists and if it has been shared with DOE. If not, this information should be made available.

Response 6: **See response to Comment #2 above.**

Comment 7: III.7 It is unclear if the companies intend to request drilling closer than the ½ mile radius. Their intention should be made clear.

Response 7: **The Companies have voluntarily agreed to a drilling moratorium within a half mile of Project Rulison during 2008. This agreement was submitted in writing to David Neslin, Acting Director of the COGCC on December 4, 2007.**

Comment 8: III.8 A general plan for development should be included that shows how many wells are contemplated throughout time in this area. Will there be 10,

50, 100, 2000? Some kind of understanding of this and some kind of plan for managing the plan during that long-term development should be at least summarized.

Response 8: **This comment is outside the technical scope of the Rulison SAP.**

Comment 9: III.9 It is unacceptable to base such sampling decisions on the use of any computer model. Actual data are needed. Because drilling and construction of gas wells creates vertical pathways for migration of contaminants, baseline data need to be collected for *both deep and shallow lanes.* A study similar to the URS Mamm Creek study needs to be performed for the Rulison area. It is not sufficient to argue that such data exist. It must be coordinated and compiled into a coherent report. Ideally, such a study would NOT be directed by the gas industry.

Response 9: **The Rulison SAP was not developed based on the use of any computer model. The DOE model is cited in the SAP as background; however, the monitoring rationale and approach provided in the SAP is independent of DOE's modeling results. The work performed under the SAP will collect both "deep" formation water as well as shallower groundwater.**

Comment 10: III.10 AdditionaI investigation work *should be completed during drilling of the gas wells* to either verify or more closely estimate assumptions used by DOE in its modeling report. Those assumptions were summarized by Dr. John Huntington in his report dated October 30,2007 together with the following statement "The authors of this study [DOE] appear to us to be aware of the potential concerns, and state the following in their executive summary: *Models are limited by the data used in them, as well as assumptions in their implementation. The results of this study are highly dependent on a combination of uncertain spatial features."*

Response 10: **Geologic, geophysical, and monitoring data developed from natural gas wells drilled within a 3-mile radius of Project Rulison will be provided to the COGCC and are available to the public if requested. All monitoring data developed will be available to the public on the COGCC's website.**

IV. RISK ASSESSMENT

A. Subsurface Characterization

Comment 1: IV.1 Concerns about the limitations and the reliability of the DOE model need to be addressed. Furthermore, the conditions modeled only include the impacts of a single well, not those of multiple wells in the area (except for a few cursory calculations), or the impacts that might occur should there be a well blowout. If there are over 1000 wells in the area addressed by the SAP, the probability of incidents of this nature is considerable and we cannot simply walk by it as if it does not exist.

Response 1: **This comment regarding the DOE model is outside the technical scope of the Rulison SAP.**

Comment 2: IV.2 The SAP needs to distinguish between data and model results.

Response 2: **The rationale and approach presented in the SAP does not rely on the DOE model results. Conclusions of the DOE modeling are included in the SAP as background and their source specifically cited as DOE (2007a). All other results presented in the SAP are actual data derived from previous investigations in the area. The source of these data are also referenced.**

Comment 3: IV.3 The SAP needs to address the question of how to approach the possibility that the DOE model is wrong in one or more respects.

Response 3: **The SAP does not assume that the DOE model is right or wrong. As stated in previous responses, the Rulison SAP was not developed based on the results of the DOE model. The monitoring proposed in the SAP is designed to screen for the presence of Rulison-related radionuclides regardless of how they may be transported to a well.**

Comment 4: IV.4 Consequences of a well blowout need to be addressed.

Response 4: **Management procedures for a well blowout are provided in Appendix A Radiological Incident Management Plan of the Rulison SAP.**

Comment 5: IV.5 Since the number of wells will be quite considerable, mutiple well scenarios are much more realistic.

Response 5: **This comment is outside the technical scope of the Rulison SAP. However, the assumption that "the number of wells will be quite considerable" may or may not be valid, as companies' business plans are not public information and are subject to ongoing revision.**

Comment 6: IV.6 The plan must not rely on the DOE model results (or any other mathematical model) as a characterization of the site, although modeling results may be useful in designing a subsurface characterization strategy and model verification and improvement may be one goal of the characterization activities.

Response 6: **See Responses 2 and 3 above.**

Comment 7: IV.7 Both shallow and deep groundwater should be properly characterized at the site. This has never been done in any systematic manner, The SAP proposal to simply monitor existing surface water and shallow wells as has been done in the past is not sufficient to accomplish this for the shallow groundwater. Wells must be placed in such a manner to provide a statistically appropriate representation of the shallow groundwater.

Response 7: **This SAP provides a mechanism for the characterization of shallow and deep groundwater quality. The shallow groundwater will continue to be monitored so that the existing conditions are known in the unlikely event that a radiological release occurs to the shallow aquifer. In fact, DOE has commented in opposition to the shallow groundwater monitoring, since DOE perceives it to have relatively little benefit; however, the companies have agreed to continue performing it.**

Comment 8: IV.8 There is no proposed plan for location and timing of proposed gas wells that could serve this function for the deeper water. Their really needs to be some kind of overall area development plan.

Response 8: **This comment is outside the technical monitoring scope of the Rulison SAP.**

Comment 9: IV.9 Such a drilling plan should be developed with a primary purpose being that of gathering data to allow the subsurface to be characterized. Thus the timing and placement of wells needs to be considered within an overall plan to accomplish this. This is not presently addressed within the SAP, but presumably would include developing a statistically valid sample set from wells that are sited and timed properly.

Response 9: **Gas wells are not being drilled to characterize the subsurface; however, subsurface natural gas, produced water, and cuttings obtained during drilling and production will be analyzed for selected radiological analytes to determine if gas production induces radionuclides to migrate from the Project Rulison cavity into the adjacent Williams Fork Formation.**

Comment 10: IV.10 No further drilling within the three mile zone, and certainly not within the 1/2-mile zone, should be contemplated until such a baseline characterization has been accomplished outside of this zone for the deep groundwater and throughout the proposed drilling area for shallow zone groundwater.

Response 10: **A number of produced water samples have been collected throughout the Piceance Basin "outside of this zone." In addition, EPA and others have collected shallow groundwater samples for many years within the 3-mile radius.**

Comment 11: IV.11 Parameters in addition to radiological should be included in the analytical plan. Regulated parameters such as uranium and other toxic metals and those organic parameters that are appropriate for monitoring (BTEX and other hydrocarbons, for example) should be included.

Response 11: **Non-radiological parameters will be included in the revised Rulison SAP.**

Comment 12: IV.12 Gross alpha and beta are standard drinking water parameters and need to be included in this SAP.

Response 12: **Gross alpha and beta were included in the draft SAP. For example, see Table 2 and Section 4.1 in the draft SAP.**

Comment 13: IV.13 The DOE model must not be relied upon for emergency response planning or for the design of safety measures. Such aspects of the plan must assume scenarios that would not be predicted with the current version of the model.

Response 13: **The DOE model was not relied on for emergency response planning or for the design of safety measures. The radiological incident management plan (Appendix A) was based on health physics measurements that can be made in the field. The action levels specified in Table A-1 are set at levels that would detect radiation far below any public or worker protection standards.**

B. DOE Model

Comment 14: IV.14 The DOE study is not based on the use of actual monitoring data, despite the fact that considerable scientific funds have been spent on the model development. As a consequence, the DOE modeling results are not calibrated or confirmed by experiment.

Our concerns about the DOE model have to our knowledge not been addressed at all, either by this plan or in any other form. The SAP and some of the responses to other comments about the SAP have cited the DOE report, apparently taken at face value, apparently concluding that it constitutes sufficient and strong "evidence" that the subsurface at Rulison poses no significant hazard. We believe that this is sloppy and dangerous thinking, and we would at a minimum want our concerns about the model to be acknowledged and addressed prior to ever considering a sampling and analysis plan for drilling within the 3-mile radius. Please see John Huntington's letter to CDPHE for details of our thoughts on this matter.

Response 14: **This comment regarding the DOE model is outside the technical scope of the Rulison SAP.**

Comment 15: IV.15 The public has not seen any detailed discussion/evaluation of the DOE Rulison Model report. Obviously such comments should influence the preparation of the SAP. Comments from other relevant agencies [US EPA, US BLM, USGS] seem to be lacking.

Response 15: **Public responses concerning the DOE model report are not relevant in the preparation of this SAP since the results of the DOE model were not relied in the development of the SAP.**

Comment 16: IV.l6 Real, not theoretical, deep monitoring wells and analytical data from samples taken from them would be necessary to evaluate the extent and nature of contamination at Rulison and to therefore calibrate the model with actual

data.

Response 16: **This SAP proposes to collect real monitoring data from deep wells. As these monitoring data will be available to the agencies and the public, DOE is free to use these data to revise or calibrate their model if they so choose.**

Comment 17: IV.l7 The modeling should be used to generate qualitative results and used with experiment to increase understanding of the geohydrologic systems, not taken as a substitute for actual measurements.

Response 17: **The rationale and approach presented in the SAP does not rely on the DOE model results. The SAP proposes to collect actual monitoring data that can be used to understand the chemical and radiological conditions in the Williams Fork Formation.**

Comment 18: IV.l8 The assumption that tritium is the only radionudide of concern. This assumption is made despite the known presence of potentially mobile, longer-lived radionuclides, such as 14C, 36Cl, 99Tc, and 129I (5, 6).

Response 18: **The SAP does not assume that tritium is the only radionuclide of concern. The draft SAP not only included tritium as an analyte, it also included gross alpha/beta, gamma-emitting radionuclides, ^{14}C, ^{36}Cl, and ^{99}Tc. (for example, see Table 2 and Section 4.1).**

The following comments are all made in regard to the DOE model and have a common response:

Comment 19: IV.19 The estimates of initial tritium concentration and total amount.

Comment 20: IV.20 The assumption that groundwater flow is not significant.

Comment 21: IV.21 The specific assumptions about the initial extent of contamination (where contaminants were initially deposited by the explosion).

Comment 22: IV.22 The specific distributions assumed for fracture length, hydrofracture length, effective permeabilities, and anisotropy. There is great uncertainty concerning the presence, orientation and extent offractures, or fracture-controlled permeability. If only a few (or even one) significant permeable fractures are present, contaminants can be transported to distances further than porous-media transport modeling would predict, regardless of the theoretical assumptions used in the modeling.

Comment 23: IV.23 The assumption that the variables that are used for the Monte-Carlo calculations are uncorrefated. If the variables used for the Monte-Carlo statistical treatment (such as fracture length and effective permeability) are in fact correlated, then the statistics will be skewed. The failure to show relationships between specific variables and tritium transport distance would then be open to question, as would the specific meaning of the percentiles

calculated *(B, 9).*

Comment 24: IV.24 Enhanced groundwater flow compared with assumptions.

Comment 25: IV.25 Initial temperature of the nuclear chimney.

Comment 26: IV.26 Presence of multiple wells.

Comment 27: IV.27 Impacts of higher pumping rates in production wells.

Comment 28: IV.28 Impacts of well blowouts.

Comment 29: IV.29 Initial distribution of radionuclides in the subsurface.

Comment 30: IV.30 Impact of "turning off" tritium decay on conclusions (relevant to the case where other volatile radionuclides might be significant)- particularly for long-term calculations> 200 years fromdetonation (10).

Comment 31: IV.31 Impact of uncertainties in the assumed initial tritium concentration and total amount of tritium on model results.

Response 19-31: These comments regarding the DOE model are outside the technical scope of the Rulison SAP.

V. ARARS (APPLICABLE RELEVANT AND APPROPRIATE LAWS REGULATIONS AND CODES)

Comment 1: V.l Are there any Federal, State or local financial assurance requirements, in addition to typical requirements, that may be applicable or relevant and appropriate to the Companies due to the unique potential risks posed by Project Rulison.

Response 1: There are not any additional financial assurance requirements (beyond the normal COGCC requirements) for drilling in the Rulison area.

Comment 2: V.2 What are the proposed surface casing depths and are the casing depths and installation procedures in accordance with applicable regulations

Response 2: COGCC specifies the surface casing depths on each well at a depth that it believes is protective of groundwater. The gas wells are installed in accordance with industry practice and applicable COGCC regulations.

Comment 3: V.3 Are the drill pads subject to storm water runoff regulations and if not should they be due to the unique potential risks posed by Project Rulison

Response 3: The drill pads are subject to stormwater regulations, which are enforced by both COGCC and CDPHE.

Comment 4: V.4 If the site is considered a hazardous waste site do all workers require 40

hour OSHA training and 8hour annual updates

Response 4: **The gas well drilling sites are not considered hazardous waste sites.**

Comment 5: V.5 What are the applicable and relevant and appropriate regulations related to chemical analysis and disposal of drilling fluids, muds, cuttings and produced water and pit closure and is the Plan in accordance with those regulations

Response 5: **Requirements for the management of drilling fluids, muds, cuttings, produced water, and pit closures are provided in the COGCC regulations, if applicable.**

Comment 6: V.6 Is there a regulatory agency that oversees the gas once it enters the pipeline system, are there any associated action level requirements, and are the Tier I and Tier II proposed gas monitoring frequency acceptable to that agency, are there any notification requirements to end users given the source and possible risks associated with the Rulison gas.

Response 6: **This comment is outside the technical scope of the Rulison SAP.**

Comment 7: V.7 The plan needs to present action levels and the basis for the action levels.

Response 7: **Screening and action levels are presented in the revised Rulison SAP (Revision 0) issued on January 7, 2008.**

VI. OPERATIONS PLAN

Comment 1: VI.1 The Plan needs to include a detailed description of drilling procedures including methods to contain and dispose of any and all drilling fluids, muds, cuttings, and produced water and frac fluids that come to the surface, storm water runoff prevention and closure of any pits.

Response 1: **This comment is outside the technical scope of the Rulison SAP, which focuses on the monitoring of the various streams and fluids for potential radiological contamination. The management of drilling fluids, muds, et al, will be in accordance with COGCC regulations.**

Comment 2: Vl.2 The Plan needs to specify the planned surface casing depths and construction details and provide the rationale for those surface casing depths.

Response 2: **See response to V.2.**

VII. SAMPLING AND ANALYSIS PLAN

Comment 1: Vll.l Does preparation of this SAP imply that past industry data should be considered of unacceptable quality? They have been drilling in this area for decades without preparing a comparable plan.

Response 1: **No. Preparation of this SAP does not imply that historical data are of unacceptable quality. Additionally, the statement "they have been drilling in this area for decades" is a difficult statement to reconcile with COGCC's 3-mile radius, which was established in 1998 at that distance because there were no wells closer than 3 miles at that time.**

Comment 2: VI1.2 pg.ll, para.2: states that "The operational monitoring program is designed to ... screen for ... Project Rulison-related radionuclides." Does this indicate that it will neglect to detect evidence of any other forms of O&G-related contamination?

Response 2: **While the Rulison SAP is primarily designed to screen for Project Rulison-related radionuclides, other non-radiological analytes will be included in the revised SAP.**

Comment 3: VI1.3 pg. 11: the 14 proposed monitoring locations represent sites established by previous industry operators or their consultants. Given that past DOE audits have stated that existing monitoring wells were sited without adequately considering ground water flow paths, why should we conclude that the SAP choices are any better? Did the DOE audit team approve the SAP details?

Response 3: **Continued monitoring of the 14 shallow groundwater and surface water locations is being continued so that the existing conditions are known in the unlikely event that a radiological release occurs to the shallow aquifer. Many of these locations are in the basin draining the Project Rulison site and surrounding area. In their comments, DOE actually commented against continuing this shallow groundwater monitoring; the operators have opted to continue it as a goodwill gesture to provide more data for concerned citizens in the area.**

Comment 4: VIIA pg. 15: URS seems to have been highly selective in choosing the details they have presented in the discussion of the past Project Rulison activities. Hence, the pivotal need for some "independent" parties [i.e. the USGS] to be involved here. We recall that there were a minimum of 8 to 10 underground nuclear explosions conducted as part of the Project Plowshare program, not 3. [I understand that only some of the Plowshare tests were intended to promote gas stimulation, but it is misleading to imply that only three such tests were conducted.]

Also, all of the technical Rulison test details described by URS seem to relate back to only one citation, AEC (1973): [AEC. 1973. Project Rulison Manager's Report, Nevada Operations Office, Las Vegas, Nevada, NVO-71, April, 247 pp.],

Response 4: **The historical information regarding Project Rulison is provided as background information for the reader. If the reader desires more**

detailed information, references are provided to the original documents from which the background summary was developed.

There were many Plowshare program tests of various types; however, there were only three Plowshare program tests intended to stimulate natural gas production. Those three tests include Gasbuggy in New Mexico and Rulison and Rio Blanco in Colorado.

Comment 5: VI1.5 pg, 15: "Re-entry drilling occurred seven months after the detonation so that the most radioactive materials decayed prior to re-entry." The statement is a bit disingenuous as the half-lives of a few of the relevant, but neglected, radionuclides are MUCH longer and clearly warrant investigation [from Davis and DeWiest, 1967].

Response 5: **The referenced statement is quoted from the Project Rulison Manager's Report (AEC 1973). As stated, the quote is correct in that the most radioactive materials (i.e., those with the most potential for external exposure) have short half lives (e.g., argon-37 whose specific activity is 1.0E5 Ci/g), thus waiting for these materials to decay prior to re-entry is prudent and enhances worker safety. Radionuclides with "much longer" half lives are generally not very radioactive (i.e., their specific activities are significantly less than those with short half lives) and thus generally do not pose an external exposure threat (e.g., uranium-238 whose specific activity is 3.3E-7 Ci/g). Note that there are roughly 12 orders of magnitude difference (10^5 vs. 10^{-7}; in layman's terms, a factor of a trillion difference) in the specific activites of Ar-37 and U-238.**

Comment 6: VII.6 pg.16; The SAP states that roughly 456 million standard cubic feet of natural gas was flared (burned) and released into the atmosphere as part of the post-Rulison testing. This gas was radioactive! However, the SAP fails to report <u>any</u> analyses of radionuclide concentrations in these gases. Were such environmental samples collected? Why are they not reported here? We know that airborne gross radioactivity sensors were utilized during the actual blast.

Response 6: **The ^{3}H, ^{85}Kr, and ^{14}C activities in gas flared are shown on Figure 4 in the draft SAP. The AEC (1973) reported that no radiation levels greater than background were detected at any of the off-site air monitoring locations during calibration flaring and gas production testing, except for ^{3}H and ^{85}Kr activities which were above background, but significantly below regulated levels.**

Comment 7: VII.7 We question the concept of only including the "closest" well within the Tier I radius for intensive monitoring. It is likely that the subsurface is very heterogeneous and anisotropic, and it is therefore possible for contamination to be encountered at more distant wells prior to its appearance in the closer wells. I believe that all wells within the l/2-mile radius should be included in the intensive monitoring strategy.

Response 7: **Monitoring is not only conducted at the closest well within Tier I sectors. Quarterly monitoring is conducted at all Tier I wells for one year. At present, no gas well have been drilled or are planned within the half mile radius. The monitoring scheme for gas wells within the half mile radius will be developed prior to drilling within that zone.**

Comment 8: VI1.8 We are not sure that the plan to monitor wells over time as a function of the volumetric gas production rate is appropriate. All models show that as time progresses the probability of encountering contamination is greater due to the impact of the well on radionuclide migration. I would favor monitoring at least for screening parameters (tritium, gross apha and beta) at regular intervals until the gas production rate falls below a point where it is likely to produce a significant impact on migration.

Response 8: **The proposed gas well monitoring scheme is reasonable as it is based on the anticipated gas production at a well, which declines rapidly during the first few years of a well's life. Thus, the current scheme provides for more frequent monitoring on a time basis during the early years of gas production when gas volumes are larger. In the out years, monitoring is less frequent on a time basis, but more frequent on a volume basis, because the gas volumes are considerably less.**

Comment 9: VII. 9 Monitoring for gross alpha and beta needs to be a part of the plan.

Response 9: **Gross alpha and beta were included in the draft SAP. For example, see Table 2 and Section 4.1 in the draft SAP.**

Comment 10: VII. 10 We believe that prior to hydrofracture anywhere within the 3-mile zone, a grab sample of the subsurface water at the depth of the well should be obtained. This sample should be analyzed at least for tritium, gross alpha, gross beta, and total gamma emitters prior to hydrofracture.

Response 10: **It is not technically feasible to collect a subsurface water sample prior to fracing. However, for the closest Tier I wells real-time tritium and gamma monitoring will be conducted during drilling. In addition, samples of the drilling fluids and cuttings will be collected and analyzed for selected radionuclides as defined in the SAP. Each of these monitoring methods is conducted prior to fracing and will determine whether Rulison-related radionuclides are present at the time of drilling. Produced water and gas will be sampled as soon as possible after fracing and no later than 30 days after the first gas delivery at a new well.**

Comment 11: Vll.ll The mechanisms by which oversight will be accomplished, and the timing and nature of reports to regulators need to be defined in this SAP.

Response 11: **The COGCC and CDPHE provide regulatory oversight as stated in the SAP. The revised SAP (Revision 0) issued on January 7, 2008 provides a reporting schedule in Section 4.7.**

Comment 12: VII.12 The mechanisms for ongoing public involvement need to be spelled out in the SAP. This plan is designed for application to many wells over many years. The idea that this brief period of discussion in December 2007 is all the public involvement that is needed for the next twenty years is obviously simply wrong. An ongoing Monitoring Advisory Committee is an obvious solution and this needs to be spelled out in the SAP.

Response 12: **This comment is outside the technical scope of the Rulison SAP. However, as noted previously, the SAP is a "living" document that will be updated as needed (with a formal review set for 2009), and all data will be made publically available through the COGCC.**

Comment 13: VI1.13 It may be appropriate given the unique potential risks posed by Project Rulison to install one upgradient and two downgradient monitoring wells, at a minimum, into shallow groundwater adjacent to each drilling pad. These wells should include a baseline analysis and follow-up monitoring for all chemicals used at the drill rig plus radionuclides on the analyte list.

Response 13: **The shallow hydrogeologic groundwater flow system is not directly connected to the Williams Fork Formation. Monitoring of produced water and natural gas in the gas well provides the earliest warning of the potential migration of Rulison-related radionuclides in the Williams Fork Formation. Thus, it is not necessary to install shallow monitoring wells upgradient or downgradient of each well pad.**

Comment 14: VII.14 The Plan states that radionuclide compounds with half lives less than 10 years will not be evaluated further. The Plan needs to state the rationale for this and provide engineering and chemical data to support that approach. When questioned on this by Garfield County URS made the following response: *"The radionuclides with half lives greater than 10 years are included in the analyte list. This includes tritium, Kr-85, CI-36, 1-129, Tc-99, Cs-137, and Sr-90. Radionuclides with half lives less than 10 years, like Sb~125* (2.8 *years) and Ar-37* (35 *days), have decayed sufficiently since the Rulison test and pose* no *threat to human health or the environment."*

Response 14: **The response provided Garfield County clearly indicates that radionuclides with half lives less than 10 years have decayed sufficiently since the test and pose no threat to human health or the environment. That response assumes that the reader understands that radioactive isotopes naturally decay and that the decay rate is quantified by the half life. Using Ar-37, which has a half life of 35 days, and assuming an initial hypothetical inventory of 1,000 Ci, then natural decay since the test would have reduced the Ar-37 activity from 1,000 Curies to zero (0) Curies. Thus, Ar-37 would not pose a health threat and would not need to be monitored.**

Comment 15: URS needs to provide a stronger technical basis to justify minimizing the

analyte list. Only a few radiological species have been inventoried from Rulison data and the rest of the inventory was extrapolated from other test sites. Further, it appears that initial activity used by URS was not measured but estimated by DOE in 2005.

Response 15: **The radionuclides proposed for analysis under the SAP were selected because they represent a subset of the most likely radionuclides that may potentially migrate from the Rulison cavity. The list includes ^{3}H, ^{85}Kr, ^{90}Sr, and ^{137}Cs which were initially the most abundant radionuclides in the cavity and two other radionuclides that tend to form anions (^{36}Cl and ^{99}Tc) and are less likely to be sorbed and thus have the potential to migrate as dissolved phases. The SAP indicates that if any of these radionuclides are found above screening or action levels, the gas well in question will be shut in and further evaluated.**

VIII. HEALTH AND SAFETY PLAN

Comment 1: VIII.1 There needs to be an adequate health and safety plan as part of the SAP. Where is it?

Response 1: **A Safe Work Plan is included in the revised SAP (Revision 0) issued on January 7, 2008.**

IX. EMERGENCY PREPAREDNESS AND EMERGENCY RESPONSE

Comment 1: IX.1 The correct title of this kind of a plan is an emergency response and emergency preparedness plan. There are clear criteria and standards for this kind of a plan, and we should not try to avoid complying with known standards by calling it incident response" instead of emergency preparedness and response.

Response 1: **Regardless of the title of Appendix A, the content of the Radiological Incident Management Plan is equivalent, as appropriate, to an emergency response and preparedness plan.**

Comment 2: IX.2 This is a critical component of the plan and appears to us to be the least well-developed. The document is totally inadequate at this time. Actions to be taken are far too nebulous and provide inadequate guidance should an emergency arise. This document needs to provide specific instructions for notification and corrective actions, provide procedures for training of personnel, and develop an approach to ensure that those who might be called upon to respond in an emergency are ready and equipped to do so. This document needs a great deal of development before it is in a state that we could consider acceptable. In particular, the procedures that will be used in the event of a well blowout must be much more completely defined and described.

Response 2: **The CDPHE Emergency Preparedness and Response Division has stated in a letter dated January 9, 2008 that "… [the Companies] have developed a thorough Incident Management Plan (Appendix A) for the Rulison Project SAP. This revised plan is more complete and consistent with industry and community practices than the previous draft."**

Comment 3: IX.3 Again, industry is only part of the picture. The plan is by definition inadequate if it fails to define the roles of government (state, federal and local) and of private citizens. There is no such thinking as an adequate plan that lacks these elements. The regulatory role is not defined at all and must be.

Response 3: **This comment is outside the technical scope of the Rulison SAP.**

Comment 4: IX.4 An adequate plan must contain all of the elements in the following schematic.

Comment 5: IX.5 Since all of the actors shown in the above schematic need to be involved in an adequate plan, a plan prepared by industry alone cannot possibly be adequate,

Responses 4& 5: **This comment is outside the technical scope of the Rulison SAP.**

Comment 6: IX.6 What is the state government role in emergency response? What plan is there for real, rather than simply paper, preparation?

Response 6: **The COGCC and CDPHE will be notified in the event of a radiological incident. The CDPHE radiation and emergency response staff are trained to respond to radiological incidents.**

Comment 7: IX.7 What is the federal government role in emergency response? What plan is there for real, rather than simply paper, preparation?

Response 7: **The DOE will be notified in the event of a radiological incident. The DOE emergency response staff are trained to respond to radiological incidents.**

Comment 8: IX.8 What is the local government role in emergency response? What plan is there for real, rather than simply paper, preparation?

Response 8: **Local government will be notified in the event of a radiological release.**

Comment 9: IX.9 The APELL system is the proper standard for this kind of plan. The ten steps of the APELL process are:

Response 9: **The Radiological Incident Management Plan was appropriately prepared using guidance from the CDPHE Emergency Preparedness and Response Division.**

Comment 10: IX.10 The Incident Response Plan is not clear as to under what conditions notification will be required to any agency other than the RSO and Company. Will the RSO be an employee of the Company or a consultant to the Company and if so does this pose potential conflict of interest?

Response 10: The required actions and notification conditions are specified in Section 4.4 of the revised (Revision 0) and Appendix A of the Rulison SAP.

Comment 11: IX.11 The Incident Response Plan does contain a list of emergency phone numbers. The one phone number given is 911. There is no clear description of the capabilities of local emergency response agencies to respond to a radiological release. Simply stating 911 will be dialed is not an acceptable Plan given the unique potential risks posed by Project Rulison.

Response 11: Emergency response numbers, in addition to 911, were provided in Tables A-2 and A-3 of the Rulison SAP.

Comment 12: IX.12 The Plan states that, *"Company emergency response procedures will be implemented* in *the event of a release of drilling fluids* or *cuttings* to *the environment. Typically, the initial operation response focuses on containment of the release as well as protecting the safety of on-site personnel."* The Plan needs to include a more detailed description of the planned procedures. The Plan also needs to provide for additional measures such as additional equipment and/or drilling muds that will be available on-site in the event of an emergency to prevent any delays while reacting to a release.

Response 12: The well pads (including berms and stormwater controls)tta are designed to contain drilling fluid releases.

X. REPORTING REQUIREMENTS

Comment 1: X.1 The SAP must present a detailed discussion of Reporting and Public Disclosure Requirements.

Response 1: The COGCC and CDPHE provide regulatory oversight as stated in the SAP. The revised SAP (Revision 0) issued on January 7, 2008 provides a reporting schedule in Section 4.7.

Comment 2: X.2 It is imperative that all relevant data be made public in a timely fashion.

Response 2: All data collected and reports prepared under this SAP will be available to the public on the COGCC's website.

ATTACHMENT 1 FIELD SAMPLING PLAN

Comment 1: Comments to be provided when plan is better defined.

Response 1: **The SAP specifies the field sampling requirements in Section 5. A separate field sampling plan is not being developed as this is not a RCRA or CERCLA investigation.**

ATTACHMENT 2 QUALITY ASSURANCE PROJECT PLAN

Comment 1: Comments to be provided when plan is better defined.

Response 1: **Quality assurance requirements are specified in Sections 8 and 9 of the SAP. A separate quality assurance project plan is not being developed as this is not a RCRA or CERCLA investigation.**