

**Citizen Comments Received with Responses
on the
Leon Lake Unit No. 2 Sundry Notice for Recompletion**

The following is a summarization of comments, concerns, and questions received from interested citizens and groups during the scoping process. The citizen comment is provided in standard text. A Forest Service response follows *in italics*. The comments have been categorized by subject area for ease of reading. A complete listing of individual letters submitted is available in the project file, located at the district office.

NEPA

1. Sidetracking is considered routine and is common. Why is the Forest Service taking public comment on project already approved under NEPA? Concerned that the Forest Service opening this rework to public comment will make well maintenance more difficult for others.

The surface use part of the proposed sidetrack includes surface disturbance related to releveling the existing drill pad. Since the well has been in "shut in" status since 1981, the Forest Service elected to document potential impacts associated with the surface use in a NEPA document. To ensure that public concerns were identified, the Forest Service conducted public scoping (see Section III of the Decision Memo (DM)). The Forest Service Handbook directs that public scoping be performed for projects considered under categorical exclusions (Forest Service Handbook 1909.15-11).

2. The Sundry Notice does not qualify as a categorical exclusion. [T]he unique circumstances of Leon Lake No. 2 requires greater scrutiny because the proposed action may have significant effects which the agencies have not analyzed.

The surface activities proposed in the Sundry Notice are suitable for documentation in a DM with a categorical exclusion (see Section V of the DM). The agencies have not identified any unique circumstances at the Leon Lake No. 2, and the reviews performed have indicated that there will be no significant effects (see Section specialists reports, project file).

3. The agencies must allow a minimum 30-day comment period on a draft NEPA

The Forest Service has documented the environmental effects using a categorical exclusion and prepared a DM. There is no public comment period associated with a DM (36 CFR 215.4(b)).

4. The 10-day public comment [scoping] period is insufficient.

The scoping period was extended to 52 days (see Section III of the DM).

5. Approving the project as a CE would send the message that the agencies had their minds made up before they decided to blunt criticism by accepting scoping comments as a pro forma exercise. On other occasions, agency representatives stated that they intend to proceed with an environmental analysis under NEPA.

When an operator of record submits plans to work on an existing well, the agency decision is not “whether to allow” the activity, but rather “how the activity” will be done (see Section VIII of the DM). It was the Forest Service intent from the onset to review the proposed project for environmental effects, which has been done. Results of this review are presented in the DM.

6. For the Leon Lake No. 2 well, the agencies need to: 1) disclose that key scientific information about Grand Mesa is incomplete or unavailable, 2) obtain information if the costs are not “exorbitant”, and 3) make the required disclosures if they elect to proceed absent the relevant information.

For the work proposed with the Sundry Notice, the agencies believe that the necessary information is available to assess and disclose effects. Through Conditions of Approval, the operator is required to gather additional data.

7. The agencies must prepare a draft NEPA document before acting.

The Decision Memo is a NEPA document (Federal Register, Vol. 57, No. 162). Decision Memos are not submitted in draft form. See response to comment 3.

8. The agencies cannot rely on a document [the 1981 Environmental assessment] which either does not exist or has not been shared with the public. The public has no idea what surface impacts were anticipated for the original drilling operation, whether actual impacts differed from project impacts, how impacts of the current proposal are expected to differ, or what conditions and stipulations the agency is considering to mitigate surface impacts.

The original drilling of the Leon Lake No.2 well was documented in Categorical Exclusion Review, after the agencies determined that an environmental assessment was not necessary (project file). During the 1981 NEPA review, issues brought forward by the resource specialists included protection of surface and subsurface water, coordination with Delta County for use of Surface Creek road, visual quality, proper timber removal activity, road use, public safety, control of drilling fluids, and reclamation. The original NEPA review documented that no TES species or cultural resources were present at the site. The impacts anticipated from the original NEPA review are consistent with what has been observed. The issues raised in 1981 are consistent with issues raised today.

9. The Sundry Notice cannot be acted on until the FS has conducted such [a NEPA] analysis and allowed public comment.

The Decision Memo and accompanying project file comply with the requirements of NEPA. See also response to comment 3. The agencies received public input through the scoping effort (see Section III of the DM).

10. Whether the no-action alternative of denying the sundry is the best course at the present time.

Based on the individual resource reports (see Section IV of the DM, and project file), in conjunction with the rights granted under a lease, the Forest Service does not have a justifiable reason to deny operations proposed in the Sundry Notice with Conditions of Approval (Attachment A of the DM).

11. Cumulative impacts in context of 600 + wells.

The agencies do not have applications for 600 wells. The number 600 is purely speculative, and is not based on any gas resource data, and therefore it is an unreliable number. The agencies have received applications from GEC for eight exploratory gas wells located in the vicinity of Somerset, Paonia and Cedaredge. Two of the proposed exploration wells are located about 0.75 mile southeast and one mile east of the Leon Lake Unit No. 2 well. Specialist's reports in the project file document the effects of these wells.

12. Leon Lake No.2 should be part of bigger analysis.

As an existing permitted operation, the operator has the right to work on the well. The work proposed is considered routine. Because a portion of the work proposed involves re-disturbance of the previously disturbed surface, the Forest Service elected to refresh the NEPA, and evaluate proposed surface use. As the work proposed is routine, limited in scope and at an existing facility, inclusion of the Leon Lake No. 2 recompletion does not warrant being part of a larger analysis.

13. Inadequacy of FS EIS [GMUG Oil and Gas EIS, 1993] with respect to CBM development.

This issue is considered to be out of the scope of the proposed action (see Section II of the DM).

14. Inadequacy of BLM Uncompahgre RMP with respect to CBM development.

This issue is considered to be out of the scope of this proposed action.

15. Neither agency has adequately studied the potential environmental impacts of CBM development as required by NEPA.

The proposed action is for recompleting an existing well, which includes testing a number of zones for potential gas production. It is not proposed CBM development. Effects of the proposed action are provided in the DM, and the specialist's reports in the project file.

16. Public meetings needed.

The Forest Service and BLM held an Open House on November 7, 2002 (see Section III of the DM).

Process Issues

17. This is an end run around the Delta County Commissioners who denied permits not too far from this well.

The Delta County process is separate from this proposal to work on an existing well on an existing federal oil and gas lease.

18. The majority of the people in Delta County do not want this to happen.

The agencies are aware of the public sentiment regarding natural gas projects in the area. As this activity is proposed for operations on an existing well on a valid federal lease, the agency decisions are not “if” the activity will happen, rather they are “how” the activity may occur (see Section VIII of the DM). The Forest Service has placed Conditions of Approval on the proposed activities for protection of surface resources (see Attachment A of the DM).

19. Forest Service appears to be lacking in qualified personnel to administer contracts so more permitting should not be done.

The Forest Service intends to perform field inspections during the proposed work to monitor activities. The well is currently being administered under an existing permit. The proposed action modifies an existing permit, it is not a new permit.

20. Bonding is not adequate.

The operator has posted a \$25,000 statewide bond. Under the existing regulations, this is all that is required (BLM per 43 CFR 3154). The Forest Service requires a bond with a Road Use Permit commensurate with use. Further the Forest Service is requiring a surface reclamation bond (see Attachment A of the DM, COAs). This bonding is considered adequate for the proposed activity.

21. Renaming the well from Leon Lake No.2 to Leon Lake Unit No.2 is dishonest. Shows that Gunnison Energy means to have full field development. It is not just one well, but the first of many.

The well was renamed to avoid confusion pertaining to location of the well, and to clarify that it occurs within the boundaries of the Leon Lake Gas Unit, which was established in 1981. Full field development is not proposed. See also Response to Comment 11.

22. The proposed action is a back door attempt by the federal lessees to proceed with CBM development absent NEPA compliance by the agencies.

The Forest Service has evaluated the effects of the proposed action in a DM, which complies with the requirements of NEPA.

23. Federal law requires that CBM development proposals be stayed to allow comprehensive analysis of potential impacts and appropriate safeguards.

The agencies have investigated and not found any such provision in law. The review of this proposed action helped define Conditions of Approval for resource protection (see Attachment A of the DM).

24. The agencies have received several proposals for CBM exploration and development in addition to the Leon Lake #2 proposal, and the agencies are obligated to consider this well as part of a major CBM exploration project aimed at proceeding with full field development.

The Forest Service and BLM have received Applications for Permits (APDs) to drill 8 eight exploration gas wells from GEC. These APDs propose to explore for gas resources in the sandstones and coals of the Mesaverde Formation. Inadequate gas occurrence data is currently available to say that full field development or production is feasible, and such has not been proposed.

A separate company has submitted six APDs for conventional gas wells in the Muddy Creek drainage (about 20 miles northeast of the Leon Lake Unit No. 2 well). These wells are proposed in an existing producing gas field. See also response to comment 26.

25. The only thing the agencies and other interested parties can be sure of is that CBM production on Grand Mesa will present issues that require individual study and tailored environmental protections.

Analysis of CBM production is outside the scope of this proposed action. Further, no production is proposed. In terms of the proposed action related to the Leon Lake Unit No. 2 well, the reviews performed for the DM helped develop the Conditions of Approval for resource protection, which are tailored to the proposed action and any effects it might have on other resources.

26. Approval of the instant sundry notice could establish a precedent for routine agency approval of future CBM exploration and development actions.

Some activities proposed under Sundry Notices do not require approvals from the agencies (see 43 CFR, Public Lands, Interior, 3162.3-2, Subsequent well Operations) . The activities proposed under the sundry for the Leon Lake Unit No. 2 require prior approval by the agencies involved. In this case, the Forest Service elected to evaluate and disclose impacts of the proposed surface use in a DM. Any future proposed new natural gas exploration and development proposals would need to be evaluated under NEPA on their own merits. This action does not set precedence for ‘ routine ’ approvals. Because the proposal includes testing all potentially gas-producing strata, it is not considered exclusively CBM.

27. It is common knowledge in Delta County that GEC and other federal leaseholders plan to drill hundreds of CBM wells – so there is no question that the instant action is “directly related to other actions with “cumulatively significant environmental effects”.

See Response to Comment 11. The agencies have not identified significant environmental effects.

28. GEC and other federal lessees have filed proposals to drill numerous “exploratory” wells. [T]he number of pending APDs appears to be somewhere between 20 and 50.

See responses to Comments 11 and 24.

29. [The BLM and FS must] first fulfill their legal responsibility to supplement existing NEPA documentation of oil and gas leasing in the Grand Mesa area by either individual amendments of the FS and BLM RMPs and management EISs.

This issue is outside the scope of this proposed action.

30. Absent an EIS, the agencies cannot fulfill their legal mandate to protect the environment and involve the public. Because of the massive scientific and other uncertainty surrounding CBM development on the Grand Mesa, “no action” must be the agencies’ preferred alternative on the present proposal and any subsequent CBM development proposals submitted, until the agencies have prepared a comprehensive analysis of the impacts of CBM development on federal oil and gas leases in the Grand Mesa region.

The proposal to recomplete the Leon Lake Unit No. 2 well does not constitute a proposal for CBM development on Grand Mesa. The Forest Service has evaluated the effects of the proposed action in a DM that complies with requirements of NEPA. Conditions of Approval for resource protection are tailored to the proposed action and any effects it might have on other resources (DM Attachment A). Subsequent activities, when and if they are proposed, will be evaluated and analyzed under an appropriate NEPA process. See also response to comment 73.

31. An arbitrary number of these exploration wells could be drilled without any further study of potential impacts.

Any proposed new drilling activity must be evaluated with the appropriate level of NEPA (36 CFR 228.107).

Leasing

32. The lease has been inactive for 20 years.

According to BLM (the leasing agency), although Federal oil and gas leases are issued for a fixed period, both the terms of the lease as well as BLM regulations provide for extension as long as the lease is producing, or is capable of producing in paying quantities. Because the BLM determined that the Leon Lake No. 2 was capable of producing in paying quantities, the lease term has been extended as provided for by regulation and lease terms. Thus, the lease is active and has been “held by production” since the original drilling of the Leon Lake No. 2 in 1981.

33. The adequacy of the lease bond addresses potential unanticipated impacts of the proposed operation, such as methane migration to nearby aquifers.

The purpose of the lease bond is for plugging and abandonment of the well.

34. The validity of the underlying lease. Because there has never been any production in paying quantities and the primary term of the lease expired in 1981, it appears that the lease should have terminated by operation of law.

See response to comment 32.

Water Resource Issues

35. The hydrogeology of formations underlying the lease, including any possible connectivity between the Cedaredge municipal watershed and domestic water well aquifers and the target formations.

The surface deposits at the location of the Leon Lake Unit No. 2 consist of a blanket of glacial sediments. This glacial till can easily transmit ground water. These glacial sediments are likely the source of surface springs in the area. A thin layer of the Green River Formation underlies the glacial sediments. The Green River Formation comprises of thinly bedded lacustrine deposits of marlstones, siltstones, and shales. These strata have lower permeabilities, and do not transmit water very effectively. The Wasatch Formation underlies the Green River formation. The Wasatch consists of soft, erodable mudstones and claystones. Mudstones and claystones typically have low permeabilities and do not readily transmit fluids. Few springs are associated with the Wasatch. The Mesaverde Formation underlies the Wasatch. The Mesaverde consists of nearly 2,800 feet of interbedded sandstone, shale and coal layers. The permeabilities of the Mesaverde strata vary dramatically from one another. Experience and evidence in the area indicates that the Mesaverde transmits little water (Wynn and Chesson, 2003). Most commonly, water occurs in isolated lenticular sandstones. There tends to be more water associated with the Mesaverde outcrop on the southern edge of the Grand Mesa. These areas close to the outcrop appear to be recharged through precipitation percolating through overlying unconsolidated materials, and through local fractures at the outcrop.

The Town of Cedaredge water supply comes from springs in unconsolidated materials about 4 miles northeast, and reservoirs about 4 miles north, of the Leon Lake Unit No. 2 well. The water is piped from the springs and reservoirs to the Town. There will be no effects from the proposed gas well recompletion on the Town of Cedaredge water supply.

A review of the Colorado State Engineer's office domestic water well records show the closest domestic water wells are 2 to 4 miles south of the Leon Lake Unit No. 2. The driller's logs for these 4 wells indicate that they are completed in shallow unconsolidated materials. Based on their placement topographically, they appear to be tapping shallow ground water associated with the Surface Creek drainage. This shallow ground water is not hydraulically connected to the strata in the Mesaverde Formation.

The 4 domestic water wells range from 157 to 247 feet deep, starting from surface elevations ranging from 7,800 feet to 8,000 feet. Thus the elevations of the depths of these domestic wells range from about 7,475 feet to 7,845 feet. The highest frac zone at the Leon Lake No. 2 will be 3,322 feet below the land surface, at an elevation of 5,570 feet. There is over 2,000 feet of strata separating the water producing zones these wells tap, and the zone targeted for fracturing. Given the distance between the Leon Lake Unit

No. 2 and these wells, and that the shallow completions for the water wells, it is very unlikely that recompletion operations will affect these wells.

Fracing the Leon Lake Unit No. 2 well will create void spaces horizontally from the well up to 500 feet away from the well bore in strata that are between 3,000 and 4,000 feet below the land surface. The fracing technology has been developed to isolate the zones desired to be fraced, and keep them from communicating with undesired formations. Fracing the formations should have no effect on the groundwater wells or the surface water bodies.

The State Engineer's records were also searched for domestic water wells that may be completed in the Mesaverde formation. The closest wells were found to be 4 to 5 miles to the southwest of the Leon Lake Unit No. 2. The topographic location of these wells was overlain on Dunrud's 1989 (see References) map and showed they plot in areas mapped as having unconsolidated deposits overlying the upper Mesaverde formation. Based on driller's logs, these wells range from 270 to 400 feet deep, and apparently tap water occurring in the unconsolidated deposits and/or in the upper Mesaverde strata. Given the distance between the Leon Lake Unit No. 2 and these wells, and the shallow completions in different geologic strata for the water wells, it is extremely unlikely that recompletion operations will affect these wells.

Information about Underground Sources of Drinking Water (USDWs) was requested from EPA and the COGCC. The information gathered indicated that USDWs are defined by presence of a water-bearing unit with less than 10,000 mg/l total dissolved solids. According to EPA, USDWs in the Piceance Basin are generally much shallower than the gas-bearing formations (Jackson and Dimatteo, pers. communication). Given the available data, this is the case in the Cedaredge area.

The target formations for the Leon Lake Unit No. #2 are deep strata. Available data indicate there is no interconnection between water-bearing zones tapped for domestic or municipal use and the deep strata in the Leon Lake Unit No. 2 well. The available data also indicate no interconnection with surface water sources.

36. The Cedaredge area [is in] possible direct connection via major fault zones from Leon Lake No. 2 to the large number of water wells in the lower MV formation. [What would the influence of this fault be on the hydrology].

Dunrud (1989) maps a fault trace that passes about 1.5 miles east of the Leon Lake Unit No. 2 well. The fault is mapped as being present in the subsurface and is mapped where it is believed to intersect the top of the Rollins Sandstone. The Rollins Sandstone is projected to lie at an elevation of about 4,800 feet in the vicinity of the Leon Lake Unit No. 2 well (about 4,100 feet below the land surface). It appears that the fault may have a morphologic influence on the formation of the Surface Creek drainage. There are no reports of major springs occurring in association with this fault.

The available data suggest that hydraulic interconnections between the Cedaredge area and the Leon Lake #2 are not present. Gas sands encountered in the interval between 3,200 and 3,400 feet indicate the nearby fault is not an open conduit (if the fault were an open conduit in connection with these sands, the gas trapped in the sands would have

migrated up the fault plane and would not be present in the well). See also response to comment 44.

37. Hydraulic fracturing coal formations of the Leon Lake No.2 well could have adverse effects on drinking water aquifers.

Hydraulic fracturing in coalbeds typically extends several hundred feet into the coalbeds, with minor vertical propagation of the fractures (Diamond, 1987). Given the distance between the Leon Lake #2 and the nearest Mesaverde domestic wells (4 and 5 miles away), the hydraulic fracturing does not pose a threat to drinking water aquifers in the area. See response to comment 35.

38. Leon Lake #2 [CBM] well and all additional wells in this project are being completed directly in an actively used aquifer zone.

The Leon Lake Unit No. 2 well recompletion is the only action being proposed. No other wells are being proposed in this proposed action. The review of the State Engineers records indicate that some domestic water wells tap water bearing zones in the upper strata of the Mesaverde formation on the southern outcrop of the formation. The Leon Lake Unit No. 2 recompletion targets deeper zones of the formation, at least 1,600 feet deeper than the domestic wells. The presence of gas sands in the Mesaverde supports the conclusion that the Mesaverde, at depths >3,000 feet is not an aquifer zone or interconnected to aquifer zones near the flanks of Grand Mesa.

39. The lease area overlaps with many private water wells producing from the Mesaverde Formation.

The lease area (COC-13563-A) covers sections 12, 13, 14 and 15, T 12 S, R 94W. The Colorado State Engineer's office records for water wells do not indicate there are water wells in the lands covered by the lease. See also response to comment 36.

40. Possibility of hydrofracing creating communication between water bearing zones.

Hydraulic fracture patterns in coals and adjacent strata were mapped during mining operations. Diamond (1987) concludes "Evidence from direct underground observations and data from many treatment records (including those from boreholes not mined through) suggest that new fractures seldom are created; rather, naturally occurring planes of weakness (cleat, joints, or bed boundaries) are entered by the fracturing fluids and opened to varying degrees. In most cases the penetration of strata overlying a main coal bench has been attributed to fluid invasion of preexisting joints, as evidenced by the general regularity of joint character and orientation throughout a mine."

Furthermore, the fractures in coalbeds were shown to "T" at the interface between shales and coals or sandstone and coalbeds, thus limiting the vertical growth of fractures in coalbeds.

Given the above information, and the depths at which fracture stimulation will occur, it is extremely unlikely that hydraulic fracturing will create any hydraulic communication between shallow water-bearing zones and the fracture stimulated zones. See response to comment 37.

41. Potential drawdown of underground aquifers in the target formations.

See response to comment 35.

42. Effects of proposed work on surface water resources, springs and streams in vicinity.

Surface waters within 1 mile of the Leon Lake #2 were sampled in fall 2002. The nearby springs and creeks have water quality characteristics typical of surface and very shallow groundwater systems (very low Total Dissolved Solids). These water quality data are in the project file. This water quality data supports that the surface water and shallow groundwater system is distinctly separate from the deeper strata of the Mesaverde Formation.

The Operator will be required to use sediment control devices on the drill pad to prevent sedimentation into water sources(See Attachment A, Conditions of Approval)..

43. How will damaged water rights be replaced.

The local water commissioner provided information regarding water rights in the vicinity of the Leon Lake Unit No. 2. Water rights are in place at Dreyfus Reservoir , Cole No. 4 Reservoir (0.5 mile east), and Cole No. 5 reservoir (1 mile southeast). No water rights will be affected by the proposed activity. The reservoirs are shown on a map in the project file. See response to comment 42.

44. Major springs resurge from the Cameo coal zone or Rollins sandstone...in at least two locations where fault zones mapped by the USGS intersect the outcrop, indicating that the faults may be permeable conduits for water transport.

Cordilleran Compliance Services(2002) reports no “major springs” along the Surface Creek Fault or along Milk Creek. Rather, the surface water gains are due to groundwater seeps of very low flow. This type of groundwater seepage is not indicative of large-scale transport of water along a major permeable conduit such as an open fault zone. Rather, the seeps indicate a very shallow groundwater system with local recharge as the source. Vertical seepage occurs through very shallow porous material (unconsolidated gravel, sand, etc.) encounters lower permeability bedrock, then the groundwater flows laterally to a discharge point (seep or spring). See also response to comment 36.

45. The data we have concerning fracturing in the Mesaverde formation, including faults mapped by the USGS, fracture patterns published by the Gas Research institute report, and on site inspection of large sections of the MV section...indicate that the formation is highly fractured on the Grand Mesa over a wide range of scales.

Surface fracture characteristics in sedimentary rocks do not necessarily indicate subsurface effects of fractures on fluid flow. This is well documented throughout the geologic literature. Studies done in the San Juan Basin on the Fruitland, Kirtland, and Mancos Shale Formations all show a fairly dense fracture frequency on surface outcrops. However, the shales exhibit extremely low bulk permeabilities at burial depths of only 200 feet, indicating that the fractures at the outcrop surface are effectively healed at these shallow depths (this healing effect is evident at all depths deeper than 200 feet).

Extrapolation of fracture characteristics at the outcrop surface to subsurface fluid flow effects is not supported by the literature, nor by the evidence at Leon Lake Unit No. 2 (gas-charged sands with no pathways to leak out to the surface).

The Gas Research Institute (Tyler, et al, 1995) report discusses fracturing on a regional basis, and on the scale associated with specific folds and faults in the Piceance Basin. In the GRI report, the scale of fracturing discussed for the southern Grand Mesa was specific to the cleat observed in the coals (GRI report, figure 79). Cleat observed in the coals does not necessarily translate to other fracturing. Fracturing associated with erosion and geomorphic processes is also common in topography like that of the Grand Mesa. Fractures form on the edges of plateaus and mesas as a result of gravity causing “unloading” in the exposed strata.

46. The potentiometric surface generated from USGS coal monitoring wells indicated flow gradients toward the outcrop and parallel to major faults. [D]rill stem test data on the north flank of the Grand Mesa published in the GRI report, and the USGS coal monitoring data both show a potentiometric dome under Grand Mesa. This is consistent with ...surface recharge through a network of fracture permeability down to the lower MV.

The term potentiometric surface applies to the pressure surface as observed under confined aquifer conditions. Data from USGS monitoring holes east of the Leon Lake Unit No. 2 was reviewed (Brooks and Ackerman, 1985). The information provided in the report showed general data about location, depth and formation drilled. Specific information needed to determine what water-bearing zone was being tapped was not provided. Therefore, a reliable “potentiometric surface” map cannot be prepared with the data provided in the report. Further, according to the USGS, these wells were drilled during a one-time study for reconnaissance of water in coal (K.Wynn, personal communication). There is little information available regarding the completion (screened) intervals of these wells, no data on seasonal effects, and the wells are not currently monitored by USGS.

The existence of a pervasive fracture network from ground surface to the lower Mesaverde is speculative, and the available data refute this interpretation. Gas sands encountered by the Leon Lake #2 show that in the area of the well bore, the strata are hydraulically isolated. If a network of interconnected fractures was present, the gas would have migrated out of these sand bodies long ago. See also response to comment 45.

47. The zone of influence of a well in an isotropic medium can extend many times farther from the well bore than in isotropic media.

In ground water science, the term ‘radius of influence’ is used. The radius of influence is determined by the permeability of the porous media and the pressure drawdown induced at the well. In anisotropic media, the radius of influence will extend further in the direction of higher permeability, and will be lower in the direction of lower permeability. The distance in either direction still depends on the permeability and the pressure drawdown, not on the degree of anisotropy of the media. If the permeability in an isotropic media is 10^{-4} cm/s, the radius of influence will be the same in all directions.

If the permeability in an anisotropic media is 10^{-4} cm/s in one direction and 0.25×10^{-4} cm/s in another direction, then the radius of influence of a well will be the same in direction of high permeability when compared to an isotropic media, and 4 times less in the direction of low permeability.

48. Expected quantities of water to be discharged from the well during and subsequent to the reworking operations.

This is a test well, therefore, postulating on the quantities of water that will be produced is speculative, at best. A test well near Somerset produced 150 barrels of water per day (bwpd, a barrel being 42 gallons) initially, then dropped to 30 bwpd during a six month test from a coal zone. The sandstones produced 10 bwp.

49. Quality of produced water, including such aspects as salinity, total dissolved solids, heavy metals, and other criteria identified by agency specialists and public comment.

Given the depths that water may be produced from, along with the low permeability environment from which water may be produced, it is very likely that produced water will have high Total Dissolved Solids (salinity), likely greater than 2,500 mg/l. The concentrations of heavy metals is unknown at this time. However, heavy metal concentrations and salinity are not relevant issues as long as GEC disposes of produced water in a manner that protects the environment and human health. GEC plans to truck the produced water to an approved disposal facility outside of Delta County.

50. [There] is the possibility of methane contamination in our water wells, contaminant transport of fracturing fluids to water wells, salt water contamination of the aquifer from the Mancos shale.

See responses to comments 37, 40, and 45.

51. Contaminant transport in highly anisotropic media undergoes little dispersion and mixing in the direction of low permeability. Therefore, contaminants may be transported with little dilution to distant sites under hydrodynamic flow.

The amount of dispersion and mixing that occur in a highly anisotropic media depends on several factors including 1. scale (longer transport distances increase the dispersion and mixing that occur) and 2. dispersivity, a quantifiable measure of dispersion in a porous media. There is less potential for dispersion and mixing in the direction of higher permeability in a highly anisotropic media.

Coalbeds exhibit anisotropy to some degree due to the cleat structure (higher permeability occurs in the direction of the face cleats, lower permeability occurs in the direction of the butt cleats. It presupposes the existence of regional, interconnected fracture system that interconnects the producing zones with domestic water wells. As noted in responses to other comments, at the Leon Lake Unit No. 2 site, there is no evidence of such a fracture system. Available data indicate the fluids encountered by the Leon Lake Unit #2 well bore are hydraulically isolated from a dynamic flow system.

52. The effective permeability seen by constituents in 2-phase flow (gas and water) is dramatically increased, thereby increasing the mobility of the two phases.

This comment was interpreted to say that when the intrinsic permeability is high, the resulting relative permeabilities of two-phase fluid flows is correspondingly high.

While it is true that when there is higher intrinsic permeability the resulting relative permeabilities are higher, the relative permeability curves also show that there will be conditions where the permeability (mobility) of each phase approaches zero. In other words, at some distance from the well bore, the gas permeability will approach or equal zero, even though some free gas is present in the pore spaces, while near the well bore, the relative permeability of water will be at or near zero because the gas phase will be the dominant phase in the pore spaces.

53. Injection of fracturing fluids into a source of underground drinking water...[u]nrecovered fluids may be transported toward the outcrop or to nearby wells in sufficient concentrations to create health risks to water users.

Transport of frac fluids to drinking water wells requires a continuous flowpath between the Leon Lake No. 2 and the drinking water wells. There is no evidence that such a flowpath exists. Furthermore, most of the frac fluids (60%) will be recovered during the frac job and production testing. See response to comment 35.

54. Under highly anisotropic fracture permeability this methane may be mobilized and migrate toward domestic water wells and outcrops following the hydrostatic gradient.

Methane contamination in domestic wells and methane seepage at the outcrop will not occur without transport pathways from the radius of influence of the Leon Lake No. 2 well bore and the domestic well/outcrop. As previously noted, there is no evidence that such pathways exist around the Leon Lake No. 2 well bore. Available data indicate the area around the Leon Lake No. 2 well bore is hydraulically isolated.

Methane liberated from a coalbed during a short-term test will be adsorbed to coals as the reservoir pressure recovers after the test is complete (typically recovery is rapid, occurring within hours or days after pumping ceases). Small amounts of free gas will be immobile and thus unable to migrate to a well or to the outcrop. If the well is capable of producing economic amounts of natural gas from the Cameo coalbeds, the free methane will migrate to the well bore, and that which doesn't migrate to the well bore will ultimately seep into the formation to a point where the relative permeability of gas approaches zero, and the gas is no longer mobile.

55. Through induced fracturing of the lower MV sandstones, connections may be created to the saline and selenium rich water of the Mancos shale. (The real issue is that the Mancos Shale water will be drawn into the Mesaverde zones, and then transported to domestic wells or surface water.)

The Mancos shale is not known to store or transmit appreciable quantities of water. Water quality issues arise when surface water flow across the Mancos shale, and assimilate chemical constituents through contact.

56. Options and preferred alternatives for disposing produced water.

The operator will be hauling any produced water and water used in the recompletion activities to a certified disposal site outside of Delta County.

57. Anticipated surface impacts with regard to treatment and disposal of produced water.

No surface impacts associated with produced water are anticipated; the water will be hauled off site to a certified disposal site outside of Delta County.

58. Hydrologic data specific to Grand Mesa must be gathered to develop an accurate technical understanding of the hydrogeologic system before an accurate assessment of risk to water resources can be made.

The Forest Service has compiled existing information about the geology and hydrogeology of the Grand Mesa (Reference list in project file). The available data are sufficient to conclude that risks to water resources resulting from the Leon Lake No. 2 activities are negligible.

59. More data on the geology and water resources (quality and quantity, i. e. , baseline studies) is needed before any drilling can be done

BLM, USFS, GEC, and the COGCC all support the collection of data as needed to establish baseline hydrologic conditions at Grand Mesa. If GEC's initial testing proves successful and additional activities are proposed, studies appropriate to proposed actions will be conducted.

60. [The analysis needs to refer to] Any relevant studies or data concerning the hydrogeology of Grand Mesa performed by U. S. E.P.A., United States Geological Survey, or other agencies or professionals.

BLM and USFS geologists have reviewed the available data concerning the hydrogeology of Grand Mesa and the various studies performed by agencies and professionals. A list of references is in the project file.

61. Hydrological tests should be conducted to determine permeability of the faults, lateral or vertical communication with the MV aquifers, time constraints for spring responses to recharge, and so forth.

The proposed Leon Lake No. 2 recompletion does not pose a threat to surface water and groundwater, therefore, these hydrological tests are not warranted

62. The full range of potential impacts-economic, environmental and social-in the event the Cedaredge municipal aquifer or domestic water wells are contaminated by methane, contaminated by hydraulic fracturing substances, and/or impacted by the migration of produced water.

From a hydrogeologic standpoint, the chances of ANY domestic well being impacted by the Leon Lake Unit No. 2 is extremely remote, and therefore a socio-economic evaluation is not warranted. The proposed recompletion will not affect the Cedaredge municipal water supply or domestic water wells. See also response to comment 35, 37, 38 and 39.

63. Potential for underground injection of water to produce earthquakes

Underground injection of water is not proposed.

Geology

64. The geometry of the gas trap, the trapping mechanism, and relationship to nearby fault zone in Leon Lake No. 2 is not known at this time, and therefore no logical inference can be made regarding the existence or absence of fracture permeability.

This comment brings up two separate issues, the interconnection between the fault zone and the gas reservoir, the fracture permeability throughout the entire Grand Mesa, and the reservoir characteristics of the gas sands encountered by the Leon Lake Unit #2 well bore.

The gas sands are thin sands interspersed in low permeability fine-grained rock, indicating a stratigraphic trap is present. The lateral extent of each gas sand is unknown at this time. It can be said conclusively that the presence of these gas sands precludes the existence of a large-scale open fracture network from the ground surface to the depth of these gas sands. It is also highly unlikely that rock units deeper than these gas sands are interconnected to the shallow groundwater system by any mechanism.

65. What is the permeability of the reservoir.

This datum is not available for the site specific. Identification of the reservoir will not occur until well testing has been completed. It is premature to guess at what the reservoir might be and at what it's permeability might be.

Downhole issues

66. Why does GEC want to rework the well.

As the owner and operator of the Leon Lake Unit No. 2 well, GEC wants to recomplate the well in order to obtain data to quantify the gas resource. The data collected will help them determine whether or not it is economically feasible to develop the natural gas. During the recompletion, the company needs to test the gas and the formations by perforating the formations (or fracing), drilling deeper, and re-cementing the casing. See Section I of the DM).

Further, the BLM gave GEC options to either test the well for production capability, or plug the well. GEC chose to test the well. Besides testing for production capability, valuable subsurface information will be obtained pertaining to the subsurface gas resources and water occurrence.

67. The term “rework” is not correct, the term recompletion should be used.

“Recomplate” means to perform work on an existing well to prepare it for production of oil and/or gas from a new zone or a previously completed zone. (modified from the term “complete”, Dictionary of Petroleum Terms). “Rework” is another term commonly used to refer to the work done on an existing well to repair or replace mechanical equipment and/or to improve the production characteristics of the well.

68. The rework should be considered the equivalent of a new well.

The recompletion activities proposed are defined in 43 CFR, Public Lands, Interior, 3162.3-2, Subsequent well operations. These regulations define activities that are allowed under a Sundry Notice. The recompletion is not a new well.

69. Why is this a sundry and not an APD?

Under 43 CFR, Public Lands, Interior, 3162.3-2, Subsequent well operations, the proposed work on an existing well is clearly defined and authorized. Re-drilling and deepening a well from the original wellbore is included in "subsequent operations" addressed in regulation.

70. Will the rework perforate through the previously tested zones.

The original well was drilled to a depth of 4111' with the 7" production casing being set at 3850'. The original well testing was conducted to depth of 3790'. Attempts to log the well below 3790' were unsuccessful and a bridge plug was set to isolate the well below this point. If mechanical problems were not encountered, the well would have been tested to total depth.

The testing in the recompletion is proposed to be conducted from 3150' to 4855'. There will be 640' of repeat testing and 1065' of new wellbore tested. At this opportunity it should be noted that technology has progressed so much in the last 20 years that most of the information gathered during the original completion of this well is not reliable.

71. What zones tested as active before.

During the original completion of the well (August 1981), numerous zones were perforated between 3274' to 3408' depths. These zones produced at 639 thousand cubic feet (mcf) per day. This is considered economic production. In August 1982, additional perforations were added higher in the well bore from 2261' to 2566' . These zones showed less productivity.

72. Is sidetracking an allowable activity under a sundry.

Under 43 CFR, Public Lands, Interior, 3162.3-2, Subsequent well operations, redrilling, which includes sidetracking is clearly defined and authorized. See also response to comment 69.

73. This is not a conventional well -it is "destined" to become a coal bed methane well.

The history of this well indicates that gas may be produced from a sandstone reservoirs in the Mesaverde Formation. The Leon Lake Unit No. 2 is considered a "conventional" well as defined by the 10,000 or so similar Mesaverde wells already permitted, drilled, and being produced in Colorado, Utah, New Mexico, and Wyoming. The Mesaverde formation consists of interbedded sandstones, shales, and coals. If the well was intended to be produced exclusively from a coal seam, it would be classified as solely CBM. However, since the Sundry Notice proposes that all open-hole horizons will be logged, it is considered a conventional well.

74. Hydraulic fracturing should not be authorized until sufficient information is collected to safeguard public health.

Hydraulic Fracturing is currently authorized as a common oil/gas development procedure in all fifty states. Since the 1950's, over one million oil and gas wells have been hydraulically fractured. A recent EPA draft study (EPA, 2002) assessed the potential impacts to Underground Sources of Drinking Water (USDW) from hydraulic fracturing operations associated with oil and gas development. The EPA study found no adverse impacts. This was predominately because most fluids used in hydraulic fracturing operations are produced back immediately.

See also responses to comments 40 and 53.

75. Methane migration resulting from hydraulic fracturing or other procedures will follow fractures, which can extend thousands of feet.

Experience in hydraulic fracturing has shown that void spaces may extend horizontally from the well bore up to 500 feet. See also responses to comments 40 and 53.

76. Full disclosure of all materials and chemical compounds that would be authorized for use in hydraulic fracturing operations.

A listing of the materials used for hydraulic fracturing are in the project file.

77. Discussion of potential impacts from hydraulic fracturing materials and compounds.

The potential impacts from hydraulic fracturing materials and compounds are that marginal, non-productive, and non-economic wells may be made productive and economic. It should be noted that the major ingredients of a frac fluids are sand and water. The MSDS sheets in the project file identify the risks of compounds and materials used in hydraulic fracturing.

78. Whether any such compounds are classified as carcinogens or hazardous substances by any regulatory agency.

Many trace compounds are used in hydrofracturing. The purpose of these chemicals are to protect the formation from damage that would reduce it's capability to produce hydrocarbons, and to enhance production. When these materials are handled according to direction they pose no threat to the public or the environment. Material Safety Data Sheets are in the project file.

79. Will the proposed work use ethylene glycol monobutyl ether.

EGME is listed as a "Minor Constituent" of the frac fluid and will be used at a level of 1.5 parts per thousand.

80. The rework will create BTEX hazardous waste.

BTEX (Benzene, Toluene, Ethylbenzene, and Xylene) are volatile organic compounds that are typically associated with leaking gasoline underground storage tanks. They are not compounds that are associated with natural gas exploration activities. BTEX compounds

are not introduced to the formations during drilling and fracing, so the rework activities will not create BTEX hazardous waste.

81. Fracing is only used for CBM wells.

Fracing is used to stimulate many oil and gas wells, not just CBM wells. See also response to comment 74.

82. CBM drilling and completion is different that that used for conventional gas wells.

CBM drilling is the same as that for conventional wells. The same rigs are employed, the same casing, the same cement. The completion procedures and production characteristics of a CBM well differ from a “conventional” well.

83. How is frac fluid removed from the hole.

The frac fluid travels from the formation to the surface on its own. The well bore provides a conduit for both the formation fluids and frac fluids to travel. The bottom hole pressure of this well is so much greater than atmospheric pressure that the fluids will easily flow on their own. If a sufficient amount of the liquid does not flow to the surface, it will be mechanically removed. Sand is placed within the induced fractures to ensure that they remain open after the fluids are pumped back out. Once the sand is in place 80% of the gel and chemicals are retrieved from the hole. The remaining 20% remains in solution with the sand.

Truck Traffic

84.Amount of truck traffic, and effects on road use and road conditions.

The estimated number of loads with heavy trucks, light trucks, and support equipment will be 130 to 180 loads for the drilling and completion activities. During times of heavy truck activity, a pilot car will be used to make moving the equipment in easier. The operator will be required to obtain a Forest Service Road Use Permit, and post a bond commensurate with use (see Attachment A, Conditions of Approval in the DM). The operator will be responsible to repair any damage that occurs from their use of forest roads. Mobilization and demobilization of equipment to the site is expected to take 2 days. Daily traffic is expected to range 3 to 54 light and heavy loads, with an average of 18 loads per day for 21 days.

85. What is the road system associated with development.

This is a proposal for recompleting a single existing well, not a development proposal. The traffic associated with recompletion would use existing roads. See Section II of the DM.

86. What is the amount of traffic on the Scenic Byway.

The proposed route of travel is north on Highway 65, then east on U50 drive, then northeast on 2500 Road to the Forest Boundary. Truck traffic would travel on the scenic byway for about 3.5 miles. See response to comment 84 for the amount of traffic.

87. What are the impacts to FR 127.

The proposed road access uses FR 125. No project related traffic would use FR 127.

88. What truck traffic will be associated with water disposal.

It is anticipated that during well testing that 2 loads per day over a 5 day period would be associated with water disposal.

Flaring Issues

89. Rates and quantity of methane venting into the air.

It is not possible to predict conclusively the type or quantity of gas that will emit during testing. Gas composition and quantities will be measured during the well testing. During the flaring process samples can be collected to analyze the BTU and other characteristics of the natural gas.

90. Degree and impact of flaring.

Flaring is a controlled combustion, or burning of the methane in the natural gas, in order to keep it from exploding from an unwanted ignition source. Flaring occurs during the well testing process. This is a way of controlling the gas flowing from the well and reducing the combustibility of the hydrocarbons in the gas (CH₄). Gunnison Energy Corporation will use a closed flaring system developed by Williams of Vernal, Utah to minimize the flaring.

91. Fire hazard and mitigation measures.

Because GEC proposes to use a closed flaring system, the risk of fire is considered low. Condition of Approval No. 5 (Attachment A of the DM) requires a Fire Prevention and Suppression Plan be prepared.

92. Fire danger associated with proposed action, specifically flaring activity.

See responses to comments 90 and 91.

Resource Issues

93. Effects on wildlife habitat.

According to the Wildlife Biology specialist report in the project file, there will be no effects to wildlife habitat.

94. What are the effects of the proposed activities on wildlife migration patterns.

According to the Wildlife Biology specialist report in the project file, there will be no effects to wildlife migration patterns.

95. Effects on recreation, including hunting.

The duration of this project will be about 4 weeks. If the work occurs during the winter months, Forest Development Road (FDR) 125 will require snow plowing up to the Leon

Lake No. 2 well pad. This will move the snowmobile trailhead about 2 miles up from the current location of the trailhead. After the work is completed, the trailhead would be moved back to its original location. The site will be reclaimed back to a smaller pad size and will be closed off for security and safety purposes to recreational uses including camping (see Condition of Approval 5, Attachment A of the DM). The Conditions of Approval also call for arranging the drilling schedule do not to interfere with big game hunting seasons.

96. Impacts to visual quality.

The proposal is to recomplete an existing well. There will be no additional impacts to visual quality.

97. Impacts to pristine nature of Grand Mesa.

The Recreation Opportunity Spectrum (ROS) designation for the vicinity of the Leon Lake Unit No. 2 well is Roded Natural. Under the ROS, areas with pristine conditions are classified as 'primitive'. As this is an existing site, there will be no effect to the existing 'roded natural' conditions.

98. Proposed activity compatibility with lifestyle and quality of life.

The proposed activity will occur at an existing site over a 4 week period. There will be some effects to road users based on truck traffic, however there will be no lasting effects to local lifestyle and quality of life.

99. How much noise is expected with the proposed rework, and how will this affect people and wildlife (trucks, drilling, and compressors).

Noise will be generated during the redrilling and recompletion activities. Workers on the drill site will follow OSHA regulations for hearing protection. The Wildlife Biology specialist report in the project file indicates that noise associated with the project may cause wildlife to avoid the area, and may interfere with vocalizations of some species.

100. Socioeconomic effects, including effects on tourism and property values.

The short duration and limited geographic area of the activity will have negligible effects of tourism and will not affect property values.

101. The most prudent way to get scientific information or to see if gas can be economically produced is to redrill and test the well.

The proposed recompletion will provide valuable subsurface data.

102. Oil and gas operators' days of "experimentation" without "accountability" are over. Work can be done without destroying the environment.

The operator will have to perform activities under oversight from the COGCC, BLM and the Forest Service. Activities will have to be performed according to Conditions of Approval required by the agencies. The agencies will have appropriate staff on site during the recompletion activities.

103. Air quality impacts relying on analysis performed in recent draft and final NEPA documents such as those addressing CBM development for the Farmington Resource Area (NM), Southern Ute Reservations (CO) and the Powder River Basin (WY and MT).

The Leon Lake Unit No. 2 is considered a conventional well (see response to Comment 73). There will be negligible impacts to air quality from this proposed activity. There will be tailpipe emissions from the truck traffic, and emissions from the drill rig while it is operating. Gas produced will be flared with negligible impacts to air quality.

104. Disclosure of actual expenditures for reclamation of similar CBM wells in other basins.

The Leon Lake Unit No. 2 is considered a conventional well (see response to Comment 73). The Forest Service is requiring a reclamation bond of \$4,500, derived from actual costs for reclamation of the surface lands.

105. Whether reclamation should be part of the surface use plan. According to the Gold Book (at 38): “A reclamation plan will be a part of the surface use plan of operations. Reclamation may be required of any surface previously disturbed that is not necessary for continued well operations.” Given the twenty-year period of inactivity on this lease, reclamation needs to be addressed.

The proposed action includes reclaiming the pad down to “production size”. See Section II of the DM. Further Forest Service regulations at 36 CFR 228.108 require reclamation. Condition of Approval Nos. 22-26 (Attachment A of the DM) gives guidance for reclamation.

106. What is the expected loss of topsoil and damage to soil.

The activity will occur on a previously disturbed site. Activity related to pad leveling will be required to keep topsoil separate for reclamation purposes. Sediment control devices will be used on the pad to prevent soil loss. See Conditions of Approval in Attachment A of the DM.

Other Issues

107. Effects of infrastructure, new roads, pipelines, etc.

No new roads or pipelines are proposed.

108. Whether there currently exist pipeline facilities to transport any marketable methane produced from the well.

No pipeline exists.

109. Whether any pipeline facilities have been proposed.

No pipeline is proposed.

110. Surface impacts associated with the drilling operation as well as future pipeline routing and construction, i.e:

- Traffic.
- Direct surface disturbances.
- Potential impacts to wetlands.
- Erosion.
- Wildlife impacts and the necessity for timing limitations. Impacts to wildlife, including Management Indicator Species (MIS), listed or candidate Threatened and/or Endangered Species, and migratory waterfowl and amphibians which could suffer injury or mortality from surface reserve pits.

The reviews performed for the proposed action considered impacts related to surface disturbance, traffic, wetlands, erosion, and wildlife (specialists reports, project file, Section IV of the DM).

111. Socio-economic impacts of CBM development in Delta County. Many residents and experts fear that property values and the economy will be negatively impacted- especially if development is allowed to proceed in advance of comprehensive study and adequate safeguards. La Plata County recently released a comprehensive study, entitled Oil and Gas Impact Reports, which establishes that CBM development decreases real estate values. The study is available at <http://co.laplata.co.us/publications.html>.

This issue beyond the scope of the proposed action of a single well recompletion that does not include CBM development.

112. The proposed action may have “significant adverse effects on public health or safety”.

Review of the proposed action does not indicate such a threat exists. See Specialist reports in the project file.

113. Gunnison energy plans full field development of at least 600 wells.

See Response to comment 11.

114. The gas supply in the field of 600 wells has 16 days supply.

See responses to comments 11 and 113.

115. This is a major change of use.

The proposed action is to rework an existing natural gas well. There is no proposed change of use.

116. The Leon Lake No. 2 is only a mile from the Spaulding Peak well.

The Spaulding Peak well was proposed on private lands. Delta County did not approve drilling this well.

117. What is the risk to Leon Lake.

Leon Lake is located about 5 miles to the northeast of the Leon Lake Unit No. 2 well. There will be no effects to Leon Lake resulting from the proposed action.

Administration

118. Who monitors the operation.

The Forest Service will inspect the road use and ensure that the surface use of the drill site is being done in conformance with Conditions of Approval. The BLM will monitor the drilling and completion activities. The COGCC, jointly with the BLM, monitors completion operations.

119. Who inspects the tubing/cementing.

The BLM may inspect/witness the placement of the casing and the subsequent cementing. The tubing conveys the gas to the surface and is an internal component of the wellbore. Besides visually witnessing the cementing process, run tickets are generated to show the quality, quantity, and pressures employed during the cement job. The trucks and materials used to cement wells are high-tech, sophisticated, and reliable.

120. Delta County requests to have the Local Government Designee Onsite during the drilling operations.

This request is not within the jurisdiction of the federal agencies to grant. This is a request that needs to be brought before the Colorado State Oil and Gas Conservation Commission.