



Department of Environmental Quality



To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Dave Freudenthal, Governor

John Corra, Director

February 18, 2010

Mr. Jon Winters
Energy Metals Corporation
139 West Second Street, Suite 1C
Casper, WY 82601

**RE: Moore Ranch Uranium In Situ Recovery Mining Permit Application,
TFN 4 2/304**

Dear Mr. Winters:

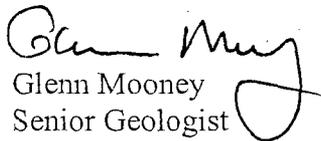
Enclosed is a consolidated review memo containing comments from the Land Quality Division staff's review of the above application. As noted in the memo, these reviews found the application remains **Technically Incomplete** as per W. S. § 35-11-406(h).

Before Energy Metals embarks on responding to these comments, we feel it would be helpful to have a meeting among Energy Metals, Energy Metals consultants, District III and Cheyenne LQD staff members to discuss the outstanding issue with the application. We are willing to travel to Casper for this meeting. Please contact me regarding meeting dates and times.

If you have any questions concerning any comment in this memo, please feel free to contact me or the author of the comment in question.

A digital copy of this memo will be emailed to you to aid in your reply.

Sincerely,


Glenn Mooney
Senior Geologist

\gm

Enclosure

Cc: Cheyenne File w/enc.
NRC-MD w/enc.

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AKMS ASR
2/18/10

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AIR, LAND AND WATER DIVISIONS
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MEMORANDUM

TO: File, Energy Metals' Moore Ranch Uranium In Situ Recovery Mining Permit, TFN 4 2/304

FROM: Glenn Mooney, Permit Coordinator

DATE: February 18, 2010 *GM*

SUBJECT: Third Consolidated Technical Reviews

Introduction

On November 1, 2007, we received an application for an uranium in situ recovery from Energy Metals Corporation, US. The Moore Ranch area is located on Highway 387 about two miles southwest of Pine Tree Junction and about 16 miles southwest of Wright in Campbell County.

Initial comments were sent January 2, 2008 under cover of my letter of the same date. A response package was received March 18, 2008. Additional materials were received on March 25, 2008, and July 30, 2008. The most recent response package was received November 23, 2009, under cover of Jon Winter's letter of the same date.

Review of this application was carried out by Larry Barbula, Glenn Mooney, Stacy Page, Dave Schellinger, Jon Sweet and Mark Taylor. Matt Kunze of the Cheyenne Land Quality Office also contributed some comments on hydrology. Their initials follow each of their comments.

Comment numbering follows the numbering sequence used in the January 2, 2008, memo. New comments resulting from this last review follow a different numbering format with the reviewer's last initial preceding the comment number. Comments not requiring responses have been omitted.

The application was declared **Complete** as defined by W.S. § 35-11-406(g) in my letter of July 10, 2008.

Completeness Review Comments

As noted above, the application was declared complete on July 10, 2008. Comments No. 7 through No. 25 were originally made as completeness comments, but now are considered technical review comments.

General Comments

1. Table of Contents

The response is satisfactory. (LB)

7. Appendix E

A revised Map E-1, Site Features, was supplied which shows the locations of pipelines, powerlines, roads, highways and an abandoned ranchhouse. The map, however, still does not show all adjacent lands (within one-half mile). This is a statutory requirement. Please resubmit showing the entire proposed permit area and lands extending at least one-half mile outside the proposed permit area. (GM)

15. Section D6.2, Surface Water, Page D6-6

EM has provided a map showing reservoirs in the project area. The response is satisfactory. (LB)

16A. Section D6.2, Surface Water, Water Rights

EM has provided an adequate mapping and listing of surface water rights. The response is satisfactory. (LB)

17. Section D6.2, Surface Water

- a) The LQD is not asking for flow gaging at the water quality sampling sites. Most water quality field sampling sheets have a line to record estimated flow at the time of sampling. In the case of reservoirs, an estimated stage can be used to give some indication of the relative amount of water in the pond at the time of sampling. Both of these estimates can provide some indication of conditions which may give some indication why analysis results show higher or lower concentrations.

The newly added footnotes on the water quality data tables show 6 of the 12 sites are at ponds. When the sample is obtained the relative stage of the pond should be noted and this note added to the table. Examples could be "dry", 6" deep puddle in bottom, ½ full with 2 gpm inflow, ½ full with no inflow, nearly full with inflow, nearly full with estimated 1 cfs inflow, full and spilling 1 cfs, or full and spilling too much to estimate.

Likewise for streams a description of flow conditions at time of sampling could read "dry", pooled but no flow, < 1 gpm but flowing, estimated 1 cfs, or "bank full".

Submitted sampling results are adequate.

- (1) During mining, sampling must have some description of flow when samples are taken. Please add a commitment to the Operations Plan, Surface Water Monitoring, on page 3-139 which includes a flow estimate or in the case of ponds a stage estimate at the time of sampling.
- (2) Subsection D-6.2.3 was added in response to Comment No. 17(a). This section adds confusion to the permit by categorizing all drainages as ephemeral. Section D-6.2 has a long paragraph in which Nine Mile Creek, Simmons Draw, an internal unnamed drainage, and Pine Tree Draw are categorized as intermittent. This paragraph goes on to state that the eastern branch of Pine Tree Draw has a spring. This reach of Pine Tree Draw could be considered perennial.

Many drainages in this area are likely ephemeral. Given that there were early water rights on both Nine Mile Creek and Pine Tree Draw it appears these may be intermittent. Please revise the permit contents for consistency. Retain the accurate discussion.

- (3) The LQD is interested in a site visit to look at surface water features in and near the project area. No response is required.

(b) Baseline surface water quality data is satisfactory. (LB)

18-22. Appendix D6, Hydrology

Responses to all these comments were satisfactory. (LB)

Appendix D-10, Wetlands

25. Appendix D10, Wetland Survey Conclusions, Section D-10.3:

EM awaits responses from the ACOE for initial wetlands inventory. When this documentation is received it must be added to the permit. If this information is not received prior to permit approval, a condition must be added to the permit to insert this information when it is available. (LB)

Appendix D-5, Geology

35. Appendix D-5, General

The response to this comment was acceptable. (MT)

36. Appendix D-5, Section D-5.2.2, Drill Holes; Table D5-1, Moore Ranch Drill Holes; and Figure D5-13, Moore Ranch Project Drill Hole Map

At Moore Ranch several exploration drill holes were drilled prior to the Wyoming Environmental Quality Act (1973) and the subsequent establishment of the Abandoned Drill Hole Program (circa. 1983). Much of Conoco's exploration drilling was conducted from the mid-1970s through the early-1980s. These holes were likely abandoned by sealing with drill and natural muds defined as drilling muds commonly used to drill plug and core holes. No additional sealing materials were likely added to increase viscosity of these abandonment muds. EMC should provide a permit commitment to relocate, to the extent possible, and reseat from the total depth to the surface with approved abandonment muds or cement slurry prior to commencing any wellfield development. In addition, given LQD's lack of capability to verify downhole abandonment on all but a handful of opportunist drillholes EMC should provide a commitment to excavate via a backhoe or similar machinery some number of the post-1983 drill holes at LQD's choosing in order to demonstrate the presence or absence of sufficient downhole sealing as to prevent communication between aquifers. (MT)

Appendix D-6, Hydrology

38. Appendix D-6, Hydrology, Section D-6.3.2, Site Hydrogeology

- a) It would be appreciated if EMC would provide a permit document map illustrating the "trend" configurations of the deeper 40 Sand, 50 Sand and 58 Sand. (MT)
- b) EMC must provide regional/permit-wide baseline groundwater quality and quantity information for all sand units (including 60 Sand and 80 Sand) {ref: W.S. §35-11-428(a)(ii), Chapter 2, Section 2(a)(i)(H) and Chapter 11, Section 3(b)}. EMC should provide sample sets sufficient to represent nature spatial and temporal variations in water quality and quantity. LQD recommends installing a minimum of one groundwater monitoring well per sand aquifer per square mile across the entire permit area. This information will be used to demonstrate that all of the aquifers outside of the exemption area are restored to their pre-mining baseline water quantity and quality. (MT)

39. Appendix D-6, Section D-6.3.2.3, Potentiometric Surface, Groundwater Flow Direction and Hydraulic Gradient

EMC must provide potentiometric surface maps for the 60 Sand, 68 Sand, 70 Sand, 72 Sand, and 80 Sand across to entire regional/permit area. (MT)

40. Appendix D-6, Section D-6.3.2.4, Aquifer Properties, 2007 Pump Tests

The response to this comment was acceptable. (MT)

41. Appendix D6, Subsection D6.3.3.2, Site Baseline Water Quality

- a. The response to this comment was acceptable. (MT/MK)
- b. **Response is not acceptable.** The intent of this comment was to request that the baseline lab water quality data for the surface water sites be submitted *electronically*, just as the field water quality data were. EMC did not submit the requested data electronically but rather referred to its location in the hard copy of the permit volume. The November 2009 submittal contained digital files for field surface water quality data but not lab surface water quality data. **Please submit the requested data in electronic format.** (MK)
- c. **Response is not acceptable.** The intent of this comment was to request that the groundwater level data be submitted *electronically*. EMC did not submit the requested data electronically but rather referred to its location in the hard copy of the permit volume. Groundwater level monitoring data can be submitted on the Excel file "Uranium_Groundwater_Level_Data.xls", available on the LQD website at http://deq.state.wy.us/lqd/Uranium_Data.htm. **Please submit the requested data (Table D6.3-2) in electronic format.** (MK)
- d. **Response is not acceptable.** The response could not be completely reviewed since the referenced spreadsheet "*Uranium_Well_Details_Updated.xls*" was not found on any of the CDs submitted with the November 2009 responses. (MK)
- e. Response is acceptable. (MK)
- f. Response is acceptable. (MK)

42. Appendix D6, Table D6.2-2

The response to this comment was acceptable. (MT)

Appendix D-8, Vegetation

52. Figure D8-1, Moore Ranch Uranium Project Vegetation Mapping, and Table D8-1, Acreage and Percentage of Total Area for Each of the Mapping Units

The response was acceptable. I have no further issues with the technical adequacy of this application. (DS)

Mine Plan

58. Operations Plan, Section 3.5.13:

The provided Figure 3-2 does not appear to show culvert locations. EM's statement implies that a revised Figure will be provided. Please provide an updated Figure 3-2 which shows culvert locations. (LB)

61. Section 3.5.14, Wellfield construction considerations and topsoil handling, Page 3-39.

The response was acceptable. I have no further issues with the technical adequacy of this application. (DS)

65. Spills

No response was received to my request that Energy Metals develop a Standard Operating Procedure (SOP) for handling of spills. (GM)

66. Water Balance

Energy Metals has applied to permit four Class I deep disposal wells and submitted preliminary plans for two lined surge ponds. With these facilities available, long-term water disposal should not be a major problem.

This is acceptable; no response is necessary.

68. Surge Capacity

Energy Metals has proposed to construct two lined surge ponds with a capacity of 3.42 acre-feet each. Preliminary designs were presented. Detailed final designs signed by a professional engineer are required. Energy Metals must commit to having the designs of these ponds approved by the Land Quality Division prior to commencing their construction. These are considered process water ponds. (GM)

69. Waste Water

Figure 3-8, Central Plant Layout, shows the plant is equipped with several below grade sumps. Page 3-52, Paragraph 5, states that wastewater generated at the plant will be directly pumped to the surge ponds. Please confirm that water and chemical solutions

spilled to the sumps will be pumped to the waste ponds or explain what other methods for handling in plant spills will be handled, considering that pumping all spills directly to the ponds may not be appropriate in some situations (i.e. damage to the pond linings). (GM)

Restoration and Reclamation Plan

73. Section 4.2.6, Revegetation Practices, Page 4-20.

The response was acceptable. I have no further issues with the technical adequacy of this application. (DS)

74. Reclamation Performance Bond

An acceptable bonding instrument must be submitted prior to permit approval. (DH)

New Comments - March 25, 2008, Response Package

75. General Comments - March 25, 2008, Response Package

While completely new mining, restoration and reclamation plans were submitted with the March 25, 2008, response package, the application remains disorganized and while some Land Quality Division comments may well have been answered, they could not be found because of the application's state of disorganization. (GM)

76. Appendix E Map – USGS Map

A revised Map E-1, Site Features, was supplied which shows the locations of pipelines, powerlines, roads, highways and an abandoned ranchhouse. The map, however, still does not show all adjacent lands (within one-half mile). This is a statutory requirement. Please resubmit showing the entire proposed permit area and lands extending at least one-half mile outside the proposed permit area. (GM)

Appendix D-5, Geology and Seismology

- 77-81 Appendix D-5, Geology and Seismology

Responses to these comments were acceptable. (MT)

82. Appendix D-5, Geology and Seismology, Figure D5-2, Cross Section Index Map

Please remove “affected lands” from the legend. (MT)

83-87. Appendix D-5, Geology and Seismology, (MT)

Responses to these comments were acceptable. (MT)

Appendix D-6, Hydrology.

88. Appendix D-6, Hydrology

Please provide brief discussions of the alluvial systems situated along Nine Mile Creek, Simmons Draw and Pine Tree Draw. (MT)

89-92. Appendix D-6, Hydrology,

The responses to this comments were acceptable. (MT)

93. Appendix D-6, Hydrology, Section D-6.1.3, Operational Water Use, pg D6-4

Please consider relocating this discussion in its entirety to a more appropriate portion of the Section 3 Operational Plan; as Appendix D-6 is intended to warehouse only baseline information. (MT)

94. Appendix D-6, Hydrology, Figure D6.1-1, Moore Ranch Project Area Water Resources, pg D6-5

The response to this comment was acceptable. (MT)

95. Appendix D-6, Hydrology, Figure D6.2-1, Moore Ranch Project Regional Water Resources, pg D6-10

The response to this comment was acceptable. (MT)

96. Figure D6.2-4

This is a duplicate of Comment 41a. Please see response to Comment 41a. (MK)

97-107. Appendix D-6, Hydrology

The responses to these comments were acceptable. (MT)

108. Appendix D-6, Hydrology, Section D-6.3.3.2, Groundwater Monitoring Network and Parameters, pg. D6-65

EMC's response states "Additional monitor wells have been installed in the 60 sand in

both wellfields and along the southern edge of the Permit Area. Please identify these wells by name and reference where these wells are shown on a figure and/or listed on a table. (MT)

109. Appendix D-6, Hydrology, Section D-6.3.3.2, Groundwater Monitoring Network and Parameters, pg. D6-65, paragraph 1

The proposed text seems to suggest that the 72 Sand was monitoring by Conoco. However, Table D6.3-8 and Figure D6.3-11 do not identify any 72 Sands wells. Please explain/correct. (MT)

- 110-146 Appendix D-6, Hydrology,

Satisfactory responses have been received to all of these comments. (MT)

147. This is a duplicate of Comment 41b. Please see response to Comment 41b. (MK)

148. This is a duplicate of Comment 41c. Please see response to Comment 41c. (MK)

149. This is a duplicate of Comment 41d. Please see response to Comment 41d. (MK)

150. This is a duplicate of Comment 41e. Please see response to Comment 41e. (MK)

151. This is a duplicate of Comment 41f. Please see response to Comment 41f. (MK)

152. The response to this comment was acceptable. (MT)

153. Appendix D-6, Hydrology, Addendum D6-B, 2007 Pump Tests, Executive Summary, Page 1, paragraph 1

The text states "The Moore Ranch Pumping Test Plan was submitted by Energy Metals Corporation (EMC) to the Wyoming Department of Environmental Quality/Land Quality Division (WDEQ/LQD) in January 2007. In accordance with the Plan, EMC installed the necessary wells and performed to pump test..." However, based upon my review of information presented in the Well Completion Reports, EMC did not install the wells in accordance with the Final Moore Ranch Project Regional Hydrologic Test Plan (January 2007). Specifically:

- c) The Well Construction section on page 8 states "...sealing materials shall consist of neat cement slurry." Type 1 and Type 2 cement slurries contain no additives and are mixed at 15.6 lbs. /gal. The well completion reports indicate that the EMC wells were completed using Type 1 and Type 2 cement with gel additive

and mixed at 13.1 lbs. /gal.

EMC's response provides a detailed cement mixture utilized for well construction and reports the mixture results in a 15.42 lbs. /gal. slurry weight. However, EMC calculations failed to properly compensate for the absolute volume of the dry cement and bentonite; 100.5 gals. and 2.3 gals., respectively. The resultant slurry weight is actual 12.3 lbs./gal. A high water-cement ratio reduces the cements strength and durability. Too much water in the cement slurry will result in settling and segregation of the solids. Also, any water that is not consumed by the hydration reaction will eventually leave the set cement as it hardens, resulting in microscopic pores and holes which reduce the hardened cement's overall strength and permeability. In addition, a cement slurry with too much water will experience more shrinkage as the excess water leaves, resulting in internal cracks and visible fractures which again will reduce the final strength. Accordingly, EMC should commit to using cement slurry similar to the following:

28 sacks Type I/II cement @ 94 lbs./sk. = 2632 lbs. x 0.0382 gals./lbs. = 100.5 gals.
1 sack powdered bentonite @ 50 lbs./sk. = 50 lbs. x 0.0454 gals./lbs. = 2.3 gals.
Water @ 6.40 gals./sk. of cement @ 8.33 lbs./gal. = 1493 lbs. = 179.2 gals.
4175 lbs. 282.0 gals.

Slurry weight = 4175 lbs. ÷ 282.0 gals. = 14.8 lbs./gal.
Slurry yield = 1.35 cu. ft. slurry/sk. of cement

Please revise Figure 3-4 to show utilizing 14.8 lbs./gal. Type I cement w/ 2% bentonite (BWOC). In addition, please provide lab analysis showing the thickening time and compressive strength at 24 hrs., 48 hrs., and 72 hrs. @ 70°F at atmospheric pressure. (MT)

154-178 Appendix D-6, Hydrology

Acceptable responses have been received to all of these comments. (MT)

Appendix D-7, Soils

179-182. General Comment

These comments are generally acceptable. (JS)

182. Soils Mapping, Figure D7-1

The new Figure D7-1 is nearly unreadable. The legend is fuzzy as are mapping unit boundaries. I believe it is a copying error but I cannot determine if that is the only issue.

Please evaluate and provide two clean copies of the revised exhibit. (JS)

Appendix D-8, Vegetation

183. Cover Summary Table, Page D-B-6.

I have no further issues with the technical issues of this application. (DS)

Mine Plan

184-188 Mine Plan,

Acceptable responses have been received to all of these comments. (MT)

189. Mine Plan, Section 3.5.1, Wellfield Design, pg. 3.6, paragraph 2

Please provide some examples of pattern "Modifications as needed". If all wells (including monitoring well during an excursion containment event) can and will be used for injection and recovery then EMC must provide a commitment to conduct MIT testing on all wells. Please describe and illustrate "alternative single line drives". (MT)

190. Section 3.5.2.1, Well Materials of Construction, Page 3-8

Energy Metals has committed to the use of SCR-17-grade casing.

This is acceptable; no response is necessary. (GM)

191. Section 3.5.2.1, Well Materials of Construction, Page 3-8

The drill hole annulus proposed for the 4.5" casing is not adequate to give the minimum 3" of annulus opening required by Land Quality Division NonCoal Rules and Regulations, Chapter 11, Section 6(c)(i).

While the response memo, Page 71, states 8 ¾ bits can be used to give enough annular space, no changes was made to the proposed mine plan text. The response text does point out that the bell housings (joints) swell outwards so that even less annular space is available in those areas.

Please revise the Mine Plan text to give assurances the required 3-inch annular space will be present at all points along the well bores. (GM)

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192. Mine Plan, Section 3.5.2.1, Well Materials of Construction, pg. 3-8

An acceptable response was received to this comment. (MT)

193. Section 3.5.2.2, Well Completion and Construction, Page 3-8

The use of screws to secure glued PVC well casing sections has been removed.

This is acceptable; no response is required. (GM)

194. Mine Plan, Section 3.5.2.2, Well Construction Methods, pg. 3-8

I opine that proper selection of well construction materials along with proper completion and development techniques are crucial aspects of a successful ISL operation. Accordingly, I again respectfully request that EMC provide very detailed well completion procedures (ref: LQD R&R, Ch. 11, Sec. 6(a)(i) and NUREG-1569, Sec. 3.1.2, pg. 3-1) or SOP (some components of which EMC has provided in responses to Questions 156 and 194) as formal permit commitments in the permit document. These procedures at a minimum should specific address the following:

- a) Type of drilling rig and specifications
- b) Drilling mud composition (trade names, additives, loss of circulation material, etc.) and weight
- c) Hole geophysical logging procedure
- d) Casing (include type, manufacture name, manufactures specification, I.D., O.H, wall thickness, burst pressure, collapse pressure)
- e) Cement slurry (composition, mix water quality and slurry weight and yield)
- f) Cements thickening time @ 70-degrees at 4hrs., 48hrs., 72hrs.
- g) Casing cementing hardware (centralizers, float shoe, wiper plug)
- h) Hole conditioning practice prior to cementing in the casing
- i) Cement slurry mix procedures and equipment.
- j) Procedure used to displace cement from casing to annulus.
- k) Time waiting for cement to cure before re-entering casing
- l) Casing/well under-reaming (equipment, tools, procedure)
- m) Screens (include type, manufacture name, manufactures specifications, I.D., O.H, slot opening, burst pressure, collapse pressure)
- n) Gravel packing procedure (sand specifications)
- o) Packer assemblies (include type, manufacture name, manufactures specifications)

(MT)

195. Mine Plan, Figure 3-4, Typical Well Completion

An acceptable response was received to this comment. (MT)

196. Mine Plan, Figure 3-4, Typical Well Completion

Please provide to copies photographs of the typical well assembly and centralizer as a component of the formal well construction/completion SOP. (MT)

197. Mine Plan, Section 3.5.2.2, Well Construction Methods, pg. 3-10, paragraph 1

An acceptable response was received to this comment. (MT)

198. Mine Plan, Section 3.5.4, Wellfield Methods of Operation, pg. 3-11

Please include components of my original comment and EMC responses as formal permit text. (MT)

199-205 Mine Plan,

Acceptable responses have been received all of these comments. (MT)

206. Mine Plan, Section 3.5.4, Wellfield Methods of Operation, pg. 3-20

Please provide the EMC response as formal permit text. (MT)

207-220. Mine Plan

Acceptable responses have been received all of these comments. (MT)

221. Mine Plan, Section 3.5-14

Please revise the mine plan and reclamation plan text so that salvage plans and redistribution plans are provided under one general location. Sections 3.5.14.2 and 4.2.3, respectively, are suggested. Currently the salvage and replacement plans appear to be dispersed under subsections of the application pertaining to specific types of disturbance. This dispersion of commitments will cause confusion in the implementation of the commitments. (JS)

223. Mine Plan, Section 3.5.14, Wellfield Delineation and Construction, pg. 3-39

EMC should consider provide a specific commitment/plan to minimize disturbance along

the draw (center Section 35; 2nd Tributary to Simmons Draw) situated through Wellfield #2. LQD encourages EMC to consider leaving a native topsoil/vegetation panel (approx. 50-feet on either side of the draw's centerline) along this draw. (MT)

224-225. Mine Plan

Acceptable responses have been received to these comments. (MT)

226. Mine Plan, Section 3.5.14, Wellfield Delineation and Construction, pg. 3-41, paragraph 1

EMC should commit to install all buried pipelines below the frost line and not less than five-foot six (5'-6") inches below grade (ref: Campbell County Commissioners Chapter 4, Section P2603.6, rules regulating construction). (MT)

227-231 Mine Plan,

Acceptable responses have been received to all of these comments. (MT)

232. Plant Building, Figures 3-8, 3-9

The new plant building layouts now show the locations of the reverse osmosis units.

This is acceptable; no response is required. (GM)

233. Section 3.5.16.8, Environmental Monitoring Program

I must insist upon the Environmental Monitoring Program be broken out so that it can be easily found, rather than be buried in the midst of NRC-required radiation monitoring activities. Energy Metals has responded that the outline of this section follows that Mandated by NREG-1569. That may be true, but Energy Metals must not forget that this document is an application for a State of Wyoming Mining Permit which must adhere to requirements for State Mining Permits as well as EPA-mandated Underground Injection Control requirements.

Experience has found that this is one of the most frequently referenced parts of the Mine and Operations Plans. At this time, not only does this section not have its own section heading, it is not listed in the Table of Contents.

Sections which must be given subsection headings and listed in the Table of Contents are: Deep Disposal Well Monitoring, Groundwater/Surface Water Monitoring Program, Wellfield Baseline Sampling, Well Sampling Methods, Monitor Well Baseline Water Quality, Wellfield Hydrologic Data Package, Operational Upper Control Limits and

Excursion Monitoring, Excursion Verification and Corrective Action and Surface Water Monitoring. See Comment No. 233 above for details.

Please revise. (GM)

234. Section 3.5.16.8, Environmental Monitoring Program, Page 3-90

I must insist upon the Environmental Monitoring Program be broken out so that it can be easily found, rather than be buried in the midst of NRC-required radiation monitoring activities. Experience has found that this is one of the most frequently referenced parts of the Mine and Operations Plans. At this time, not only does this section not have its own section heading, it is also not listed in the Table of Contents. See Comment No. 233 above for details.

Please revise. (GM)

235. Plant Construction and Operational Areas

A revised map, Figure 3-9, Site Drainage Detail, was supplied that reportedly shows the plant layout along with the laydown area requested. However, the map is at a scale of 1"=750' and depicts only a small portion of the permit area on a 8½" x 11" page, resulting in details that are illegible. Please supply a map or maps depicting the plant and operational areas at a scale of not less than 1"=400 feet, sufficient to depict all pertinent items clearly. This map must show proposed roads and topsoil stockpiles. (GM)

236. Driller's Yard and Ancillary Areas

A revised map, Figure 3-9, Site Drainage Detail, was supplied that reportedly shows the plant layout along with the laydown area requested. However, the map is at a scale of 1"=750' and depicts only a small portion of the permit area on a 8½" x 11" page resulting in details that are illegible. Please supply maps depicting the plant and operational areas at a scale of not less than 1"=400 feet, sufficient to depict all pertinent items clearly. This map must show proposed roads and topsoil stockpiles. (GM)

237-238. Mine Plan

Acceptable responses have been received to these comments. (MT)

Reclamation Plan

239-243. Reclamation Plan

Acceptable responses have been received to all of these comments. (MT)

244. Section 4.1.8, Well Plugging and Abandonment

As requested the text has been revised to state that well abandonment is governed by Land Quality Division NonCoal Rules and Regulations, Chapter 11, Section 8.

This is acceptable; no response is required. (GM)

245-246. Reclamation Plan

Acceptable responses have been received to these comments. (MT)

247. Section 4.2.4, Erosion Control Practices

A cross reference to Section 4.2.4 has been added to Mine Plan Section 3.5.14.1, Well Field Delineation and Construction.

This is acceptable; no response is required. (GM)

248. Topsoil Replacement

In response to this comment, a sentence was added to Section 4.2.6, Revegetation Practices, that states that the areas to be topsoiled will be treated first with a harrow, chisel plow, or conventional disk.

This section should further modified to state that areas which have undergone considerable compaction such as roads, parking areas and storage yards will be ripped by a dozer equipped with rippers to depths of at least two feet. (GM)

249. Section 4.2.6, Revegetation Practices, Page 4-20

The response is satisfactory. Sideoats grama has been replaced with with blue grama. The ecology of small seeded species is that many more seeds than a large seeded species must be seeded to produce one plant. The relationship between number of seeds planted per square foot and establishment of those seeded species is unknown. If the blue grama is not successful at 1 lbs/acre PLS adjustments can be made to the seed mix. (SP)

250. Section 3.5-19, Reporting Procedures, Page 3-102

The reporting of quarterly Mechanical Integrity Test Results was added to the required reports list as requested.

This is acceptable; no response is required. (GM)

New Comments – February 2010 Review

Appendix D-5, Geology

T-1. Section D-5.1, Regional Geology:

Please provide maps which illustrate general subsurface (i.e., bedrock) and surficial geology of lands within and an adjacent to the proposed Moore Ranch permit area. I suggest a colorized map showing the Pumpkin Buttes Mining District (area 20-miles x 20-miles) with the Moore Ranch permit area as the center of the map. I suggest using available 1:100,000 USGS geologic maps as the basis for this information. (MT)

T-2. Section D-5.2, Site Geology:

Please consider providing more detailed discussions as to the origin, geochemistry, and transport of the uranium ore deposits within the proposed permit area. (MT)

T-3. Section D-5.2, Site Geology:

Please provide a diagrammatic cross-section of a multiple or stacked roll front which is bounded by overlying and underlying shales/mudstones. This diagram should be similar to how the 70 Sand is illustrated on Figure D6.3-4. (MT)

T-4. Section D-5.2, Site Geology, pg. D5-3, para. 1

Due to the complex nature of the fluvial sandstone deposition in the Wasatch formation is not well understood. EMC needs to go into much more detailed discussion into site-specific fluvial environments and their deposits (i.e., point bar or natural levee deposits, abandoned channel fill deposits, crevasse splay, lacustrine deposits, lacustrine delta, etc.) seen at the Moore Ranch. Please consider providing block diagrams to aid these discussions. (MT)

T-5. Section D-5.2, Site Geology:

Please provide permit text describing the Ninemile Creek, Simmons Draw and Pine Tree

Draw alluvium. Also see Comment 88. (MT)

T-6. Section D-5.2, Site Geology:

Please revise Figure D5-2 to show the outline of the region in which detailed isopach maps (i.e. Figure D5-14a through Figure D5-24) were provided. (MT)

T-7. Figures D5-6 (C-C') and D5-12 (J-J'):

At the intersection of 4275-35-UMW-1, cross-section C-C' shows 80 Sand at the surface while cross-section J-J' shows shale. Please correct. (MT)

T-8. Figures D5-6 (D-D') and D5-10 (H-H'):

At the intersection of 4275-36-CBM5-14, cross-section D-D' shows shale at the surface and cross-section H-H' shows 80 Sand. Please correct. (MT)

T-9. Figures D5-10 (H-H') and D5-3 (A-A'):

At the intersection of 4275-25-4501, cross-section H-H' shows 82 Sand at the surface and cross-section A-A' shows shale. Please correct. (MT)

T-10. Figures D5-9 (G-G') and D5-6 (D-D'):

At the intersection of 4175-2-UMW-7, cross-section G-G' shows shale at the surface and cross-section D-D' shows 80 Sand. Please correct. (MT)

T-11. Figures D5-9 (G-G'), D5-3 (A-A'), D5-8 (F-F'), and D5-7 (E-E'):

For clarity please consider naming and labeling the two sand intervals which are shown above the 80 Sand. (MT)

T-12. Figures D5-6 (D-D') and D5-7 (E-E'):

At the intersection of 4275-33-8, the uppermost sand should be named and labeled on cross-section E-E'. Also the 72 sand on cross-section D-D' is shown to correlate with the 80 Sand on cross-section E-E'. Please correct. (MT)

Appendix D-6, Hydrology

T-13. Figure D6.2-3a, Moore Ranch Uranium Project Coal Bed Methane Wells & Outfall Locations

For clarity and consistency please remove the "Wellfield 3" from this exhibit. (MT)

T-14. Table D6.1-2, Estimated Water Use in Campbell County, Wyoming:

Please include a footnote as to where the CBM uses are listed on this table. (MT)

15. Section D-6.3.2-5, Groundwater Modeling of Site Hydrologic Conditions & Figures D6.1-2, D6.1-3a, D6.1-3b, D6.1-3c & tables D6.1.3 and D6.1.4:

It is preferred that these discussions and information be presented in the Operations Plan (i.e., Section 3) in order to keep that Appendix D-6 baseline as evergreen as possible. (MT)

T-16. Section D-6.1.2, Permit Area Groundwater Use, pg. D6-3, paragraph 4

Please investigate into where the Mondle School, the Van Gordon Ranch, and the Bozarth Ranch historically obtain their domestic water supply. Provide a discussion on the results of this investigation in the permit text. (MT)

T-17. Well PW-1

Please show the location of this well on Figures D6.3-5a through D6.3-5h. In addition, please list this well on Table D6.3-2. (MT)

T-18. Table D6.3-1

Please revise this table to include all EMC (i.e., please add all wells listed on Table D6.3-7a and Table CR-27 [Addendum D6-B3]). (MT)

T-19. Table D6.3-2

Please include data from wells UMW-6 and UMW-9. (MT)

T-20. Addendum D6-B2

Please provide the well completion details for all wells used in the 5-spot hydrological tests. (MT)

Section 3.0 Operations Plan

T-21. Groundwater Monitoring, Pg. 3-19:

EMC must submit a detailed regional/mine-wide during mining/restoration groundwater monitoring plans (specific wells shown on a map and frequency/parameters listed on table) which:

- demonstrates non-degradation of groundwater uses outside of the permit area
- validates that all groundwaters outside of the aquifer exemption area are protected to their pre-mining baseline water quality and applicable MCLs
- verify the groundwater models (MT)

T-22. Groundwater Monitoring:

Please commit to installing groundwater monitoring wells in the 80 Sand (or first groundwater) proximate the plant area to order to demonstrate groundwater non-degradation beneath this area. (MT)

T-23. Groundwater Monitoring:

EMC should provide a permit commitment to resample water quality and levels on all monitoring wells a minimum of 1-year (i.e., four quarters) prior to initiating mining. (MT)

Mine Plan

M-1. Section 3.5.14.1, Wellfield Delineation and Construction, Page 3-58

This section states that drilling activities to delineate new well fields will be conducted under a WDEQ-LQD Drill Notification. A Drilling Notification is not necessary for activities within an approved permit area. Proposed activities should be stated in each year's Annual Report and sufficient bonding must be included to cover the abandonment of drill holes, wells and surface disturbances for that coming year. Please remove the reference to the Drilling Notifications from this section.

M-2. Completion of New Wells

Chapter 11, Section 11(b) requires that each Class III well will require submission of a notice of completion of construction for each well to the Administrator. The Administrator must then inspect or review the new injection

wells and determine whether the well is in compliance with the permit. The Administrator only has thirteen (13) days to make this determination.

Also, EPA will require that digital data covering all Class III wells be incorporated into their GEM database. It is our intention to combine the well certification process and database population process into one procedure. Further information on this database, required format and procedures for certifying Class III wells will be forwarded as they are developed. (GM)

Restoration and Reclamation Plans

M-3. Section 4.1.1, Groundwater Restoration Criteria, Page 4-2

The second paragraph states "Baseline values will not be changed unless the operational monitoring plan indicates that baseline water quality has changed significantly due to accelerated movement of groundwater and that such change justifies redetermination of baseline water quality." Baseline water quality is exactly that, the baseline before it is affected by the mining operation. The interpretation of baseline data may change, but not the data. That is why the LQD is insistent upon taking great care in the sources and methods of baseline water quality collection.

Please remove this sentence and the next.

M-4. Reclamation Bond

The bond estimate dates back to November 2007 and contains a great deal of outdated and incomplete costs. An updated estimate is needed, based on the most recently available costs.

Numerous issues must be addressed including:

- a. There are numerous references to LQD Guideline 12, App. 11. There is no Appendix 11 to Guideline 12. All of Guideline 12's Appendices have letter designations.
- b. On page 2 of 34, the estimate states the kilowatt to horse power ratio is 0.746 kw/hp. This implies a 100% efficiency for the electric motors. Please use a figure of 933 watts per horsepower which corresponds to an efficiency of 80%, more in line with available references for small electric motors.
- c. On Page 2 of 34, there is a cost given for reductants as \$0.30 per 1000 pounds. Perhaps \$0.30 per 1000 gallons of reductant solution is meant instead? The most recent PRI cost per 1000 gallons of reductant solution is \$1.69. Please explain.
- d. On Page 2 of 34 for plant dismantling, the cost of demolition of plant footers is given as \$5.10 per cubic foot of concrete and references Guideline 12. It also

- states that it is adjusted to 0.75 inch concrete. Guideline 12 references demolition of concrete footers in linear feet and gives a current cost of \$17.80 per lineal foot. The 0.75 inch figure is meaningless. Please revise.
- e. On Page 2 of 34 for plant dismantling, the cost of demolition of plant foundations is given as \$5.10 per cubic foot of concrete and references Guideline 12. It also states that it is adjusted to 0.75 inch thick concrete. Guideline 12 references demolition of concrete footers in square feet and gives a current cost of \$4.80 per square foot. The 0.75 inch figure must mean 0.75 foot thick concrete. Adjusted for the thicker concrete would give a current cost of \$7.20 for demolition of 9-inch thick concrete. Please revise.
 - f. On Page 2 of 34, please present documentation as to the distances to disposal sites and costs per yard for both contaminated and uncontaminated waste.
 - g. On Page 3 of 34, the cost of \$1,125/week is quoted for a Cat trackhoe. What size of trackhoe is this? This cost is far lower than the cost cited by EquipmentWatch for a Cat 322 trackhoe. Please explain.
 - h. On Page 3 of 34 the cost of \$814.22 per acre cited for a Cat motor grader is cited as coming from Guideline 12, App. 11. As noted above, Guideline 12 has no App. 11. In addition, the cost cited of \$814.22 seems excessively large for any motor grader task.
 - i. On Page 3 of 34 the \$814.22 per acre cost for a dozer is cited as coming from Guideline 12 App. 11. Once again, there is no Guideline 12, App. 11. What size dozer is this and what is its task? Dozer tasks are generally on a per yard basis. Please explain.
 - j. On Page 3 of 34 the \$814.22 per acre cost for a scraper is cited as coming from Guideline 12 App. 11. Once again, there is no Guideline 12, App. 11. What size scraper is this and what is its task? Scraper costs generally are given on a per yard basis. Please explain.
 - k. On Page 3 of 34 the \$280 per acre cost for discing and seeding is cited as Operator Experience based on current contractor pricing. Unless current contractor bid estimates can be presented, please use current Guideline 12 costs.
 - l. On Page 3 of 34 the \$0.71 per acre cost for Top Soil Application is cited as coming from Guideline 12, App. 11. Once again, there is no Guideline 12, App. 11. Even at \$0.71 per **yard**, this cost is excessively low for this type of operation. Please explain.
 - m. On Page 3 of 34 there are numerous references to costs from operating ISR facilities. Please present up-to-date documentation of these costs.
 - n. On Page 3 of 34 the cost of well abandonment is cited as coming from Spreadsheet UC-WA. Please identify this spreadsheet and its relevance for up-date-costs on well abandonment? The costs for COGEMA's recent abandonment of Irigaray wellfield wells would be relevant. Please present those.
 - o. In a January 5, 2009, conversation with Dale Anderson of the Solid and

Hazardous Waste Division of DEQ, he offered the following information about the nearest landfills. The Edgerton landfill is about full and waste will soon be transferred to the Casper landfill. The Casper landfill is currently charging between \$42.00 and \$43.00 per ton. He said there is no room for disposal in the Kaycee landfill. The Buffalo landfill is a possibility but disposal costs there will run more than \$50.00 per ton. Another possibility is the Gillette landfill which is currently charging \$60.00 per ton.

Please recalculate the disposal costs using more up-to-date disposal costs and mileages.

- p. Burial of some waste such as concrete rubble on-site is a possibility, but more discussion in the reclamation plan is necessary before this can be an active part of the reclamation bond estimate. First, documentation is necessary to show the surface owner will allow permanent disposal of waste on his land. Also, brief description of the planned disposal operation is needed, including placement away from drainages, more than 20 feet about the postmining groundwater level, removal and stockpiling of topsoil, a showing that any rubble will be buried a minimum of four feet and replacement of topsoil and seeding. For more information, consult Chapter 3 of the Solid and Hazardous Waste Division Rules and Regulations.
- q. The costs of removing the surge ponds and reclaiming their locations must be added to the bond estimate.
- r. The cost of seed given on Page 33 of 34 needs to be updated. The current cost of the seed mixture listed in Section 4.2.6 on Page 4-22 is about \$55 per acre, compared to the \$30 per acre given on Page 33.

M-5. Transferability of Agreement with Licensed Disposal Area Operator

The agreement that Energy Metals has with the owner of the Licensed Disposal Area must be transferable to the State of Wyoming and the NRC so that in the event the State or the NRC has to assume reclamation liability, they can dispose at the same rate as negotiated by Energy Metals.

Conclusions

Responses to previous staff comments been received from Energy Metals Corporation. Reviews of the application have found that it remains **Technically Incomplete** as per W. S. § 35-11-406(h).

/gm