



Department of Environmental Quality

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



Matthew H. Mead, Governor

Todd Parfitt, Director

May 31, 2013

Mr. Ken Garoutte
Manager – Safety, Health, Environment and Quality
Cameco Resources, Inc.
PO Box 1210
Glenrock, WY 82637

**Subject: TFN 5 1/330, Restoration Research Proposal, T3 Review
Permit 633, Cameco Resources**

Dear Mr. Garoutte:

The Land Quality Division (LQD) has completed the review of the referenced proposal to conduct restoration research on the Smith Ranch Mine permit area. Please find remaining review comments enclosed. In addition to the remaining outstanding comments, the LQD is awaiting concurrence from the DEQ/Water Quality Division (WQD) as noted in several of the comments.

It is expected that Cameco will obtain the formal concurrence from the WQD for the use of the unauthorized chemical tracers and nutrient stimulation of the aquifer with any expectations for remediation for their use.

If you have any questions, please contact me at 777-7048 or pam.rothwell@wyo.gov.

Sincerely,

Pam Rothwell
District 1 Assistant Supervisor
Land Quality Division

Enclosure

cc: Kevin Frederick, WQD
Doug Mandeville, NRC



INTRODUCTION

The Land Quality Division (LQD) received the responses to T2 review comments for the three proposed restoration research projects on November 5, 2012. The three research proposals included the tracer study, the bio-stimulation study and the natural attenuation study. CR has responded to LQD comments for the tracer study and the bio-stimulation proposals. Comments that addressed the natural attenuation and contaminant mobility proposal have been deferred to a later date. In lieu of CR's decision to postpone the natural attenuation proposal, the LQD will omit any further review of the study. As suggested by CR, when the proposal is ready to move forward it will be re-submitted for LQD review.

CR also attached a commentary regarding several of the comments and suggests that the comments are better suited to a peer review by qualified scientific peer reviewers. The LQD supports peer reviews of the proposal and results of the studies. However, any changes to the restoration protocol require a permit revision and LQD review.

It is noted that the *Proposal to Conduct Restoration Research Projects* and the eleven (11) Attachments is not paginated for insertion into Permit 633. Also, the Index of Change does not address the original submittal and whether it is now a superseded version. The proposal is being reviewed for technical content for a permit change according to Chapter 11, Section 19. LQD is evaluating whether it will be a significant or non-significant revision. Upon approval, LQD will require insertion into the permit document (See Comments 22/Tracer Review and 13/Bio-stimulation Review).

Tracer Study Proposal

- 1 Response Acceptable. (SI)
- 2 Response Acceptable. (SI)
- 3 Response Acceptable. The tracer(s) will be added to the injection stream, not the production stream as stated in the initial proposal. (SI)
- 4 Response Acceptable. Different tracers will be added to each injection well to discern how each injection well contributes to the production flow. (SI)
- 5 Response Acceptable. As stated in the response, the possible need for additional core was due to the large spatial variability in uranium roll fronts. (SI)
- 6 Response Acceptable. The response states that there are no other activities in the area that would affect the tracer study. (SI)

- 7 Response Acceptable. The usefulness of the core analysis from the core library will be determined by the peer reviewers. (SI)
- 8 **First Bullet:** Response Acceptable. The response acknowledges inefficiencies in Mine Unit C after the bio-remediation test (2009) and states that the information to date strongly suggests sweep inefficiencies. The inefficiencies in MU-4 have not been identified but are the focus of the test proposal. Section 2.1.3 identifies how the tracer study will aid in identifying heterogeneities in the tested patterns. Also, the core results, which weren't available at the time of the initial submittal contain areas that were not oxidized by mining.
- Second Bullet:** Response Acceptable, for the purposes of this review. LQD would appreciate receiving the final report when it is completed. (SI)
- Third Bullet:** Response Acceptable, for the purposes of this review. The differential equation solution should be evaluated by the peer reviewers to correct what appear to be errors in the methodology or presentation.
- Fourth Bullet:** Response Acceptable. The relationship between sweep efficiency and changes in aquifer characteristics as a result of mining is unknown. The discussion in the response to Comment 7 will suffice at this time. (SI/PCR)
- 9 **Response Not Acceptable.** The map *Mine Unit 4 Bio-Remediation Proposed Test Wells* indicates two five spot patterns that will be used for the bio-remediation test proposal. Thank you for the map. The response indicates the map is Attachment 1, however, this reference was not identified on the map. LQD would prefer the map be included in the Reclamation Plan. Please insert the map into the Reclamation Plan and provide a text reference to the map on page 6-3H. (PCR)
- 10 Response Acceptable. The wellfield status is discussed including the Guideline 8 water quality sample results of the two pattern areas proposed for the test. A discussion is provided describing the interaction of the nutrient addition with uranium. (It is noted that the uranium concentrations shown in the water quality sample results are already low, as are all of the restoration parameters with the exception of radium 226.) The revision text indicates that the groundwater is not expected to react with the tracers. (PCR)
- 11 Response Acceptable. The injection and production wells are identified. (PCR)
- 12 Response Acceptable. Unique geochemical and hydrologic conditions specific to the local conditions at the Smith Ranch mine site seems to support the need to conduct the proposed field test on the permit to advance the knowledge obtained through laboratory experiments on core samples obtained from the wellfields. Note, although LQD supports research to advance restoration methodologies in general, as a permitted mine facility, the mine site is not viewed as a research facility. LQD also understands that not only are the unique conditions of the site a reason to conduct the

research on the permit, the established infrastructure is available to support the project. As indicated by CR in the *Commentary* included with this round of review, the LQD technical staff has limited expertise with technical or regulatory reviews for compliance with regard to research on LQD permitted mine sites. Further, the approved permit does not provide for detailed research activities. Therefore, LQD's review is to evaluate the proposal to determine whether it is a non-significant or significant deviation from the approve permit. (PCR)

- 13 **Response Not Acceptable.** CR states that monitoring is not planned. The test is expected to last one to two years without pumping to maintain an inward gradient. Please explain how a potential excursion will be detected. The LQD would expect to have the tracer mass remediated with a demonstration of the remediation to achieve restoration of the Mine Unit. (See Comment 11 below) (PCR)
- 14 Response Acceptable. Laboratory testing with tracers was conducted on cores taken from a drill hole near 4P-121 following mining activity. The tracers are not expected to react with the groundwater, however chemical reactivity is likely between the tracers and the mineralogical constituents of the aquifer formation. (PCR)
- 15 Response Acceptable. (PCR)
- 16 Response Acceptable. The LQD will require concurrence from the WQD to use the chemicals proposed in the research proposal. (PCR)
- 17 Response Acceptable. The LQD will require concurrence from the WQD to use the chemicals proposed in the research proposal. (PCR)
- 18 Response Acceptable. The revision indicates that the minimal impacts of the use of the tracers will not affect the ability to restore the aquifer to baseline conditions. (PCR)
- 19 Response Acceptable. The revision indicates that no infrastructure components would be affected by the proposed tracers. (PCR)
- 20 **Response Not Acceptable.** The LQD would expect to have the tracer mass remediated with a demonstration of the remediation to achieve restoration of the Mine Unit. (PCR)
- 21 Response Acceptable. The LQD will require concurrence from the WQD to use the chemicals proposed in the research proposal. (PCR)
- 22 **Response Not Acceptable.** The proposal when approved will need to be incorporated into the permit. CR may wish to request a separate confidential volume to be kept in a locked cabinet. The request should be in writing and well justified for a determination by the Administrator (WEQA § 35-11-1101). Any future monitoring

reports and the final report will be maintained in this volume. Please update the index of change to indicate how the revision will be maintained in the permit. (PCR)

- 23 **Response Not Acceptable.** An estimated cost should be provided for the infrastructure, groundwater restoration and disposal costs needed for the project. CR does not anticipate “clogging” of restoration wells due to bioremediation as occurred in MU-C in 2009, however, a maintenance cost to swab and or a replacement cost for the wells is needed as a precaution. Monitoring and sampling costs should be included as needed to demonstrate excursion prevention and restoration of the injected constituents. Drill holes used for cores should be identified in the surety. LQD understands the cost will be minimal, however over the duration of the project a cost will be incurred. It is suggested that a section of the surety identified as Restoration Research Proposal be added with a breakdown of the identified costs. (PCR)
- 24 Response Acceptable. The response states that the test would not impact the restoration schedule. (PCR)
- 25 Response Acceptable. The LQD will require concurrence from the WQD to use the chemicals proposed in the research proposal. (PCR)
- 26 **Response Not Acceptable.** The steps are well defined with approximate time periods for the individual steps included for tracer and nutrient additions. It appears the project could take a minimum of one year and up to two years to complete with a final evaluation and report time period in addition to the one to two years of field testing. The monitoring and sampling schedules are undefined. LQD will expect to be updated with the data on a routine schedule. Please provide a commitment to update the LQD with the information that will be provided. This commitment should be included on page 6-3H of the Reclamation Plan. (PCR)
- 27 Response Acceptable. (SI)

Bio-stimulation

- 1 Response Acceptable. The core was vacuum sealed and kept cold. (SI)
- 2 Response Acceptable. (SI)
- 3 Response Acceptable. The text in Section 2.2.5 appears to unnecessarily limit the nutrient to tryptone or safflower oil, when the “choice and quantity” has yet to be determined by the experts. (SI)
- 4 Response Acceptable for the purposes of this review. (SI)
- 5 Response Acceptable. The passive sampling described in the revised text will be either a bailed sample or a variation of micro-purge sampling. (SI)

- 6 Response Acceptable for the purposes of this review. The usefulness of the uranium and carbon isotope ratio studies will be determined after the ratios are acquired and peer reviewed. The response cites several studies in support of using isotope ratio studies. (SI)
- 7 Response Acceptable. The initial proposal did not discuss the qualitative nature of the value of core from the core library. (SI)
- 8 **Response Not Acceptable.** The map *Mine Unit 4 Bio-Remediation Proposed Test Wells* indicates two five spot patterns that will be used for the bio-remediation test proposal. Thank you for the map. The response indicates the map is Attachment 1, however, this reference was not identified on the map. LQD would prefer the map be included in the Reclamation Plan. Please insert the map into the Reclamation Plan and provide a text reference to the map on page 6-3H. (PCR)
- 9 Response Acceptable. The wellfield status is discussed in Section 2.2.4. The Guideline 8 sample results for the two pattern areas are included as Attachments 10 and 11. The proposed nutrients will be electron donors resulting in reduction reactions potentially precipitating uranium from solution. CR has offered further discussion with the research scientists if needed, to address specific questions from LQD. (PCR)
- 10 Response Acceptable. Unique geochemical and hydrologic conditions specific to the local conditions at the Smith Ranch mine site seems to support the need to conduct the proposed field test on the permit to advance the knowledge obtained through laboratory experiments on core samples obtained from the wellfields. Note, although LQD supports research to advance restoration methodologies in general, as a permitted mine facility, the mine site is not viewed as a research facility. LQD also understands that not only are the unique conditions of the site a reason to conduct the research on the permit, the established infrastructure is available to support the project. As indicated by CR in the *Commentary* included with this round of review, the LQD technical staff has limited expertise with technical or regulatory reviews for compliance with regard to research on LQD permitted mine sites. Further, the approved permit does not provide for detailed research activities. Therefore, LQD's review is to evaluate the proposal to determine whether it is a non-significant or significant deviation from the approve permit. (PCR)
- 11 **Response Not Acceptable.** The response better defines the reason that monitoring will not be provided (compared to the response to Comment 13 above). CR could expand the discussion in Section 2.1.6 with language included in the response to justify the lack of monitoring. Further explanation to the revision text could also better define the lack of need to provide remediation of the tracers and nutrients added to the pattern areas. CR should consider expanding the discussion in Section 2.1.6 for a determination of an acceptable response to Comments 13 (Tracers) and Comment 11 (Bio-restoration). (PCR)

- 12 Response Acceptable. The revision indicates that the minimal impacts of the use of the tracers will not affect the ability to restore the aquifer to baseline conditions. (PCR)
- 13 **Response Not Acceptable.** The proposal when approved will need to be incorporated into the permit. CR may wish to request a separate confidential volume to be kept in a locked cabinet. The request should be in writing and well justified for a determination by the Administrator (WEQA § 35-11-1101). Any future monitoring reports and the final report will be maintained in this volume. Please update the index of change to indicate how the approved revision will be maintained in the permit. (PCR)
- 14 **Response Not Acceptable.** An estimated cost should be provided for the infrastructure and disposal costs needed for the project. CR does not anticipate “clogging” of restoration wells due to bio-restoration as occurred in MU-C in 2009, however, a maintenance cost to swab and or a replacement cost for the wells is needed as a precaution. Monitoring and sampling costs should be included as needed to demonstrate excursion prevention and restoration of the injected constituents. Drill holes used for cores should be identified in the surety. LQD understands the cost will be minimal, however over the duration of the project a cost will be incurred. It is suggested that a section of the surety identified as Restoration Research Proposal be added with a breakdown of the identified costs. (PCR)
- 15 Response Acceptable. The response states that the test would not impact the restoration schedule. (PCR)
- 16 **Response Not Acceptable.** The steps are well defined with approximate time periods for the individual steps included for tracer and nutrient additions. It appears the project could take a minimum of one year and up to two years to complete with a final evaluation and report time period in addition to the one to two years of field testing. The monitoring and sampling schedules are undefined. LQD will expect to be updated with the data on a routine schedule. Please provide a commitment to update the LQD with the information that will be provided. This commitment should be included on page 6-3H of the Reclamation Plan. (PCR)
- 17 Response Acceptable. (SI)

Natural Attenuation and Contaminant Mobility Study – This proposal is being withdrawn from this application. When it is pursued at a later date, Cameco will re-submit a new proposal to LQD as a separate revision for review. It is suggested that the technical review comments that were provided for this proposal be addressed in the submittal.