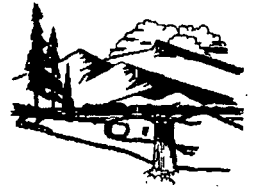




# Department of Environmental Quality



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

November 20, 2009

Mr. John Cash  
Lost Creek ISR, LLC  
5880 Enterprise Drive, Suite 200  
Casper, WY 82609

RE: **Lost Creek ISR LLC, In-Situ Recovery (ISR) Permit Application, TFN 4 6/268**

Dear Mr. Cash,

Enclosed please find the second round of technical comments to responses which were received by the Wyoming Department of Environmental Quality – Land Quality Division (WDEQ/LQD) District II Field Office on October 19, 2009. We apologize for the slight delay in the response, but I believe you have been made aware of the circumstances that surround some of the reviewers that worked on this submittal.

After review of statements made in the Summary Section of the First Round of Technical Comments, there is one point that I believe should be clarified concerning Second Public Notice and subsequent Permit Approval process. Direction to proceed with Second Public Notice will not be given until the WDEQ/LQD receives a Letter of Application Approval / Concurrence from the Bureau of Land Management (landowner). This Letter serves as the required Surface Owner Consent per W.S. §35-11-406 (b)(xii).

If you have specific questions regarding the enclosed review, it is suggested that you contact the individual reviewer for clarification. It is anticipated that Melissa Bautz will return to the office the first week in January.

Respectfully,

Brian R. Wood  
District II Hydrologist

w/ enclosure, 2<sup>nd</sup> Round of Technical Comments

Cc Mr. Harold Backer, Ur-Energy USA, 10758 W. Centennial Rd. Suite 200, Littleton, CO 80127 (w/encl)  
Mark Newman – BLM Rawlins, P. O. Box 2407, Rawlins, WY 82301 (w/encl)  
Ronald A. Burrows, U.S. Nuclear Regulatory Commission, Federal and State Materials and Environmental Management Programs Uranium Recovery Licensing Branch, Mail Stop T-8F5, Washington, D.C. 20555-0001 (w/encl)  
Don McKenzie/Matthew Kunz, Cheyenne WDEQ/LQD → TFN 4 6/268 Lost Creek ISR File (w/encl)  
Mark Moxley - Lander WDEQ/LQD → TFN 4 6/268 Lost Creek ISR File (w/encl)

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## Memorandum

File: Lost Creek ISR, LLC Uranium Project, Permit Application, TFN 4 2/628

From: Melissa L. Bautz – WyDEQ/LQD District II Geologist (MLB)  
Amy Boyle – WyDEQ/LQD District II Hydrogeologist (AB)  
Mark Moxley – WyDEQ/LQD District II Supervisor (MM)  
Craig Smith – WyDEQ/LQD District II Vegetation Ecologist (CS)  
Steve Platt – WyDEQ/LQD District II Wildlife Biologist (SP)  
Matt Kunze, WyDEQ/LQD Cheyenne Natural Resources Analyst (MK)  
Brian R. Wood – WyDEQ/LQD District II Hydrologist (BRW)

Date: November 20, 2009

Subject: Second round of Technical Review comments on Lost Creek ISR Application, TFN 4 2/628

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This memorandum contains the WDEQ Land Quality Division's (LQD's) technical comments on Lost Creek ISR's (LC's) responses to LQD's first round of technical comments. The application submitted was received at the WDEQ/LQD Lander office on December 20, 2007 and it achieved completeness on May 20, 2008. Preliminary technical comments were provided by Matthew Kunze (LQD Cheyenne) in a memorandum dated August 8, 2008 and by Amy Boyle (LQD Lander) in a memorandum dated August 26, 2008. Final technical comments were provided by LQD Lander staff in a memorandum dated January 30, 2009.

Responses to Amy Boyle's 44 comments (August 26, 2008) were received on May 5, 2009. A second round of comments was sent to LC on June 19, 2009. Eighteen of the original comments were resolved, and two new comments were generated as part of that review.

On October 19, 2009, LC submitted responses to the final technical comments (those cited in the January 30, 2009 memo). Below is LQD's review of LC's responses to the final technical comments. The format is as follows: The original LQD comment appears first in normal font (with the commentator's initials in parentheses at the end). A summary of LC's response follows in italics. Lastly, the LQD's determination of the response's adequacy follows in bold face print.

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### **Volume 1 (Adjudication):**

- 1) The Appendix E map (Plate E-1) must show all lands to be affected by the operation, including all proposed or potential well fields. The permit boundary should be reflective of the extent of proposed mining. The permit area should encompass all lands that are proposed to be affected and some reasonable buffer around the affected lands. Conversely, if an area is not going to be affected by the proposed operation then it shouldn't be in the permit area. Based on Figure OP-2a, there are large portions of the permit area (entire sections or half sections) where no proposed operations are shown. Unless there are reserves that are proposed to be mined in these areas, then these lands should not be included in the permit area. The "additional resources known to exist within the permit area", mentioned on page OP-6, must be shown in some fashion order to justify the size of the permit area. **(MM)**

LC's Response: The size of the Permit Area was based on a number of factors, in particular: the necessary spacing for the deep disposal wells; potential development; and practical land use considerations.

With respect to the deep wells, five wells are currently planned. To accommodate regulatory requirements and meet the necessary injection criteria, the wells are widely spaced and located in Sections 16, 18, and 19 of Township 25 North, Range 92 West and Sections 13 and 25 in Township 25 North, Range 93 West. Plate OP-1 has been updated to show the locations of the wells.

With respect to potential development, LC ISR, LLC is interested in potential exploration and production targets in areas near (or vertical to) the proposed mine units. Rather than 'piecemeal' the baseline data for these areas, LC ISR, LLC considered it more effective to cover a larger area at one time. In addition, this approach provides more data for these areas than would be obtained for a Drilling Notification.

With respect to practical land use considerations, the Permit Area boundaries are in some cases designed to coincide with 'claim block' or lease boundaries. These boundaries may extend outside areas of interest for exploration or production, but for easier administration, they were included in the Permit Area.

**Response not acceptable.** Comment stands as written. (MM)

- 2) The Appendix E map (Plate E-1) as well as all of the maps that are presented on a USGS quad map base, should be presented at a standard USGS scale of 1"=2,000' so that they are easily comparable. (MM)

LC's Response: The map scale has been changed, as requested. In addition, the map now shows the East and West Access Roads, which were added to the Permit Area after discussions between WDEQ-LQD and BLM (September 2009).

**Response acceptable.** (MM)

#### ***New Information - Adjudication***

A) Form 1-UIC - The acreage listed on Page 2 of the form has been updated to include the acreage for the East and West Access Roads and submitted to LQD. The start and end dates for the Project have also been updated.

**Deanna Hill reviewed the revised Form 1-UIC and found it to be acceptable.** (MM)

B) Appendix C - The plate and text have been updated to include the acreage for the East and West Access Roads.

**Response acceptable.** The portions of Appendix C that describe the east and west access roads (pages 6 and 7) have been corrected as per my 11/11/09 e-mail to John Cash. (MM)

C) Table ADJ-1 - The table has been updated with the most recent information on the status of the various permits required for the Lost Creek Project.

**The revised materials are acceptable.** (MM)

*D) List of Preparers - The list has been updated in response to comments on other sections of the permit application.*

**The revised materials are acceptable. (MM)**

**Volume 2 (Appendices D-1 through D-5):**

***New Information - APPENDIX D-1 (LAND USE)***

*A) The permit acreage noted in the first paragraph has been updated to include the East and West Access Roads, and a cross-reference to the Appendix D information for the East and West Roads has been added.*

**The revised materials are acceptable. (MM)**

*B) Figures D1-1a and D1-1b have been updated to include the East and West Access Roads.*

**The revised materials are acceptable. (MM)**

***New Information - APPENDIX D-3 (ARCHEOLOGY)***

*A) Attachment D3-2, which is a mitigation plan for an NRHP site, has been added to the Confidential Volume. The Table of Contents for Appendix D3 and Section D3.1.3 (Agency and Public Consultation) have been updated to reflect this addition.*

**The revised materials are acceptable. (MM)**

*B) The References page was replaced to correct a typo in the 'Thompson' reference*

**The revised materials are acceptable. (MM)**

***Appendix D5 - Geology***

- 1) Section D5.2.4, "Historic Uranium Exploration Activities", Page D5-6: The last paragraph states that historic and current uranium explorations exist in "other" areas of the Basin. There is no mention of the adjacent Sweetwater Uranium project in this section. Due to that project's proximity to the Lost Creek project, it must be discussed here. **(MLB)**

*LC's Response: Section D5.2.4 was changed to Section D5.2.4.1 as a result of LC's response to a comment in Amy Boyle's August 26, 2008 memo. At the beginning of Section 5.2.4.1, a brief description of the Sweetwater Uranium Project has been added.*

**Response acceptable. (MLB)**

- 2) Attachment D5-2, Plates AD5-2a,b,c: These maps need to include section lines, township and range lines, topography, roads, and other ground features. During the meeting among LQD and Lost Creek personnel held in at the Lander WDEQ/LQD office on September 22, 2008, an example of the type of base map features that should appear on all plates/maps in the Permit was demonstrated and discussed. **(MLB)**

*LC's Response:* The figures and plates in Appendices D5 and D6 were revised to include the requested features and submitted on May 4, 2009 in response to a similar comment made in Amy Boyle's August 26, 2008 memo. WyDEQ/LQD, in turn, commented on the response on June 22, 2009. LC is in the process of addressing the June 22, 2009 comment addressing this topic. Therefore, it will be sent under separate cover.

**Response acceptable.** LQD will look for revised versions of these plates in LC's response to the June 22, 2009 review. (MLB)

**Volume 3 (Hydrology Appendix D-6):**

1) **Section D6-1:** The purpose of this section is to characterize the baseline hydrology of the proposed permit area. The information provided concerning the surface water portion is not acceptable for the following reasons:

- a. A map was not provided that delineates the three drainage basins as described in the text on page D6-1. Figure D6-1, the drainage basin map provided, is a gross illustration of regional drainage basins. Please provide a drainage basin map that describes the three primary drainage basins within the permit area.

*LC's Response:* Figure D6-1 has been revised to reflect the three principal drainages in the Permit Area, named (for the purposes of the application) Western Draw, Western Battle Spring Draw, and Eastern Battle Spring Draw.

- b. Please provide the total areal extent within each drainage basin and within the permit area for the three basins described.

*LC's Response:* The third paragraph in Section D6.1.1 has been revised to include this information, along with channel slope, sinuosity, and drainage density data for the three principal watersheds.

- c. Please provide runoff estimates for various events for the three drainage basins. (BRW)

*LC's Response:* Table D6-1b has been revised to include this information.

**Response acceptable.** The requested revisions have been made. (BRW)

2) **Section D6-2:** Figure D6-2 is a longitudinal profile of North Battle Spring Draw. Please illustrate the location on a map of the longitudinal profile; mark the two end points as A and A' or use similar notation. Please also state how the profile was generated (e.g., actual survey or using USGS topographic mapping). (BRW)

*LC's Response:* Figure D6-1 has been revised to include endpoints for the longitudinal profiles of the three principal drainages; these points correspond to where the drainages enter and leave the Permit Area. Figure D6-2 has been revised to include all three principal on-site drainages. Longitudinal profiles were generated from 1:24,000 USGS topographic maps that were imported into GIS; the third paragraph in Section D6.1.1 has been revised to include this information.

**Response acceptable.** Figure D6-1 has been revised to include the longitudinal endpoints of the profile. The text was revised to indicate that USGS 1:24,000 topographic mapping was utilized to conduct the drainage system analysis. Analyses of this scale provide a gross approximation of basin

hydrology and hydraulics, but because the proposed operation is not a surface mine the response is found to be acceptable. (BRW)

- 3) Section D6-3: The text indicates that any runoff quickly infiltrates and is either lost to ground water recharge or evapotranspiration. The text in Appendices D6 and D7 has not provided any information regarding the hydrologic characteristics of the soils present within the proposed permit area. Please provide information to support the text (e.g., provide a relationship based on texture to hydrologic soil group, infiltration rates, etc.). (BRW)

*LC's Response:* Baseline studies have shown that soils are loams and sandy-loams. The steady-state infiltration rate for soils with this texture under laboratory conditions is estimated as 0.2 to 0.8 in/hr (Hillel, 1980). However, the practical infiltration rate is much higher because: a) more macropores are present under field conditions and at large scales; and b) saturated conditions are rare in this climate. Infiltration excess (Hortonian) overland flow has not been observed at the site. The first paragraph in Section D6.1.1 has been revised to include this information.

**Response acceptable.** The text has revised as requested. (BRW)

- 4) Section D6-4: The text indicates that the shallow aquifer is typically 150 to 200 feet below ground surface. The BLM well (WSEO Permit 3 P55113W) located in Township 25N, Range 92W, Section 30 is completed to a depth of approximately 220 and screened from 185 to 215 feet. Between 128 and 134 feet there is a layer of gray shale and the static water level at the time of completion was reported to be 109 feet. It appears that at a minimum semi-confined conditions exist rather than unconfined as portrayed in the text. Please explain the disparity. (BRW)

*LC's Response:* The text at the end of the first paragraph in Section D6.1.1 (Drainage Characteristics) was intended to provide some very basic information (e.g., type of material and approximate depth to ground water) on the material underlying the drainages. That text (now in the second paragraph in Section D6.1.1) has been revised to more closely reflect the discussion of the regional hydrogeology in Section D6.2.1.5 (Battle Spring Formation - Wasatch Formation) that the Battle Springs Formation is "typically under confined conditions, although locally unconfined conditions exist". The variation from unconfined to confined conditions is due to the interfingering of sands and shales throughout the Battle Springs Formation (see, e.g., Section 5.2.1 (Stratigraphy)). As water was reportedly encountered in BLM Well 4777 at 184 feet below surface (fbs), below the shale layers, the static water level of 109 fbs would indicate confined to semi-confined conditions, at least locally.

**Response acceptable.** The text has been revised to include a brief discussion confinement within the Battle Springs Formation. (BRW)

- 5) Section D6-5: Section D6.1.2 contains a discussion of the Robinson Reservoir. I have searched the WSEO database believe it was a typo based on other information presented; the true location of this reservoir being in Township 25N, Range 72W, Section 26. Please remove the discussion concerning this reservoir and revise the water rights table accordingly. (BRW)

*LC's Response:* This typo was verified by WSEO the 26<sup>th</sup> of May, 2009. Therefore, the discussion was removed from the text, and Figure D6-3b and Table D6-2 were updated accordingly.

**Response acceptable.** Information regarding Robinson Reservoir has been removed from the application. (BRW)

- 6) Section D6-6: Please indicate what type of sampler was used to collect water quality samples. **(BRW)**

*LC's Response:* Nalgene Storm Water Samplers were used to collect 0.26 gallon (1L) samples of first-flush streamflow during runoff events. Section D6.1.3 has been revised to include this information.

**Response acceptable.** The text in Section D6.1.3 was revised to indicate the type of samplers utilized. **(BRW)**

- 7) Section D6-7: Please indicate if discharge measurements were taken and/or can be estimated for each sample procured. **(BRW)**

*LC's Response:* Figure D6-5 was renamed D6-5a, and Figure D6-5b was added, showing snowmelt discharge in one of the stream channels in the Permit Area on April 17, 2007. Due to the lag between the first runoff flush and sample retrieval, the wetted perimeter of the channels during first flush is not known. In the absence of wetted perimeter or cross-sectional area, discharge cannot be estimated using typical, empirically-based approximations such as Manning's or Limerino's equations. When present, surface water discharge at the Lost Creek Permit Area has always been estimated by qualified personnel as less than 0.5 cfs, so it is believed that the discharge was less than 1 cfs when the samples were collected. The fourth paragraph in Section D6.1.3 has been revised to include this information.

**Response acceptable.** The text in Section D6.1.3 was revised to indicate that an instantaneous discharge measurement was not obtained at the time of sampling, but rather estimated to be less than one cfs. **(BRW)**

- 8) Please submit the station site information for the thirteen surface water monitoring stations (LC1 through LC13) shown on Figure D6-5 in Appendix D-6. An Excel spreadsheet template for surface water stations will soon be available on the LQD website, [http://deq.state.wy.us/lqd/Uranium\\_Data.htm](http://deq.state.wy.us/lqd/Uranium_Data.htm). A copy of this file is also attached to this memo. In particular, please provide the station type (stream station, reservoir, stockpond, etc.), stream or waterbody name, and the location coordinates for each station. Also please note that a separate spreadsheet (also attached and on the LQD website) can be used to submit surface water flow data if this type of monitoring will occur. **(MK)**

*LC's Response:* The requested surface water information is provided in digital form (Microsoft Excel) on a CD attached to these responses.

**Response conditionally acceptable.** The Cheyenne Office has not received a copy of the Compact Disc from District II. Once received and reviewed final acceptability will be determined. **(MK)**

- 9) Please submit the baseline lab water quality data that were collected on April 17, 2007 at seven of the surface water monitoring stations. The lab data are shown in the permit application in Table D6-4 and Attachment D6-1 of Appendix D-6.

*LC's Response:* Please see Response to Comment #1.

**Response conditionally acceptable.** The Cheyenne Office has not received a copy of the Compact Disc from District II. Once received and reviewed final acceptability will be determined. **(MK)**

- 10) In future submissions of lab water quality data, please use the preferred list of parameter names. LQD staff in Cheyenne (Kathy Muller Ogle and Matt Kunze) are available to work with Energy Laboratories, Inc. to make them aware of the preferred formats for submitting water quality data electronically. (MK)

*LC's Response:* LC ISR, LLC will try to ensure the preferred parameter names are used for future submittals. However, please be aware that while LC ISR, LLC will use a certified laboratory for analytical work, it may not always be Energy Laboratories, Inc.

**Response acceptable.** The LQD can provide a list of preferred parameter names to whichever laboratory is used. (MK)

- 11) In future submissions of lab water quality data, please provide the laboratory detection limit used for parameters that were reported as "ND." LQD stores the value of the detection limit, even if a parameter is reported as not detected by the lab. LQD prefers the non-detect values be reported as negative numbers (i.e., -0.001). The baseline data submitted in Lost\_Creek\_Uranium\_Lab\_Water\_Quality\_Data.xls used both negative numbers and "ND."

*LC's Response:* LC ISR, LLC will try to ensure the detection limits are reported as requested.

**Response acceptable.** (MK)

#### **Volume 4 (Appendices D-7 through D-11):**

##### ***Appendix D7 - Soils:***

- 1) Lands to be affected by the operation (plant site, ponds, roads, well fields, etc.) must be outlined on the soils map. (MM)

*LC's Response:* Plate D7-1 and Figure D7-2 were revised to delineate the areas of anticipated disturbance. In addition, the soil mapping information was added to Figure D7-2.

**Response acceptable.** (MM)

- 2) The soils map should be presented at a normal engineering scale (i.e. 1"=400' or 1"=500'). The township, range and county should be clearly noted on the map. (MM)

*LC's Response:* Plate D7-1 was revised to a normal engineering scale and clearly identifies the township, range and county. The scale for Figure D7-2 has also been standardized.

**Response acceptable.** (MM)

- 3) The soils on lands to be affected must be mapped at an Order 1-2 level. (MM)

*LC's Response:* Order 1 soil surveys were conducted in 2008 and 2009 for the Plant site (2008), the deep injection well locations (2009), and Mine Unit One (2008). The results of the surveys for the Plant site and the deep well locations are discussed briefly in Section D7.4 and in more detail in Attachments OP-5a and OP-5b. The results of the survey of Mine Unit One will be included with the mine unit package. As the areas for additional mine units are delineated in more detail, Order 1 surveys will be conducted and the results submitted with the respective mine unit packages.



**Response partially acceptable.** The soils information for the deep well locations has not yet been provided. Also it does not appear that the deep well location in the SW ¼ of section 25 was surveyed. The survey for mine unit no. 1 has not yet been submitted. (MM)

- 4) A map must be presented to show topsoil suitability/stripping depths. (MM)

*LC's Response:* Topsoil suitability/stripping depths are included in Section OP 2.5.

**Response not acceptable.** The objective is to have a map that clearly shows the depths of soils that will be salvaged from each site-specific area to be affected. This information is currently not readily available in the permit document. Comment stands as written. (MM)

- 5) Coarse fragments is one of the criteria in LQD Guideline No. 1 for establishing soil suitability. However, where soils resources are limited and marginal in quality LQD recommends that coarse fragments not be used as the determining factor for soil suitability. (MM)

*LC's Response:* The text in the last paragraph of Section D7.4 has been revised to reflect this recommendation, and it was kept in mind in the evaluation of the Order 1 survey results (Attachments OP-5a and 5b).

**Response acceptable.** (MM)

- 6) The volumes of soil to be salvaged and stockpiled from the various major affected areas (plant site, ponds, roads, etc.) should be listed. (MM)

*LC's Response:* Please see Section OP 2.5.

**Response not acceptable.** The objective is to determine the amount of soil that will be salvaged and stockpiled on a site-specific basis. The information presented is very general in nature and does not accurately reflect site-specific soil depths. (MM)

- 7) The person(s) who conducted the soils study should be identified. (MM)

*LC's Response:* The Order 3 survey was completed by Victor Meyer, a Senior Soil Specialist at Tetra Tech, and Daniella Rough and Ethan Brown of AATA International Inc. (AATA) in 2006. The 2008 Order 1 soil survey was completed in September 2008 by Dr. Jan Cipra with the assistance of Duncan Eccleston and Heidi Netter of AATA, and the 2009 Order 1 soil survey was completed by Jim Nyenhuis with the assistance of Duncan Eccleston. The List of Preparers in the Adjudication File has been updated to provide more detail if a person worked only on specific portions of the application.

**Response acceptable.** (MM)

#### ***New Information - Soils***

***A)*** In Section D7.6 (Geotechnical Investigations), a cross-reference was added to Attachment OP-7 of the Operations Plan, which includes results of the geotechnical work for the Storage Ponds.

***B)*** In Section D7.7 (Historical Disturbance), a sentence about the acreage associated with the existing two-track roads was added in the first paragraph.

**Appendix D8 - Vegetation**

- 1) Lands to be affected by the operation must be outlined on the vegetation map. (MM)

*LC's Response: Figure D8-1 was revised to outline the lands to be affected.*

**Response acceptable. (CS)**

- 2) The vegetation map should be presented at a normal engineering scale (i.e. 1"=400' or 1"=500'). (MM)

*LC's Response: Plate D8-1 was created to present the vegetation map at a normal engineering scale; references to the plate have been added to the text (next to references to Figure D8-1).*

**Response acceptable. (CS)**

- 3) On page D8-6, section D8.4.1.2, the third sentence refers to **Upland** Big Sagebrush Shrubland. It appears that the correct reference would be **Lowland** Big Sagebrush Shrubland. (MM)

*LC's Response: The text has been revised accordingly.*

**Response acceptable. (CS)**

- 4) Sample site/transect locations should be identified by number on the map. (MM)

*LC's Response: The sample site/transect locations are identified by number on Figure D8-1 and Plate D8-1.*

**Response acceptable. (CS)**

- 5) Appendix D8.2, Description of Study Area: Precipitation data references appendix 4. Also reference the weather station as per Chapter 2, Section 2(a)(i)(C) and (D) of the DEQ non-coal rules. (CS)

*LC's Response: The text in Section 8.2 has been modified to reference the weather station.*

**Response acceptable. (CS)**

- 6) Appendix D8.3.3, Sampling Design: It is stated that "no control areas or reference areas were established. The design described is referred to as an "Extended Reference Area" in DEQ/LQD Guideline 2 Section 3 (B). It can be referred to as such in the permit application. (CS)

*LC's Response: The text has been revised accordingly.*

**Response acceptable. (CS)**

- 7) Appendix D8.3.5, Collection and Analysis of Vegetation Cover Data: A parenthetical comment is included explaining what constitutes a "hit". The remarks are unclear and should be reworded to better explain what data was recorded. Please explain which hits were used in calculating total vegetation cover, just first hits or all hits recorded. (CS)

LC's Response: The text has been reworded to better explain how data were recorded in accordance with WDEQ Guideline No. 2 for Vegetation Studies:

**Response acceptable. (CS)**

- 8) Appendix D8.4.1.1, Upland Big Sagebrush Shrubland Type: The total number of acres disturbed is not provided. The Operations Plan is referenced; however the number of acres to be affected needs to be provided as per DEQ/LQD Guideline 2 Section 1 (D). (CS)

LC's Response: This information has been added to Section OP 2.7 of the Operations Plan.

**Response acceptable.** The new text reference where to find the information in the permit application. (CS)

- 9) Appendix D8.4.1.2, Lowland Big Sagebrush Shrubland Type: The total number of acres disturbed is not provided. The Operations Plan is referenced; however the number of acres to be affected needs to be provided as per DEQ/LQD Guideline 2 Section 1 (D). (CS)

LC's Response: This information has been added to Section OP 2.7 of the Operations Plan.

**Response acceptable.** The new text reference where to find the information in the permit application. (CS)

- 10) Appendix D8.4.1.2, Lowland Big Sagebrush Shrubland Type: In the first paragraph fourth sentence there is a reference to Upland Big Sagebrush Shrubland. The reference should read Lowland Big Sagebrush Shrubland. (CS)

LC's Response: The text has been revised accordingly.

**Response acceptable. (CS)**

- 11) Appendix D8.4.1.2, Lowland Big Sagebrush Shrubland Type: The first paragraph includes a discussion of the differences between the sagebrush growing in the upland and lowland big sagebrush shrubland types. These differences could be a sub-species variation in Big sagebrush (*Artemisia tridentata* spp. *tridentata* vs. *Artemisia tridentata* spp. *wyomingensis*). If applicable add discussion about Big sagebrush subspecies. (CS)

LC's Response: Although both *Artemisia tridentata* spp. *tridentata* and *Artemisia tridentata* spp. *wyomingensis* may occur within the Permit Area, the species was not identified to the subspecies level. The two vegetation types of the Permit Area were generally delineated based on the height of the big sagebrush, which is likely attributed to the conditions in which the big sagebrush was located. The big sagebrush growing in the shallow draws of the Lowland Big Sagebrush Shrubland type was often only one to two feet taller than the big sagebrush growing on the adjacent Upland Big Sagebrush Shrubland areas and, in many cases, was probably the same subspecies. The slightly deeper soil of the shallow draws most likely provides a better environment for shrub growth. In other cases, especially along the larger drainages, the big sagebrush, probably spp. *tridentata*, was as much as three to four feet taller than those growing on the Uplands. Overall, the height of big sagebrush plants varied a great deal.

The differences between the Lowland and Upland Big Sagebrush Shrubland are not simply explained based on two different subspecies of big sagebrush. While the *tridentata* subspecies may

*be more or less restricted to the Lowland areas, the wyomingensis subspecies occurs in both the Lowland and Upland environments of the Permit Area. The original text was not modified in response to this comment.*

**Response acceptable. (CS)**

- 12) Appendix D8.4.3, Weeds, Selenium Indicators, Endangered or Threatened Species: It is stated that “the permit area has very few weeds”. This statement should be defined quantitatively. For example it could be defined in terms of percent cover, number of individual encountered or some other measureable way. (CS)

*LC's Response: Only one listed noxious weed species, tansy mustard (Descurainia pinnata), was noted on the Permit Area. Tansy mustard was observed as scattered individuals in the Lowland Big Sagebrush Shrubland. Tansy mustard was not actually encountered as part of the cover sampling; however, it did occur within one meter of either side of five of the 20 Lowland Big Sagebrush Shrubland transects and has a relative frequency of 1.97 percent. The text has been modified to include this information.*

**Response acceptable. (CS)**

- 13) Appendix D8.4.3, Weeds, Selenium Indicators, Endangered or Threatened Species: It is stated that Tansy mustard is a “listed noxious weed species”. Tansy mustard is a restricted noxious weed. Please update to reflect the correct status of Tansy mustard. (CS)

*LC's Response: The text in Section D8.4.3 has been revised accordingly.*

**Response acceptable. (CS)**

- 14) Appendix D8.6, Conclusions: There is no discussion of vegetative cover in the conclusions section. Please add a general statement addressing vegetative cover. (CS)

*LC's Response: Two bullets concerning vegetative cover were inserted into Section 8.6.*

**Response acceptable. (CS)**

- 15) Figure D8-1, Vegetation Map: The scale of this map is approximately 1”=1760’. The scale of the vegetation map must be greater than 1”=1000’ as per DEQ/LQD Guideline 2 Section 1 (A). Please reconstruct map at a scale of 1”=1000” or greater. (CS)

*LC's Response: Please see Response to Comment V4, D8, #2.*

**Response acceptable. (CS)**

- 16) Table D8-5, List of Vegetation Species Observed: The cool season perennial grasses and grass like plants section contains many perennial forbs. Please separate out the perennial forbs into their own section. This would be constant with the other vegetation tables. (CS)

*LC's Response: The table was revised accordingly.*

**Response acceptable. (CS)**

- 17) Table D8-9, Evaluation of Sample Adequacy: The variance entries are incorrect. It appears these entries are variance<sup>2</sup>. Please correct the entries of the row title. (CS)

*LC's Response: The variance entries are correct since variance is the standard deviation squared. However, the "s" variable in the footnote should be defined as the "sample standard deviation". The variance label and the footnote were revised for clarity. In addition, the text in Section D8.4.5 was revised.*

**Response acceptable. You are correct the numbers were right but were labeled incorrectly. The issue is resolved. (CS)**

#### **Appendix D9 – Wildlife**

- 1) Section D9.3.6, Wildlife: The sage thrasher (ST) is listed in both the third and fourth paragraphs. In the first instance, ST was not documented on the study area and in the second instance, it is known to breed on the study area. Please correct. (SP)

*LC's response: The Sage Thrasher should not appear in the third paragraph. Section D9.3.6 has been edited to correct this error.*

**Response acceptable. (SP)**

- 2) Attachment D9-2, Wildlife: On page 2 of the attachment, the table of contents should contain the page numbers of the identified sections. Please correct. (SP)

*LC's response: Page numbers have been added to the Table of Contents of Attachment D9-2.*

**Response acceptable. (SP)**

- 3) Figure D9-6, Sage Grouse Lek Map: Oral and written communication between Melissa Bautz (LQD) and Ms. Carrie Dobby (WGFD – Lander) on January 15 and 16, 2009 revealed that the Crooked Well sage grouse lek in UTM Zone 13 E 267113 N 4669158 (NAD 1983) at the eastern end of the proposed Permit Boundary is considered active by the WGFD. On Figure D9-6, the Crooked Well lek is designated as "unoccupied". The WGFD considers this lek to be "occupied". This is because the WGFD considers a lek to be "unoccupied" only after 10 years of inactivity at the lek. Figure D9-6 must depict the Crooked Well lek as "occupied" given the WGFD's criteria. Please revise the map accordingly. (MLB)

*LC's response: Figure D9-6 has been updated to include the Crooked Well lek's WQFD designation as "occupied and inactive" (see new Attachment D9-4).*

**Response acceptable. (MLB)**

#### **New Information – Wildlife Section**

*Appendix D9 has been updated to include 2008 and 2009 information. Changes to the text include:*

- *Revised permit acreage at the end of the first paragraph in Section D9;*
- *Revised dates in the fourth paragraph in Section D9, the second paragraph in Section D9.3.2 (Upland Game Birds), and first and third paragraphs in Section D9.3.3 (Raptors);*

- Information on the expanded sage grouse survey area in 2009 (next to last paragraph in Section D9);
- Updated Table D6-3 with the 2008 and 2009 sage grouse survey data;
- A cross-reference at the end of Section D9.3.4 (Waterfowl and Shorebirds) to the new information on BLM Well No. 4551, which is summarized in Appendix D11.

### **Appendix D11 - Wetlands**

- 1) The person(s) who conducted the wetlands study should be identified. (MM)

*LC's response:* The List of Preparers in the Adjudication File has been updated to provide more detail if a person worked primarily on specific portions of the application.

**Response acceptable.** LC has updated the list of preparers to indicate who worked on the various sections of the permit. (BRW for MM)

- 2) Section D11-1: The text on page D11-1 states that "wetland delineation is based on the presence and abundance of obligate wetland plants...." Wetland delineation is based on three basic site characteristics: (1) vegetation, as noted in the text, (2) presence or absence of hydric soils, and (3) hydrology. Please revise the text accordingly. (BRW)

*LC's response:* The text was clarified to indicate that all three of the delineation criteria were taken into account initially, but the more detailed wetland vegetation inventory was only done where at least one of the other criteria (hydrology) might have been met.

**Response acceptable.** Text was added to suggest that all three criteria were used in the evaluation of a potential wetland's existence or non-existence. (BRW)

- 3) Section D11-2: The text appears to indicate that wetland hydrology does not exist at the site. Assuming the average growing season for the area is 100 days, according to the 1987 ACOE Wetlands Manual, if the area is inundated for a period of five days (5% of the growing season) annually, the potential for wetland hydrology exists. I understand that runoff occurs infrequently in this area, however, given the fact all three wetland areas are identified under the National Wetlands Inventory (NWI) program appear to be depressional and over time the bottom of these features should seal through the deposition of silts, it is certainly plausible that these areas could hold water for five day minimum period. Therefore, hydrology does not appear to a limiting factor in a wetland determination; please revise the text accordingly. (BRW)

*LC's response:* As noted in the revised text, hydrology is apparently a limiting factor at one of the three potential wetlands identified under the National Wetlands Inventory. Battle Spring Well No. 4551 may have been the water source supporting another of the potential wetlands, but the well had not been in use for some time prior to the April 2006 field work, so hydrology may have also been a limiting factor at this location. As noted above, the text has been clarified, and photographs added, to provide more information about all three of the potential wetlands.

**Response acceptable.** The added text and photographs provide the requested clarification. (BRW)

- 4) Section D11-3: No photos were provided for the two other NWI mapped wetland areas in Township 25N, Range 93W, Section 24 and Township 25N, Range 92W, Section 21. Please provide. (BRW)

*LC's response: Figures D11-3 and D11-4, which include photographs of the two potential wetlands noted in the comment, have been added. Figure D11-2 has also been updated to include an April 2009 photograph.*

**Response acceptable.** Photographs have been added for the two other potential wetland areas as requested. (BRW)

- 5) **Section D11-4:** From on-site inspections during exploration, etc., I would agree that no wetlands exist within the proposed permit area, however the documentation provided to render this decision is lacking as alluded to in the first three comments. Please re-write this section to better support the supposition that no wetlands exist within the proposed permit area. (BRW)

*LC's response: The text has been clarified to provide a more complete description of the wetland evaluation process.*

**Response not acceptable.** The reviewer would agree that the site in Section 24 is not a wetland. It is also agreed that the site in Section 21 is not a wetland as the hydrology is artificially sustained through the well. However, specific to Crooked Reservoir, based on the photos provided I would guess that the hydrology criteria is met (reference the text in Comment D11-3) and most likely there is probably some gleying or mottling in the soils, thus meeting soils requirement. Vegetation appears to be the limiting factor in the wetland designation. The only clue to this is the statement at the top of page D11-2 that states "Had wetlands been identified in the field using indicator species...". The reviewer would like some expansion in the text regarding the vegetation present (e.g. a short list of the major species present) because it appears there is more than just Sagebrush and an ocular estimate of the percentage of upland species present to validate that the wetland vegetation criteria were not met. Please revise the text accordingly. (BRW)

- 6) On Figure D11-1, the legend shows the symbol for the plant site but it does not appear that the plant site is actually shown on the map. Also, some of the potential wetland locations are obscured by the cross hatch symbol used to show the mine units. (MM)

*LC's response: The location of the Plant has been added to the map. The symbols for the Mine Units have also been changed because the 'center' of each Mine Unit, represented by a circle within the cross-hatch, was difficult to distinguish from the symbol for a potential wetland, particularly in the Mine Units with blue cross-hatch. As discussed in the text, none of three potential wetlands were within the Mine Units.*

**Response acceptable.** The map has been revised as requested. (BRW for MM)

#### New Information – Wetlands Section

*There has been a change in conditions at the location in T25N, R92W, Section 21 since Appendix D-11 was originally written. The well at that location, Battle Spring Draw Well No. 4551, has been put back into service and a dirt 'tank' established. These changes have been documented in Appendix D9, and cross-referenced in Section D6.3 of Appendix D6.*

### **Volume 5 – (Operations Plan and Reclamation Plan):**

#### ***Operations Plan (OP)***

- 1) All maps must be presented at a standard engineering scale which should be stated on the map, in addition to the bar scale. Odd scales such as 1"=110' (Fig. OP-7c), 1"=1,760' (Fig. OP-2a),

1"=1,540' (Plate E-1), 1"=1,620' (Plate C-1), 1"=16' (Plate OP-1) or 1"=1,700' (Figure RP-2) are not acceptable. Typical map scales used in mine permit applications are 1"=2,000' and/or 1"=500'. It is helpful to present all maps in the application at a few consistent scales to facilitate comparison of maps or overlaying them on a light table. (MM)

*LC's response:* The map scales have been reviewed and adjusted to allow for similar and standard scales. When appropriate, maps were plotted on 11" x 17" paper. However, when greater detail was needed, maps were plotted on plates.

**Response acceptable. (MM)**

- 2) The LQD Administrator has determined that an ISL mine permit application must, at a minimum, include a detailed plan for the first well field. (MM)

*LC's response:* Pursuant to discussions during the June 22, 2009 meeting in Casper between LQD and LC ISR, LLC, the wellfield package for the first mine unit will be supplied to LQD for review and approval prior to issuance of the permit to mine.

**Response acceptable, Pending submittal of first wellfield package. (MM)**

- 3) **Section OP 1.0, Overview of Proposed Operation:** In the first paragraph it states that "the surface area to be affected by the ISR operation will total 285 acres". However, this figure is inconsistent with Table OP-2 which indicates 58 acres will be affected by the operation. It should be noted that all of the site's roads (including so-called "tertiary" roads or two-tracks) must be included in the total affected acreage. Refer to Mark Moxley's comment number 6 below for more suggestions on how to address this. (MLB)

*LC's Response:* Table OP-2 differentiates between acres from which topsoil is stripped and acreage disturbed versus acres on which topsoil is left in place but vegetation may be affected.

**Response acceptable. Also addressed in Comment OP-6 below. (MLB)**

- 4) **Section OP 1.1, Site Facilities Layout:** should include a detailed facilities site plan map presented on a topographic base at a scale of 1"=100' with a 2' contour interval. All facilities and structures should be shown, including lay-down yards, parking areas, site drainage control features, ponds and topsoil stockpiles. (MM)

*LC's Response:* Plate OP-2, which shows the locations of the facilities within the Plant, has been added to the permit.

**Response partially acceptable.** Plate OP-2, Plant and Shop Detail, should be revised to address the following:

- a. The plant, shop and ponds should be labeled.
- b. The 6975' contour line is mislabeled as 6970' inside the plant building.
- c. The location of the plant water well should be shown.
- d. Miscellaneous features, such as the two small squares located southeast of the plant, should be labeled.
- e. Drainage and diversion ditches, runoff control and containment structures should be shown.
- f. The location of the staging area illustrated on the in-set drawing should be shown relative to the plant, or Plate OP-1 should be referenced.



g. The two parallel fence lines east of the ponds may pose a hazard to wildlife and could probably be replaced by a single fence. **(MM)**

- 5) **Figure OP-2a (and Plate E1):** All roads to be improved or constructed, including primary, main and secondary, should be clearly identified and shown on the maps (e.g. Plate E-1 and Fig. Op-2a) and should be included in the permit area. Roads that provide access to the site from a formally designated public road (e.g., name and road number) and where maintenance will be incumbent on Lost Creek must be made part of the permit. Please provide a ROW agreement and revise the permit area boundary to include all access roads. Legal descriptions should be provided for the primary access roads from that point that they leave the county roads (i.e. the Baroil Road, the Minerals Ex Road and the Wamsutter Road). **(BRW and MM)**

*LC's Response: The permit area has been enlarged to include the eastern and western access roads per WDEQ-LQD's request. Figure OP-1 and Plate E-1 have been revised accordingly to show the new permit area and the access roads. Appendix C has been updated to include the legal description of the permit area including the eastern and western access roads. The permit area added for the roads is 100 feet wide for the entire length of the road.*

*The BLM confirmed in a letter dated September 10, 2009 to Lost Creek ISR, LLC that "Roads constructed or upgraded for access to mining claims and powerlines constructed for uses incidental and necessary for mining operations do not require a right of way permit." Therefore, no right of way permit will be sought from BLM.*

**Response acceptable.** Plate OP-1 and the Appendix C have been revised to include the East and West access roads within the permit area. No ROW agreement is necessary per the BLM letter; it is assumed that the BLM will include the roads within their Plan of Operations. **(BRW and MM)**

- 6) **Section OP 1.0, Overview of Proposed Operation (Page OP-1) and Section OP 2.3, Land Use (Page OP-7):** These sections state that the operation will affect approximately 285 acres. Form 1 also lists 285 acres. Does this figure include all affected lands such as roads? On page OP-3 it is stated that each well field will cover about 50 acres. Six well fields @ 50 acres would total 300 acres. Table OP-2 only lists 58 acres to be affected, which is inconsistent and unrealistic. Table OP-2 should be removed. Table OP-4 contains a better accounting of affected areas (285 acres). Well fields should be considered to be affected and should be accounted as such (the monitor well ring is a reasonable affected area boundary). An accurate estimate of affected lands for the life of the mine, within the proposed permit boundary, is required. **(MM)**

*LC's Response: Please see Response to Comment V5, OP Comment 3.*

**Response partially acceptable.** The estimate of affected area has been revised upwards from 285 to 324 acres. This appears to be a reasonable estimate based on the information included in Table OP-2, however the assumptions used to develop the estimate should be clearly described. For example: it appears that for pipelines and drilling outside of the wellfield pattern areas only the area of the excavation was counted, not the associated area affected by topsoil and subsoil piles or the area affected by backfilling and regrading operations. This should be clarified. As another example: it is stated in the comments column on page 2 of the table that the estimates did not account for pre-existing road disturbance even though new roads will follow existing two-tracks where possible. Is this true of all roads? Please describe all assumptions used in the acreage estimates. **(MM)**

- 7) **Section OP 1.0, Overview of Proposed Operation:** The text indicates that the proposed permit area encompasses 4,220 acres and the disturbance area will encompass approximately 285 acres. The

application goes on to state that each well field will consist of a reserve block of approximately 50 acres and there are six proposed well fields. This later figure does not include the disturbance associated with the facilities area. None of the above figures account for the access road. Needless to say, all of the above is contradictory. While it is understood that there will be some need for ancillary areas, Lost Creek has not demonstrated by the permit area must be 10 times greater than the proposed disturbance. Please address the above. **(BRW)**

*LC's Response:* The size of the Permit Area was based on a number of factors, in particular: the necessary spacing for the deep disposal wells; potential development; and practical land use considerations. With respect to the deep wells, five wells are currently planned. To accommodate regulatory requirements and meet the necessary injection criteria, the wells are widely spaced and located in Township 25 North, Range 93 West, Sections 13, 17, 18, 19, and 25. Plate OP1 has been updated to show the locations of the wells.

*With respect to potential development, LC ISR, LLC is interested in potential exploration and production targets in areas near (or vertical to) the proposed mine units. Rather than 'piecemeal' the baseline data for these areas, LC ISR, LLC considered it more effective to cover a larger area at one time. In addition, this approach provides more data for these areas than would be obtained for a Drilling Notification.*

*With respect to practical land use considerations, the Permit Area boundaries are in some cases designed to coincide with 'claim block' or lease boundaries. These boundaries may extend outside areas of interest for exploration or production, but for easier administration, they were included in the Permit Area.*

**Response not acceptable.** None of the maps indicate the potential presence of ore in Sections 16 and 25, thus to include the entire section just for the sake of one deep disposal well or for exploratory purposes does not hold merit. Baseline information (e.g., soils, vegetation, and hydrology) can be collected outside the permit area without inclusion of such lands. In addition, Figure OP-2A indicates that Well Field 6 will abut the permit area boundary without sufficient permitted lands available for monitoring well ring installation. Please provide further justification for the permit area boundary as presented. **(BRW)**

- 8) **Plate OP-1.** The proximity of the pond directly adjacent to the processing facilities raises concerns regarding the following: ability to monitor the pond or conduct any potential future corrective action with little to no room on the west side; the inability to expand the processing building to the east; the inability to use sprayers for enhanced evaporative effect, due to the proximity to the building; the limited use of noise deterrents to prevent waterfowl from landing on the pond, due to its proximity to the plant. **(AB)**

*LC's Response:* The location of the ponds adjacent to the processing facilities was selected based on a variety of factors related to construction and operation needs, including those noted above. The pond construction, with double liner, leak detection, and redundant capacity (Section OP 2.9.4), is designed to prevent the need for such extensive corrective action that would require work under the processing facilities. Should expansion of the processing building be necessary, other options than expansion to the east are considered preferable for a variety of reasons not related to the ponds. Sprayers are not needed because the ponds will not be used for evaporation (Section OP 3.6.3.1). The proximity of the ponds to the active areas of the Plant may provide as effective as noise deterrents in discouraging water fowl from landing on the ponds. In addition, the proximity of the ponds allows for a shorter pipeline to the ponds, reducing the possibilities for leakage along that length, and for easier access for daily checks of the ponds (Section 2.9.4).



$$\begin{aligned} \text{Pond Fluid Depth} &= 161711 \text{ cu. ft.} / (160 \text{ ft. wide} \times 260 \text{ ft. long}) \\ &= 3.9 \text{ feet deep} \end{aligned}$$

The ponds are redundant in capacity allowing for maintenance of the ponds in the event of a liner problem.

**Response not acceptable.** The original comment stated that the pond designs were not acceptable for several reasons, but not limited to several items identified above. The proposed designs do not meet the criteria as outlined in 40 CFR 264, SubPart K (see attached). In addition, no details were provided concerning QA/QC criteria that would be used to evaluate seam quality, only that a factory representative would be on hand. Please make the appropriate revisions to the designs. **(BRW)**

- 10) **Figures OP-2a and OP-2b** show the powerline and pipeline layout along with the ore body. Please include the location of the Lost Creek fault(s) on these figures as well, as its location is a factor in the mine's operations. **(AB)**

**LC's Response:** *Figures OP-2a and OP-2b have been revised to show the fault location.*

**Response acceptable.** The two Figures were revised to show the faults. Greater detail on the location of the faults has been included. **(AB)**

- 11) **Figure OP-2a Site Layout:** A much more detailed Mine Plan map will need to be included in the permit. It should indicate all roads, fencing, topsoil pile locations, stormwater diversion structures, chemical storage areas, lay down yards, easements, utilities, pipelines, monitor well locations, air and weather monitoring stations, etc. There should be one comprehensive map that indicates where any surface disturbance or feature is planned. **(AB)**

**LC's Response:** *Plate OP-1 has been updated and revised to show the life-of-project disturbance, and Plate OP-2 has been added to show more detail at the Plant. Plate OP-1 also shows estimated locations of disturbance within the mine units, based on currently available information. The specific locations of all the surface features in the mine units have not yet been determined and will be based on the ore distribution within each mine unit. Therefore, the Mine Unit packages will include the details requested above as they pertain to the individual mine units.*

**Response not acceptable.** Culvert locations are shown on Plate OP-1 for the main E/W road, but no culverts have been designated on the roads within the well fields, although drainages are crossed. Please indicate whether the Monitor Well Ring and its access road will be located inside or outside the fence for each wellfield. **(AB)**

- 12) **Section OP1.1 Site Facility Layout:** The underground power lines should be in conduit, as opposed to direct burial. This should be specified in the plan. **(AB)**

**LC's Response:** *All powerlines to the point of transform from 34,500 volts to 480 volts will be overhead lines built compliant to regional raptor specifications (see Response to Comment V5, OP#34). After transform, lines will be installed per the NEC 2008 Handbook. Specifically, Table 300.5 details the depth of burial and Article 340, Section II, 340.10, (1) specifies the use of Type UF cable for direct burial.*

*LCI plans to use direct burial cable as allowed in the NEC 2008 Handbook to deliver power to the header house and to the production wells as needed.*

**Response not acceptable.** LC's response is acceptable, however, the reviewer could not find where the basic information in the response was incorporated into the text. Please make the appropriate updates to the text and/or direct the reviewer to where the information is located. **(BRW for AB)**

- 13) **Section OP 2.1 Project Schedule:** How is the amount of time for mine unit development, production, ground water sweep, reverse osmosis etc. determined. Calculations should be presented which indicate the time it will take to perform each step, based on the hydrologic conditions of the ore body. **(AB)**

*LC's Reponse: The time frames associated with development, production, restoration and reclamation are based on numerous factors. The main factors in determining the progression of mining at a site are hydrologic conditions, corporate production expectations and corporate capabilities which include knowledge and experience in the application of in-situ uranium production and restoration operations. The response outlined in detail how LC ISR, LLC has determined the time requirements for each of the ISR steps in Figure OP-4a.*

**Response not acceptable.** The assumptions outlined in the steps provided in the response should be provided as part of the permit application. They could be added to a Figure OP4-c, or incorporated into the text of Section OP2.1, Project Schedule. **(AB)**

- 14) **Section OP 2.1 Project Schedule:** What are the criteria to move from production into restoration, and restoration to stability monitoring? This should be specified. **(AB)**

*LC's Response: The criteria for moving from production to restoration are described in Section RP 1.0. A cross-reference to that section has been added to Section OP 2.1. The monitoring that will take place during restoration and prior to transition from restoration to stability are described in the last paragraph of Section RP 2.3.2 and in Section RP 2.5, respectively. Development of the restoration criteria is discussed in Section RP 2.2. A cross-reference to the appropriate sections has been added to Section OP 2.1.*

**Response acceptable.** The cross reference provides the necessary information. **(AB)**

- 15) **Section OP 2.1, Project Schedule:** should demonstrate that reclamation will be contemporaneous with mining operations. Since the schedule presented in Figure OP-4a is considered to be somewhat conceptual and subject to change, definitive commitments such as the following should be provided, for example:
- seamless transition from production to restoration with no well field down time
  - no inactive well fields for periods exceeding 30 days
  - specified minimum restoration flow rates
  - no more than two well fields in production at any given time
  - complete restoration of the first well field, through stabilization, before initiating production from the 5<sup>th</sup> well field **(MM)**

*LC's Response: As required in R&R Ch. 3 Sec. 2(k) and Ch. 11 Sec. 5(a)(i), the project schedule (Figure OP-4a) shows clearly that groundwater restoration activities will commence directly after mining operations are completed in each mine unit and restoration operations will occur concurrently with mining operations in other units as long as mining operations are ongoing. The schedule demonstrates a coordinated sequence of mining, restoration and reclamation with ground*

*water restoration commencing directly following the determination of completion of uranium recovery (mining) in the first production area, consistent with the orderly and economic development of the property. Further, the capacity of the water/waste water treatment systems and correlation of the capacity with the mining and restoration schedule is clearly demonstrated in the presentation and discussion of Figures OP-5a through OP-5f.*

*R&R Ch. 3 Sec. 2(k), and/or other (non-cited) WDEQ-LQD regulations, do not suggest that definitive commitments should be provided when a schedule is "considered to be somewhat conceptual and subject to change." Indeed, the requirement to include a project schedule update with each annual report reflects an understanding that industrial operations are subject to changing economic and political conditions. Activities that may be deemed economic can change from year to year. Never the less, as stated in Section OP 2.1 of the permit application, LC ISR, LLC has committed to installing the specified restoration equipment and waste water disposal systems prior to commencement of mining at the site.*

*Figure OP-4a illustrates that the purchase of the restoration equipment and waste water disposal systems prior to the commencement of production will result in an idle investment for the first two years of the operational life. This action unequivocally demonstrates LC ISR, LLC's commitment to achieve the earliest possible reclamation consistent with the orderly and economic development of the property and to meet the WDEQ staff requirements of this Technical Comment. In fact, this commitment goes beyond the R&R Ch. 3, Sec 2(k)(i)(d) requirement of "orderly and economic development" by truly ignoring the fundamental economic principles of opportunity cost, deferring discretionary capital expenditures, and preservation of finite capital resources.*

*Responsible capital budgeting practices give explicit consideration to the time factor in the value of money. Timing of capital expenditures is therefore crucial to an investment's success. The opportunity cost of an expenditure made in advance of when necessary is detrimental to the investment's overall return. In other words, the money could have been put to better use at the time and the loss of this alternative use represents an opportunity cost. LC ISR, LLC projects that the advanced expenditure required to meet this commitment will approach eight million dollars.*

*Another consideration is the scarcity of capital. LC ISR, LLC presently has no sources of operating cash flows and thus has a finite amount of capital resources available to satisfy the nearly eight million dollar capital requirement of this project commitment. Any discretionary capital expenditures should normally be deferred until operating cash flows are available to fund the expenditures. The finite capital resources of the company should be preserved to enable the company to achieve production and subsequently generate operating cash flow. A discretionary capital expenditure made in advance of when necessary decreases the capital resources of the company and increases the project's risk without any corresponding increase in return.*

*Figure OP-4b presents the proposed restoration equipment installation schedule. The figure has been revised in light of regulatory/permitting delays with both the NRC and the WDEQ-LQD with the understanding that neither agency will allow construction of process facilities prior to issuance of the license/permit. In combination, Figures OP-4a and OP-4b represent LC ISR, LLC's detailed level of advanced planning and its unprecedented financial commitment to restore the affected aquifers in an orderly timeframe.*

**Response acceptable.** The project schedule shown in Figure OP-4a and 4b shows no more than two mine units in production at any given time and provides for contemporaneous reclamation.  
(MM)

- 16) Section OP 2.1, Project Schedule, Page OP-5: The use of ground water sweep with direct disposal of the produced water, is no longer considered to be BPT due to excessive consumption of ground water and resultant impacts to ground water resources. This section (as well as section RP 2.3.1), should be revised to clarify that ground water sweep will only be employed when the produced water can be treated and re-injected. **(MLB)**

*LC's Response:* This comment was addressed by LC in their response to Comment RP1.

**Refer to LQD's review of Comment RP1 for acceptability determination. (MLB)**

- 17) Page OP-5 (and RP-1), the statement is made that an updated schedule will be supplied with the annual report if the operation or restoration schedule varies from that shown in Figure OP-4a (and Figure RP-1). Lost Creek ISR should understand that they are obligated to follow the approved mine and reclamation schedule (refer to W.S. 35-11-415). If Lost Creek ISR plans to revise the approved schedule then it must be submitted as a permit revision for review and approval by LQD. An updated schedule submitted with an annual report would be informational, (and would probably trigger a request for a permit revision from LQD) but would not replace the schedule in the approved permit. Please revise these sections to reflect this understanding. **(MM)**

*LC's Response:* The next to last paragraph in Section OP 2.1 and the first paragraph in the Reclamation Plan have been revised to include a commitment to follow the approved schedule or to seek a revision if necessary. The last sentence in the first paragraph of Section OP 2.1 has also been edited to reflect the anticipated average annual production.

**Response acceptable.** Appropriate changes have been made to the text on the top of page OP-6. **(MM)**

- 18) Figures OP-5a-e. These water balance flow charts should include the average and minimum evapotranspiration rates of the evaporation ponds to show the full water balance of the ponds, and that the ponds are up to capacity requirements. **(AB)**

*LC's Response:* The primary purpose of the storage ponds is to allow for maintenance of the disposal wells. The "Operations Plan, Section OP 5.2.3.1, Storage Ponds" details that purpose. Evaporative loss is not included in the water balance calculations and any evaporative losses will enhance the disposal capacity of the waste water system.

**Response acceptable.** Since these are storage ponds as opposed to disposal (Evaporation) ponds, the evaporation rate is not as relevant, and does not need to be included. **(AB)**

- 19) Section OP 2.2, Additional Regulatory Requirements. Reference is made to the SWPPP, yet a complete hydrologic control plan for the facilities area and associated appurtenances as well as the first mine unit must be included in the Operations Plan. Will water from the facilities area be diverted to a lined site containment pond. The hydrologic control plan for the remaining well fields maybe submitted with the individual well field packages. **(BRW and AB)**

*LC's Response:* The drainage plan, stamped by a Professional Engineer, is included as Attachment OP-4 to the Application. It is important to note that the drainage plan was developed to ensure that surface water runoff will not cause undue soil erosion or excessive pooling of water. The drainage plan was not developed to prevent the migration of chemical spills. Due to the low relief of the area, lack of contaminant sources, and arid conditions, no lined containment ponds for runoff or other substantial erosion surface water control structures are required. No diversion structures are

*anticipated. When roads cross an ephemeral drainage a culvert will be installed. The culvert will be designed by a professional engineer in accordance with WDEQ-LQD Guideline 15 (see Sections OP 1.1 and 2.5.2).*

*During construction activities, erosion of topsoil into drainages will be minimized as required by the use of silt fence, hay bales, or other similar systems. There are no plans to alter the natural drainage within the wellfield areas.*

**Response not acceptable.** The only material presented concerns the WYDES Stormwater Permit and some general maps that illustrate drainage / flow direction. In the reviewer's opinion the material presented does not meet the intent of W.S. § 35-11-406(b)(v). Specifically, generic designs of the proposed Alternate Sediment Control Measures to be utilized should be furnished as well as the approximate installation location on one of the drainage maps provided. Please provide a complete hydrologic control plan as originally requested. **(BRW)**

- 20) Table OP-2 and the text on Page OP-7: Section "OP 2.3 – Land Use" states that a total of approximately 285 acres will be affected throughout the project. However, Table OP-2 only indicates 58 acres as being affected. This inconsistency should be clarified. It should be noted that Table OP-2 should include all disturbed areas throughout the life of the mine including all "tertiary roads". **(MLB)**

LC's Response: Please see Response to Comment OP3.

**Refer to LQD's review of Comment OP6 for acceptability determination. (MLB)**

- 21) Section OP 2.4, Cultural Resources Mitigation Program, Page OP-8: In the middle of line 7 in the first paragraph, after the sentence ending in the word "excavations", another sentence should be added. The new sentence must make a commitment to add via permit revision any/all archaeological restrictions and protocol in to the permit document. **(MLB)**

LC's Response: A paragraph which discusses existing and future restrictions and protocol has been added to the end of Section OP 2.4.

**Response acceptable. (MLB)**

- 22) Section OP 2.5, Topsoil Management, Page OP-8: The second paragraph of this section reiterates that only 58 acres will be affected. However, this value disagrees with the previously stated value of 285 acres (in the Land Use section of the Operations Plan, Page OP-7). Please clarify which value is accurate: 58 acres or 285 acres. **(MLB)**

LC's Response: Please see Response to Comment OP3.

**Refer to LQD's review of Comment OP6 for acceptability determination. (MLB)**

- 23) Section OP 2.5, Topsoil Management, Page OP-8: The text on page OP-8 states that detailed soil surveys will be conducted at the plant site as well as each mine unit to provide specific information for topsoil protection and management. Given that the first well field package must be included with the application, this is not acceptable. The detailed soil survey(s) necessary for topsoil management decisions and commitments at the first mine unit must be included in the Permit Application. **(BRW and MLB)**



*LC's Response:* With respect to the life-of-mine disturbance, the detailed soil survey information is included in Attachments OP-5a and 5b. With respect to Mine Unit One, please see Response to Comment V5, OP#2.

**Response not acceptable.** The reviewer agrees that the soil survey for Mine Unit 1 could be submitted prior to permit approval. However, the long-term facilities area surveys are incomplete (reference Attachment 5b). In addition, the surveys lack clarity in terms of specifying salvage depths. The comment remains outstanding until the survey in Attachment 5b is complete and salvage depths are clearly identified. **(BRW)**

- 24) Section OP 2.5, Topsoil Management: should include a plan for well field layout and installation to accompany Figure OP-7c. **(MM)**

*LC's Response:* Pursuant to discussions at the June 22, 2009 meeting in Casper with WDEQ and LCI, a generic discussion of wellfield design criteria is included in Section OP 2.5 of the permit application.

**Response not acceptable.** Please provide a written plan and revisions to Fig. OP-6 describing and illustrating in detail the specific measures to be employed during wellfield development operations to minimize disturbance and protect the native vegetation and soils. These measures should include up-front planning and installation of roads to header houses (with topsoil salvage); establishment of designated temporary off-road traffic routes; construction of appropriate drainage crossings, culverts or graveled low-water crossings; centralization and co-location of pipelines and utility lines; restricting off-road operations during wet or muddy conditions; orderly and sequenced installation of wells and utilities, designation of zones or corridors of "no disturbance"; use of low-round pressure vehicles; and appropriate enforcement of these protective measures. The goal is to preserve a substantial portion (at least 50%) of the native vegetation in the wellfield. If this is not achievable then topsoil stripping may be required prior to wellfield development. **(MM)**

- 25) Section OP 2.5, Topsoil Management, Page OP-8: The third paragraph of this section states that "Per WDEQ-LQD requirements, topsoil will not be stripped from areas where there is minor disturbance, such as light-use-roads, monitoring stations, fences, and drill sites (except for the mud pits);". Given the definition of "minor disturbance" as maintaining 50% of the native land remaining undisturbed, it has been the experience of this reviewer that in practice, it is not feasible to assume that the well fields will witness only minor disturbance. That is, based on this reviewer's observations of the disturbance levels associated with delineation drilling at the Lost Creek Project, it is expected that greater than 50% of the native vegetation will be adversely affected during the construction of the mine units. In light of that, the LQD will require that mine units and the roads leading to them be completely stripped of topsoil. **(MLB)**

*LC's Response:* Pursuant to discussions during the June 22, 2009 meeting in Casper between LQD and LC ISR, LLC, the mine unit area will not be stripped unless greater than 50% of the area inside the monitor well ring will be disturbed. Areas impacted by main and secondary roads will be stripped of topsoil prior to road construction. Tertiary (two-track) roads will not be stripped of topsoil as a general practice. However, portions of tertiary roads may be stripped of topsoil and improved as needed to ensure the road remains in good condition.

While LC ISR, LLC fully intends to comply with the verbal agreement from the June 22, 2009 meeting, LC ISR, LLC believes it is important to document why stripping of topsoil within the mine unit is not considered a regulatory requirement or advisable from a technical standpoint. Regulations pertaining to topsoil protection can be found in WDEQ-LQD Rules and Regulations

*Chapter 3 Section 2(c)(i) through (iii) and Chapter 11 Section 4(a)(iii). The language in both chapters is very similar. With regard to topsoil protection in the wellfield, Chapter 11 Section 4(a)(iii) states in pertinent part,*

*"The Administrator may authorize topsoil to remain on areas where minor disturbance will occur associated with construction and installation activities including but not limited to light-use roads, signs, **wellfields** (*emphasis added*), utility lines, fences, monitoring stations, and drilling provided that the minor disturbance will not destroy the protective vegetative cover, increase erosion, nor adversely affect the soil resource."*

*It is LC ISR, LLC's position that stripping of topsoil within the wellfield area will create more disturbance (water and wind erosion and topsoil degradation) than leaving it in place. This assertion is based on many factors including:*

- Experience at other facilities, such as Wellfield 1 at Smith Ranch. Because of the sandy nature of the soils in this wellfield, erosion and re-establishment of vegetation were problematic after wellfield installation, even though topsoil was not stripped. Ultimately, use of a cover crop (alternated in rows with the permanent seed mix) was necessary. Had the topsoil been stripped, it is likely the problems would have been even worse;*
- The results of a study performed by the University of Wyoming College of Agriculture entitled "Final Research Report: Topsoil Management on In-Situ Uranium Wellfields" by P. Stahl et. al. This study, funded by the Wyoming Mining Association and developed from suggestions and comments from the Wyoming Department of Environmental Quality was finalized in January 1998.*
- A September 14, 1998 letter from WDEQ Director Dennis Hemmer to the Director of the Wyoming Mining Association Marion Loomis stating in pertinent part, "With regard to topsoil management at in-situ operations, you were concerned that DEQ would require stripping of the entire wellfield. I will not support a requirement to strip the entire wellfield. While our first priority in reclamation must be preserving topsoil, other than wasting or losing topsoil and contaminating topsoil, I believe one of the most destructive actions we take is stripping and stockpiling topsoil."*

*Stripping the topsoil will result in the removal and destruction of 100% of the vegetation cover and associated root systems. By leaving the topsoil in place, at least some of the vegetation will survive, and the root system will help maintain the soils integrity thereby minimizing wind and water erosion. The subsoil at the site is composed of generally unconsolidated fines. When exposed to wind and rain this subsoil easily erodes and may contribute to increased sediment load in ephemeral drainages and decreased air quality. In addition, a particular concern at the Lost Creek site is the preservation of sagebrush. The ability of sagebrush to recover after mechanical damage (as opposed to fire damage) has been a bane to those trying to clear lands for other purposes. In this case, retaining as much sagebrush as possible should help with respect to wildlife habitat.*

*Finally, stripping of topsoil requires the use of heavy equipment such as scrapers and blades. This equipment will cause as much soil compaction as the relatively light equipment that will be used at the site otherwise. A loaded scraper commonly used to strip topsoil tips the scale at 70,000 to 144,630 pounds (Caterpillar 613G and 623G respectively). The next heaviest piece of equipment at the site will be a 60,000 pound drill rig. Stripping of topsoil requires that the scraper drive over the soil to pick it up and then drive over the topsoil pile to lay down the load. During reclamation the process will be reversed and the scraper will drive over the soil twice more. The rough soil will then have to be smoothed with a motor grader before revegetation. LC ISR, LLC realizes that typical operations within a mine unit will result in topsoil compaction. However, the effect of*

*compaction will be mitigated by freeze/thaw cycles and if necessary by ripping of some areas before revegetation.*

*LC ISR LLC's agrees with WDEQ-LQD Guideline 4 Attachment III Section I which states in part, "To minimize disturbance below the surface, preserve soil structure and facilitate the reestablishment of native vegetation, topsoil and subsoil are generally not stripped and stockpiled for the entire wellfield." Areas where the topsoil resource cannot be protected should be stripped (i.e. building sites, trenches, graveled roads, and areas susceptible to deleterious contamination from chemicals).*

**Response acceptable.** The LQD agrees that LC's statements generally reflect the agreements made during the June 22, 2009 meeting in Casper, however it was LQD's understanding that LC would provide a pro-active plan that would explain how they would preserve 50% of the native vegetation in the wellfields. Installation of the first wellfield will be monitored periodically by the LQD to ensure that 50% criteria are met. If the 50% criteria cannot be met, the characteristics of the soils present indicate that they can be easily eroded if vegetation is not present, thus, it maybe prudent to temporarily stockpile the topsoil. When topsoil is stockpiled for a relatively short period (e.g., less than a year), a viable seed source still exists and revegetation success is generally good. **(BRW for MLB)**

- 26) Section OP 2.5.2 Long Term Topsoil Protection, Section OP2.6 Roads, Figure OP-2c. Topsoil stripping of roads has not been mentioned but is required for topsoil protection. The text should commit to topsoil stripping for roads and Figure OP-2c should also indicate that topsoil will be stripped. The amount of topsoil to be stripped should be specified and the height, dimensions, and locations of topsoil piles should be detailed. In addition, the seed mixture for the topsoil piles should be specified. **(AB)**

*LC's Response: The text in Section OP 2.6 has been revised to state primary and secondary roads (as defined in WDEQ-LQD Guideline 4 Attachment III Section III(B)) will be stripped of topsoil. Figure OP-2c is intended to show road design and therefore has not been revised to discuss topsoil removal.*

*Topsoil depths in the areas around the plant facility, primary and secondary roads, and the first wellfield have all been characterized by Order 1-2 soil surveys. The results of the soil surveys in the area of the plant facility and roads is provided in Attachments OP-5a and 5b of the permit application. Results of the soil survey for the first mine unit will be provided in the mine unit package.*

*The long-term seed mixture to be used on long-term topsoil piles is given in Table RP-3 with the exception that shrubs will be removed from the mix. An initial vigorous cover crop, such as sterile rye, may be planted to stabilize the topsoil pile and then the final long-term seed mixture interseeded.*

**Response not acceptable.** Section OP2.6 has been revised to include a commitment to strip primary and secondary roads. Please include a statement clarifying that soils in and adjacent to existing two-track roads that will be upgraded to secondary roads will be stripped. Soil survey information has been provided in Attachments OP-5a and OP-5b. No changes were made to Figure OP-2c, yet in the cross sections of the road designs these figures indicate "original grade" with gravel applied on top of the original grade. This seems to imply that no topsoil is stripped. Please change "original grade" to a term that indicates that the topsoil has already been removed. **(AB)**

- 27) Section OP 2.5, Topsoil Management. Paragraph 3 states that topsoil will not be stripped from light use roads. It is stated that roads to monitoring wells will not be upgraded. Given that the monitoring wells will need to have year round access, if snow removal is necessary to access an area, then the road should be upgraded, and the topsoil should be stripped. **(AB)**

*LC's Response:* Pursuant to discussions held on June 22, 2009 in Casper between LQD and LC ISR, LLC, roads to monitor wells will only be stripped of topsoil if the roads must be upgraded to maintain their integrity. The statement referenced in Section OP 2.5 has been revised to document this agreement. This approach is consistent with WDEQ-LQD Guideline 4 Attachment III Section VI(E) which states that topsoil is generally not salvaged from monitor well roads.

**Response acceptable.** Section OP 2.5 Paragraph 3 was revised to provide for topsoil stripping of a monitor well road if required to maintain its integrity. **(AB)**

- 28) Section OP 2.5.2, Long Term Topsoil Protection: should specify that all topsoil stockpiles will be sloped on all sides to 3:1 or flatter and will be promptly drill-seeded with the permanent seed mix, minus the shrub species. **(MM)**

*LC's Response:* Section OP2.5.2 has been revised to state that all long-term stockpiles of topsoil will be sloped on all sides at a slope of 3:1 or less and reseeded as soon as possible using the approved seed mix, minus the shrub species.

**Response acceptable.** The text in Section 2.5.2.1 has been revised as requested. **(MM)**

- 29) Section OP 2.6, Roads, Page OP-10 and Figure OP-2a: The first paragraph of Section OP 2.6 as well as Figure OP-2a neglect to acknowledge and/or depict the roads that will be needed to access monitoring wells (sometimes referred to as "tertiary" roads). These roads must be discussed in the text and must be depicted on Figure OP-2a. Tertiary roads must also be depicted on any other figures depicting the project's roads. **(MLB)**

*LC's Response:* Plate OP-1 has been updated to show the approximate location of all proposed roads. The location of roads will be need to be adjusted as the ore body is further delineated. LC ISR, LLC will submit the proposed changes to WDEQ-LQD for review and approval. The site road map will subsequently be adjusted to accurately reflect road locations.

*Please note that the first paragraph in Section OP 2.6 is intended to discuss primary and secondary roads. The fourth paragraph discusses two track roads that will be used to access monitor wells. Each figure within the application serves a specific purpose(s). For example, Figure OP-1 shows the site layout including the roads. Therefore, it is not reasonable to put all the roads on all of the figures. This would result in illegible figures.*

**Response not acceptable.** The text discussion is generally acceptable. However, the text indicates that Secondary Roads will be utilized to access the various deep well injection sites. Figure OP-1 shows a Secondary Road that accesses a deep disposal well in the SESE of Section 19 that connects to nothing. Additionally, the Secondary Road that connects to the deep well injection site in Section 16 connects to an existing two-track. According to the reviewer's interpretation of the text this two-track would be upgraded to a secondary road and should be illustrated as such. The map legend should differentiate between Primary, Secondary, and Tertiary Roads as they will be constructed to different standards. Finally, Figure OP-1 and others which illustrate road locations do not illustrate the same alignment as what is shown on Plate OP-1. Please revise the submittal accordingly. **(BRW for MLB)**

- 30) Section OP 2.6, Roads, Page OP-11: The fourth paragraph acknowledges that tertiary (two-track) roads will be needed and used to access the monitoring wells and header houses at the project. The text indicates that some pre-existing two tracks can and will be used for these purposes. However, the text also refers to the routes that will be taken to some monitoring wells and header houses as "travel routes". The inference of this reviewer is that these are paths beaten through the sage brush where there is no preexisting two-track. Travel routes will quickly become two-tracks which will, in turn, require reclamation at the end of the project. All of the site's roads, two-tracks, and travel routes must be accounted for in the text as well as site maps. (MLB)

*LC's Response: Figures OP-2c and OP-7b are incorrect based on the Bureau of Land Management publication "Engineering Road Standards, Excerpts from BLM Manual, Section 9113, 1985". Figure OP-2c has been revised to show the "Secondary Access Road" width as 14 feet and the borrow ditches as 3 feet each. Figure OP-7b has been revised to show the "Secondary Road" as 14 feet wide. Table OP-4 has also been revised based on the above as well as the Response to Comment V5, #3*

***Response not acceptable.*** The LQD accepts LC's response that the exact location of roads with respect to specific mine units will be submitted with the corresponding wellfield package. However, the text within Section 2.6 does correlate with Figure OP-6A. See also Comment 31 below. Please update the figure accordingly. (BRW for MLB)

- 31) Section OP 2.6, Roads: discusses the primary access road to the plant and secondary access roads to the mine units. Figure OP-2c illustrates the main access road with a 20' wide surface and secondary access road with a 12' surface. Figure OP-7b is somewhat inconsistent. It shows a "main road" with a 20' surface accessing the well field and a 15' wide secondary road in the well field. Table OP-4 lists main access road, main roads and secondary roads. Clarification is needed relative to road classifications and widths. (MM)

***Response not acceptable.*** There is still inconsistency regarding road widths. Figures OP-2c and 3c show the secondary roads being 12' wide. Figures OP-6a and 6b show secondary roads being 15' wide. (MM)

- 32) Section OP 2.7, Vegetation Protection and Weed Control, Page OP-11: The second paragraph in this section ended with an ending quote, with no preceding quotation mark. This appears to merely a typographical error. (MLB)

*LC's Response: The typo has been corrected.*

***Response acceptable.*** The typographical error was corrected. (MLB)

- 33) Sections OP 2.8.1.2 and OP 2.8.1.5 should discuss speed limits on the various roads, including signage, employee training and enforcement policies, specifically in regards to minimizing vehicle collisions with wildlife and livestock. (MM)

*LC's Response: The specific provisions of the Wildlife Protection and Monitoring Plans have been moved from Section OP 2.8 to Attachment OP-6. Section 1.4.1 of the attachment now includes information on speed limits, training, and road usage.*

***Response acceptable.*** (SP for MM)

- 34) Section 2.8.1.4, Transmission Line: discusses power transmission lines. Raptors perching on power poles are a threat to sage grouse. Power lines should either be buried or raptor perch guards should be provided to deter raptor perching, in addition to minimizing the risk of electrocution. (MM)

*LC's Response: The specific provisions of the Wildlife Protection and Monitoring Plans have been moved from Section OP 2.8 to Attachment OP-6. Section OP 2.8.1.4 stated that roost guards would be included on transmission lines and power poles, and that commitment is now in Section 1.2.2 of the attachment.*

**Response acceptable. (SP for MM)**

- 35) Section OP 2.8.1.3, Fencing and Screening. Fencing design and specifications should be presented in the Operations Plan. Wildlife fencing, mud pit fencing and security fencing should each be specified. (AB)

*LC's Response: The specific provisions of the Wildlife Protection and Monitoring Plans have been moved from Section OP 2.8 to Attachment OP-6. Section OP 1.3.3 of Attachment OP-6 discusses fencing. Based on preliminary discussions with Mr. Scott Gamo of WGFD on August 18, 2009, use of fencing that is intended to preclude access by all wildlife to the mine units (e.g., Type I and II fencing) is not recommended due to mortality and injury concerns. Use of Type III fencing (to restrict access by cattle and wild horses) would be consistent with the approach used at other ISR operations. The exception would be in areas of the Plant, such as around the Storage Ponds.*

**Response not acceptable.** Section 1.3.3 of Attachment OP-6 has been added to address wildlife fencing around the Mine Units (Type III fencing) and around the storage pond (Type I fencing). What type of security fencing will be utilized around the processing plant? This should be addressed as part of the Operations Plan as well. (AB)

- 36) Section OP 2.8.1.3, Fencing and Screening. As water in the ponds becomes concentrated over time, it is likely that screening will be required. US Fish and Wildlife Service (USFWS) and Wyoming Game and Fish (WG&F) should be consulted regarding the ponds and their requirements. Pond sampling schedule, the type of analysis to be performed, and screen design should all be presented in the Operations Plan. (AB)

*LC's Response: Table OP-5 includes the anticipated water quality in the pond, and Section OP 1.3.3 of Attachment OP-6 discusses the pond water quality relative to wildlife. Because the ponds are not evaporation ponds and because the water in the pond will be replaced periodically, the parameter concentrations are not anticipated to increase as would the concentrations in an evaporation pond. The pond sampling parameters and schedule are discussed in Section OP 2.9.4. As noted in the Response to Comment V5, OP#54, a copy of Attachment OP-6 will be sent to WGFD and USFWS for review.*

**Response not acceptable.** Pond sampling schedule and the parameters to be monitored were provided in Section OP2.9.4. However, the need for any deterrents to birds landing on the ponds and ingesting the water is under review of WGFD and USFWS. This comment will remain unresolved pending the review of WGFD and USFWS. (AB)

- 37) Section OP 2.8.2, Wildlife Monitoring, Page OP-13: A separate table summarizing the annual wildlife monitoring schedule should be created and referenced in this section. This table must include a commitment to survey the two mile radius around the permit boundary every year for new sage grouse leks. (MLB)

*LC's Response:* For ease of review by WGFD and USFWS, Attachment OP-6 (Wildlife Protection Plan and Wildlife Monitoring Plan) has been added to the Operations Plan. Section OP 2.8 has been shortened substantially and summarizes the detailed information presented in Attachment OP-6. Table OP-A6-6 in Attachment OP-6 summarizes the wildlife monitoring schedule, and includes a commitment to survey the two-mile radius around the Permit Area for new sage grouse leks every year.

**Response acceptable. (SP for MLB)**

- 38) Section OP 2.8.1, Wildlife Monitoring: This section indicates that "...additional [protection] measures will be implemented as on-site activities..." but they are not specified. Please correct. (SP)

*LC's Response:* Wildlife protection measures are described in Attachment OP-6 Section 1.1. Specific wildlife protection measures are grouped according to Operation restrictions and New Activity/Mortality Reporting (Section 1.1.1), Infrastructure (Section 1.1.2), Human Activity (Section 1.1.3), Site Maintenance and Reclamation (Section 1.1.4), and Habitat Enhancement (Section 1.1.5).

**Response acceptable. (SP)**

- 39) Section OP 2.8.1.3, Wildlife Monitoring: This section indicates that "...Mine units will be fenced..."; however, wildlife friendly fences identified in LQD Guideline #10 should be used for the perimeter fence. This would mean that **all** mud pits would need to be fenced as pronghorn antelope and other wildlife are capable of penetrating the perimeter fence. Please correct. (SP)

*LC's Response:* Please see Response to Comment V5, OP#35.

**Response acceptable. (SP)**

- 40) Section OP 2.8.1.3, Wildlife Monitoring: Fences should not be removed until vegetation is well established. Please correct. (MM)

*LC's Response:* Attachment OP-6 Section 1.1.2.3 states that the mine unit fences will be removed after ISR operations are complete and vegetation has become reestablished unless otherwise approved and agreed upon with the Landowner (BLM).

**Response acceptable. (SP for MM)**

- 41) Section OP 2.8.1.3, Wildlife Monitoring: By only committing to net or use other deterrence only IF fluid storage ponds are determined "to be harmful" to birds, LC ISL is proposing to wait until a violation of the Migratory Bird Treaty Act (1971) occurs. Before a "taking" occurs, LC ISL should take preventative measures. Netting or other measures should be put in place immediately upon construction of any fluid holding structure larger than a mud pit. Please correct. (SP)

*LC's Response:* Please see Response to Comment V5, OP#36.

**Response acceptable. (SP)**

- 42) Section OP 2.8.1.5, Wildlife Monitoring: This section should commit to a speed limit of no more than 30 mph to minimize vehicle collisions with wildlife. Please correct. (SP)

*LC's Response: Section 1.1.3.1 of Attachment OP-6 commits to a speed limit of 30 mph for the main access routes, and no more than 20 mph on secondary roads.*

**Response acceptable. (SP)**

- 43) Section OP 2.8.1.6, Wildlife Monitoring: This section identifies "...wildlife enhancements in the Permit Area or nearby areas not proposed for disturbance...". Do "nearby areas" include only lands within the permit area or are those outside the permit area included as well? Affecting areas outside the permit boundary may represent an LQD Regulatory conflict. Although interagency coordination may relieve LQD concerns. Please correct. (SP)

*LC's Response: Attachment OP-6 Section 1.1.5 describes a commitment to work with BLM and WGFD to develop habitat enhancements in areas that are outside the Permit Area, but nearby, if these are deemed desirable by permitting agencies. If these measures represent a regulatory conflict, or are not deemed desirable and feasible, they will not be undertaken.*

**Response acceptable. (SP)**

- 44) Section OP 2.8 Wildlife Monitoring. Only monitoring of raptors and sage grouse is listed, yet vertebrates are also required to be monitored. (AB)

*LC's Response: The Wildlife Monitoring Plan is presented in Attachment OP-6 Section 2.0. LC ISR, LLC commits to monitoring: big game; sage grouse/upland birds; raptors; Migratory Birds of High Federal Interest; and lagomorphs (as prey abundance for raptors, Section 1.2.3). When completing other wildlife surveys, incidental observations of federally listed Threatened and Endangered Species, non-game mammals, non-game birds, and reptiles and amphibians made will be recorded, and these will be summarized in the Annual Report.*

**Response not acceptable.** Attachment OP-6, Wildlife Protection Plan and Wildlife Monitoring Plan has been added to the permit. Big game (pronghorn), lagomorphs, raptor, sage grouse and migratory birds are all included as part of the monitoring plan. This plan has been submitted to USFWS and WGFD and the permit will need to include their recommendations. The monitoring will need to comply with the recommendations. The LQD (Steve Platt) will need to review the written responses from these agencies. This item is unresolved pending submittal and review of the USFWS and WGFD recommendations. (AB)

- 45) Section OP 2.8.1.4, Transmission Line: Raptor deterrents designs on the transmission lines should be presented in the Operations Plan, and also approved by USFWS and WG&F. (AB)

*LC's Response: Please see Response to Comment V5, OP#34.*

**Response acceptable.** Attachment OP-6, Section 1.5.3.1 Predation, states that above ground transmission lines will have perching and roosting deterrents. (AB)

- 46) Section OP 2.8.2, Wildlife Monitoring: This section indicates that the annual report will be formatted to "...meet BLM requirements...". The LQD requires an annual report written to the format specification of the WQED-LQD (see Required Annual Report Information – For Large



Mine Operations, rev. 10/93 on the LQD website: <http://deq.state.wy.us/lqd/>). BLM can receive a copy of the annual report to the LQD. Please correct. (SP)

*LC's Response: The Annual Wildlife Monitoring Report will be formatted to meet WDEQ-LQD standards. This commitment is made in Attachment OP-6 Section 1.2.*

**Response acceptable. (SP)**

- 47) Section OP 2.8.2.1 Raptors. It is stated that monitoring will be conducted between April and July, and also states that it will be scheduled as late in the nesting season as possible. Given known nesting seasons for the likely raptors to be present, the months to conduct the monitoring should be specified. (AB)

*LC's Response: A survey for signs of golden eagle and great horned owl courtship or nesting will be conducted during the first two weeks of February. A survey for great horned owl and golden eagle nests will be completed in March. A survey will be completed in April to locate most of the nests of other species. Another survey will be completed from mid-May to mid-June to locate raptor nests that have become established since the April survey, and to check the status (activity, number of young birds) of all nests. These commitments are described in Attachment OP-6 Section 1.2.3.*

**Response acceptable.** Attachment OP-6, Section 2.3.1 Nest Status and Production Success, has been added to the permit and addresses the specifics for raptor monitoring. (AB)

- 48) Section OP 2.8.2.1 Raptors. The potential need for wildlife mitigation measures should be outlined in the Operations Plan. Approval from USFWS and WGF will be required for taking a nest, or any raptor deterrence plan. (AB)

*LC's Response: Attachment OP-6 Section 1.2.3 describes the potential need for mitigation measures, if a raptor nest is found within the area covered by surface activity restrictions. That section also commits to consulting USFWS and WGFD to determine appropriate mitigation measures. Attachment OP-6 Section 1.1.2.2, commits to using agency-approved designs for anti-roosting raptor deterrents.*

**Response not acceptable.** Attachment OP-6, Section 1.3.1 Locations and Disturbance Area. states that if a raptor nest is found within 0.5 miles of project activities, that USFWS and WGFD will be consulted and if needed appropriate mitigation permits will be obtained. Following USFWS and WGFD review, they may require that a nesting deterrence plan or other mitigation be in place prior to mining. This comment is unresolved, pending the review of Attachment OP-6 by USFWS and WGFD. (AB)

- 49) Section OP 2.8.2, Wildlife Monitoring: Annual wildlife monitoring reports also need to be included in the LQD Annual Report. This should be added to the text in paragraph one. (AB)

*LC's Response: Attachment OP-6 Section 1.0 states that the results and conclusions from each year's wildlife protection and monitoring measures will be included in LC ISR, LLC's Annual Report to WDEQ-LQD. Section 1.2 of the attachment states that the complete wildlife monitoring report--including survey methods, results, any trend, an assessment of protection measures implemented during the past year, recommendations for protection measures for the coming year, recommended modifications to monitoring or surveying, and any*

*recommendations for additional species to be monitored (e.g., a newly listed species) will be submitted to WDEQ-LQD each year.*

**Response acceptable.** Attachment OP-6, Page 1, states that the wildlife monitoring results will be provided in the LQD Annual Report. **(AB)**

- 50) **Section OP 2.8.2, Wildlife Monitoring:** Once the mine permit is approved the wildlife monitoring plan will be clearly defined in the permit and it should not be necessary to coordinate with the BLM and WGFD “annually” prior to commencing or during monitoring unless unusual circumstances occur. Annual consultation with USFWS is generally not necessary unless a T&E species is seen or if a nesting raptor is found in spring within 1 mile of current operations or if planned expansion of the operation area is to occur within 1 mile that season. Please correct. **(SP)**

*LC's Response: Attachment OP-6 Section 1.2 states that consultation with BLM, WGFD, and USFWS will be occur on an as-needed basis as needed prior to annual survey work.*

**Response acceptable. (SP)**

- 51) **Section OP 2.8.2, Wildlife Monitoring:** On page OP-13 it is indicated that LC ISL will “...document [the] circumstances...” of each wildlife incident with the operation and will included the information in the LQD annual report. LC ISR should commit to recording all incidences in a log-book kept at the mine site and available for LQD inspection. Please correct. **(SP)**

*LC's Response: In Attachment OP-6 Section 2.0, LC ISR, LLC commits to documenting all instances where Project activities may have impacted wildlife (such as wildlife/vehicle collisions on roads, or other mortality within the Permit Area).*

**Response acceptable. (SP)**

- 52) **Section OP 2.8.2.1, Wildlife Monitoring:** All available nesting habitat for raptors on the permit area and within a 1 mile perimeter should be checked for new nests every year (i.e., when the first survey of each nesting season is conducted). The volume of suitable nesting habitat is relatively small; therefore, it is not a huge task. Please correct. **(SP)**

*LC's Response: Section 2.3 of Attachment OP-6 describes the extent of the areal coverage and timing for the raptor surveys. As with the baseline surveys (Appendix D9), the perimeter will extend out one mile from the permit boundary.*

**Response acceptable. (SP)**

- 53) **Section OP 2.8.2.2, Wildlife Monitoring:** “Standard protocol” in both instances should be changed to cite methods in the baseline study and if different, the method should be clearly stated here. Please correct. **(SP)**

*LC's Response: Sage grouse lek search and lek attendance survey protocols approved by WGFD and BLM for the baseline studies are detailed in Appendix D9. These methods will be used for future surveys, as noted in Section 2.0 of Attachment OP-6, unless alternate protocols are required by USFWS or WGFD.*

**Response acceptable. (SP)**

- 54) Section OP 2.8.2.2, Sage Grouse, Page OP-15: Written documentation from the Wyoming Game & Fish and U.S. Fish and Wildlife Service which addresses any specific permitting requirements that they wish to impose based on the wildlife survey results, needs to be included in the permit document. Oral and written communication between Melissa Bautz (LQD-Lander) and Ms. Carrie Dobey (WGFD-Lander) reveal that the WGFD consider in situ uranium activities to have a similar effect on sage grouse and sage grouse habitat as does oil and gas activities.

Specifically, WGFD's "*Stipulations for Development in Core Sage Grouse Population Areas*" (dated July 31, 2008) states the following regarding in-situ uranium: "*There is no published research on specific impacts on sage grouse. Since development scenarios (well density, roads, and activity) are similar to oil and gas, assume impacts are similar to oil and gas development. Use same stipulations used for oil and gas. In-situ uranium permitting should include a requirement to acquire data on sage grouse response to development and operation.*" In light of these concerns LQD will require that a section be added to the Wildlife Monitoring portion of the Operations Plan that addresses acquisition of data on sage grouse response to development and operation. Attached is a copy of the above-referenced document from the WGFD entitled "*Stipulations for Development in Core Sage Grouse Population Areas*". The stipulations on oil and gas development can be found at the beginning of that document. (MLB)

*LC's Response:* For ease of review by WGFD and USFWS, Attachment OP-6 (Wildlife Protection Plan and Wildlife Monitoring Plan) has been added to the Operations Plan. Section OP 2.8 has been shortened substantially and summarizes the detailed information presented in Attachment OP-6. The attachment includes Table OP-A6-1 which lists the stipulations and mitigation (including comparison of ISR and oil and gas operations). LC ISR, LLC also met with Mr. Scott Gamo of WGFD on August 18, 2009, primarily to discuss sage grouse protection. A printed copy of Appendix D9, the Operations Plan, and Attachment OP-6 will be sent to Mr. Gamo and the appropriate contact at USFWS, along with an electronic copy of the entire permit document. Correspondence with WGFD and USFWS related to the protection and monitoring plans will be included in an addendum to Attachment OP-6.

**Response acceptable. (SP for MLB)**

- 55) Section OP 2.8.2.2, Sage Grouse: discusses monitoring for sage grouse. It should be noted that the project is within the WG&F designated sage grouse Core Area. Please revise this section to include annual surveys for new leks on the permit area and a one mile perimeter. Also please reference WG&F approved survey methods which are described in Appendix B of LQD Coal Rules. (MM)

*LC's Response:* Attachment OP-6 Section 1.1.1 states that the Permit Area is located within the South Pass Sage-Grouse Core Breeding Area. Sage grouse lek search and lek attendance survey protocols approved by WGFD and BLM are detailed in Attachment OP-6 Section 2.0. This section commits to conducting lek searches and lek attendance surveys within a 2-mile radius of the Permit Area.

**Response acceptable. (SP for MM)**

- 56) Section OP 2.9, Prevention and Remediation of Accidental Releases: In the second paragraph of this section, the commitment to contact the WDEQ/LQD and WDEQ/WQD within 24 hours of a release must specify that the contact will be verbal (not merely via e-mail or voice mail). (MLB)

*LC's Response:* Section OP 2.9 has been revised to confirm LC ISR, LLC's commitment to comply with existing regulations by verbally notifying WDEQ/LQD and WDEQ/WQD within 24 hours of a qualifying release.

**Response acceptable.** The text has been revised as requested. (MLB)

- 57) Section OP 2.9, Prevention and Remediation of Accidental Releases: This section needs significantly more detail. What is the specific training that will be provided all employees? What is the frequency of the training? What is the frequency of the inspections to be conducted? How will the inspections be documented? The detailed procedures to be outlined in the Environmental Management Programs should be presented as part of the mine permit. Surface and pipeline spills have been a common occurrence at ISL facilities in the past. The Division is requiring that detailed, documented, training and inspections be clearly outlined in the Operations Plan. (MLB)

*LC's Response:* Regulatory citations provided in WDEQ-LQD's letter of April 1, 2009 to LC ISR, LLC: W.S. § 35-11-428(a)(iii)(F) and R&R Ch. 11, Sec. 4(a)(vii).

Pursuant to discussions during the June 22, 2009 meeting in Casper between LQD and LC ISR, LLC, Standard Operating Procedures (SOP) addressing spill prevention and mitigation will be developed and implemented at the site. The SOPs will specifically address: pipeline installation and testing; automated system monitoring and alarming; site inspections; spill mitigation; and employee training.

**Response not acceptable.** LC has significantly updated the text in this section; however, there is no indication that SOP's will be developed as indicated in the response. The text in Section 2.9 should be revised to indicate that SOP's will be developed to address various critical issues from pipeline installation to spills and indicate that the SOP's will be available on-site for review by the LQD. (BRW for MLB)

- 58) Section OP 2.9, Prevention and Remediation of Accidental Releases: This section must include a discussion of how contaminated soils resulting from a spill are to be delineated horizontally and vertically. Gamma ray and SAR must be included in the parameters measured in the soil. Specifics on how the depth of contamination will be determined and mapped must be provided. Treatment protocol must also be addressed in this section. Additionally, the permit must contain a commitment to report and track annual releases from the site via a map in the WDEQ/LQD Annual report. The map should be a cumulative map indicating the footprint of the recent years spills in addition to any previous spills. This map should be accompanied by a table outlining the history of each release, including the estimated amount (gallons) of the release, footprint of contamination, depth of contamination, initial contamination levels, their sample locations, and any history of remediation efforts. (MLB and AB)

*LC's Response:* Section OP 2.9 has been revised to address this comment.

**Response not acceptable.** Section OP 2.9.1 Pipelines, Fittings, Valves, and Tanks has been revised to include a discussion regarding spill investigation and reporting. Spills greater than 420 gallons will be reported to the DEQ within 24 hours, however any spill, including those less than 420 gallons will need to be investigated and included in the Annual report. This could be more clearly stated in Paragraph 5 of this section, which states "Within 24 hours of the discovery of a lixiviant spill...." But could be changed to read "Within 24 hours of the discovery of any lixiviant spill (regardless of the volume)" Also, does lixiviant refer to the solution being injected as well as the pregnant solution? This should be clarified. (AB)

- 59) Section OP 2.9.1, Pipelines, Fittings, Valves and Tanks, Page OP-15: In the second paragraph, the depth at which pipes will be buried as well as the depth to which freezing occurs at the site should be discussed. (MLB)

*LC's Response:* Regulatory citations provided in WDEQ-LQD's letter of April 1, 2009 to LC ISR, LLC: W.S. § 35-11-428(a)(iii)(C).

*Pipelines will generally be buried between 48 and 72 inches below surface. The maximum Project frost line according to the National Oceanic and Atmospheric Administration (NOAA) is approximately 1.3 meters or 51 inches. However, this depth is highly dependent upon temperature, traffic, moisture, soil type, etc. The pipelines are buried to prevent freezing when the fluid is not flowing, such as during a significant power outage or a long term process shutdown.*

**Response acceptable.** The text has been revised to indicate that pipelines will be buried between 48 and 72 inches below ground surface. (BRW for MLB)

- 60) Section OP 2.9.1, Pipelines, Fittings, Valves and Tanks, Page OP-16: In the first paragraph, more detail on how the flow through pipelines will be monitored must be provided. Specifically, there should be as commitment to having a central control room where monitoring of pressure and flow of individual wells and pipelines and system balance on a mine wide and unit basis is automated. It is expected that there will be alarms requiring a response by a human being and documentation that the alarm was answered and by whom it was answered, etc. It is the reviewers' belief that a human being should not have to occupy a header house to monitor what is occurring in that particular sector of a given well field. A central control room will also minimize traffic across the site, a stated goal of the project. Other items to be addressed include how the alarm system will be tested to verify its integrity; use of tolerance limits to account for nominal deviations in flow and pressure, who/how the entire system will be monitored, whether the system will be monitored 24 hours per day and seven days per week by a human. Will the system have redundancy? In the earliest meetings among LQD and Lost Creek ISR personnel (along with AATA personnel), a central control room style of monitoring was explained (by AATA to LQD) to be an integral part of this project's design. (MLB and BRW)

*LC's Response:* The following response is grouped by topic (Leak Detection, System Integrity, Tolerance Limits, Oversight, and Redundancy).

**Leak Detection:**

*The basis for monitoring flow and pressure in pipelines is the prevention of leaks. There will be three layers of protection associated with the wellfield instrumentation:*

1. *Monitoring and Data Output*
2. *Alarm and Notification*
3. *Control and Shutdown*

*1. Monitoring and Data Output:*

- a. *Oxygen: Oxygen pressures will be monitored for abnormal operating conditions.*
- b. *Production Systems: The main header pressure and flow rate will be monitored as well as the flow rate of each of the production wells for abnormal operating conditions. The On/Off status of each of the pumps will also be monitored.*

- c. *Injection Systems: The main header pressure and flow rate will be monitored as well as the flow rate of each of the injection wells for abnormal operating conditions.*
- d. *Header House Sumps: Sump levels and the operating status of the sump pumps in the header house basements will be monitored and transmitted to the Plant for review/alarm.*

## *2. Alarm and Notification:*

- a. *Oxygen: High and low data points will be set for oxygen injection piping within the header houses. If pressures are outside the set points, Operators will be notified via alarm and Wellfield Operators will address the upset condition.*
- b. *Production Systems: The main header pressure and flow rate will have high and low set points. If there is an upset condition, Operators will be notified via alarm and Wellfield Operators will address the upset condition. The same is true for individual production well flow rates as well as the On/Off status of the pumps. Differential flow algorithms may be utilized to review differential flow status to determine if there is a potential problem. Production wellheads will have fluid detection systems to alarm of a leak. The fluid will close a circuit that will generate an alarm either locally, at the plant, or both.*
- c. *Injection Systems: The main header pressure and flow rate will have high and low set points. If there is an upset condition, Operators will be notified via alarm and Wellfield Operators will address the upset condition. The same is true for individual injection well flow rates. Differential flow algorithms may be utilized to review differential flow status to determine if there is a potential problem. Injection wellheads will have fluid detection systems to alarm of a leak. The fluid will close a circuit that will generate an alarm either locally, at the plant, or both.*
- d. *Header House Sumps: If sumps have fluid in them, the sumps will be activated and the fluid pumped into the production header. Anytime the sumps are activated, the Plant Operator will receive an indication. If a high level in the sump is received, the Operator will receive an alarm and the Wellfield Operator will address the upset condition.*

## *3. Control and Shutdown:*

- a. *Oxygen: Pressure switches and interlocks with the injection system will be utilized to insure that oxygen injection cannot occur without adequate flow and pressure in the injection header. The concept being that if oxygen is only allowed to enter the injection header when water is present, then dangerous concentrations cannot build up in the piping.*
- b. *Production Systems: There are several levels of control and shutdown within the production system. The PLC will be connected to the Plant and will allow for shutdown/startup of all production wells in upset conditions. The main valve will be capable of being shut based on operating conditions, i.e. sump overflow, ruptured flowline, etc. The motor control center (MCC) will typically be interlocked with the sump high level shutoff to shut-down operating pumps. The wellheads will typically utilize any leaking fluid to complete a circuit and initiate an alarm in the form of either an audible/visible alarm locally or by transmitting an alarm to the operations center. Simple systems included in the piping include check valves to insure that pipeline production fluid cannot enter shutdown sections of pipe.*
- c. *Injection Systems: Control of this system begins with the control valve where the injection fluid enters the header house. This valve will maintain the appropriate pressure and flow for the local operating conditions as well as allow for complete shutdown of injection. Data from the main flow line and the individual injection wells will be transmitted to the Plant for review. If there is an upset condition, operators will be notified and suspect area will be shut down for maintenance. The wellheads will typically utilize any leaking fluid to complete a*

*circuit and initiate an alarm in the form of either an audible/visible alarm locally or by transmitting an alarm to the operations center.*

- d. *Header House Sumps: High sump levels will initiate a shutdown in the production wells and alarm the Operators.*

***System Integrity:***

*As with any system, one of the keys to the overall integrity is a regular presence of Operators in the mine units. The Operators will be responsible for taking measurements and looking for leaks and problems at the header houses. In addition, their regular routine will include checking each of the wellheads for leaks or salts and repairing them as needed. They will also be required to drive the pipeline right-of-way and check the valve stations for leaks and signs of moisture. Also key to the proper operation is the additional review of operational data by managers and engineers. Verifying data through calculation and providing technical support to the operators will be routine to their activities.*

***Tolerance Limits:***

*Differential flow algorithms may be utilized to review differential flow status to determine if there is a potential problem.*

***Oversight:***

*The facility will have coverage 24 hours a day, 7 days a week from both Wellfield Operators and Plant Operators.*

***Redundancy:***

*The system has multiple components with varying points of redundancy, including:*

- *Flow data capture/analysis and sump alarms and wellhead leak detection in header houses;*
- *Flow data capture/analysis from the plant to the disposal well and from the disposal well pump to the wellhead;*
- *Pipelines have flow measurement at the distribution and reception points as well as pressure comparison.*

***Response not acceptable.*** The response is, to a degree, nebulous. For example, there is nothing specific in the response to indicate where the alarms will be located (i.e., within a central control facility, within the wellfield proper, or ?). Suffice as to say the discussion under Item 2 is open-ended regarding this subject. Additionally, a substantial portion of the response has not been incorporated into the application text. An operation that relies solely on field monitoring is unacceptable. The system operation should be constructed such that pressure and flow of each well can be monitored, individual well flow rates can be adjusted, and individual wells can be turned on or off from a central location. A brief discussion as to how the entire system will work should also be provided (e.g., is everything hard-wired or is telemetry being used for all or part). Please also see the original comment and revise the text accordingly. **(BRW)**

- 61) ***Section OP 2.9.1 Pipelines, Fittings, Valves and Tanks.*** Preventive maintenance procedures should then be described. Visual inspection of pipelines, fittings and valves should be conducted to detect seeps or deteriorating conditions. Preventive maintenance schedule for replacement of pumps or valves, should also be discussed. **(AB)**

***LC's Response:*** Information on equipment design life and inspection has been added to Section OP 2.9.1.

**Response not acceptable.** Section OP 2.9.1 Pipelines, Fittings, Valves, and Tanks states that “visual inspection of pipelines, valve stations... is the daily responsibility of all mine site staff” and that “it is the responsibility of mine unit operators to inspect these items on a routine basis” It is recommended that a formal inspection program (e.g., develop an SOP) and inspection checklist be implemented on a set schedule in order to document that these inspections are being conducted. (AB)

- 62) Section OP 2.9.1 Pipelines, Fittings, Valves, and Tanks. What will be considered a significant change in flow rate or pressure to activate the alarm? Which will actually be monitored – flow rates or pressures? (AB)

*LC's Response:* The minimum detectable leakage will typically depend on the area, the system and the location of the leak. For example:

*LCI is planning on installing wellhead leak detection inside the wellhead covers. This detection system will typically use simple circuit completion as the tool to alarm in the event of a leak. In this case, anything from a drip to a small leak will be detectable if it will “puddle” water.*

*LCI is also planning on installing sumps in the wellfield header houses. The sump pumps will provide notification to the main system when they become operational. Again, if the leak is large enough to generate two or more gallons, the alarm should initiate. This will alarm and contain all leaks within the header houses. In the case of a catastrophic type failure within the header house, the sump pump will not be able to keep up and a high level shut down point will be reached. At that time, the injection and production line control valves will shut and the pumps associated with that motor control center will shut down.*

*Leaks between the header house and the wellhead are the hardest to detect and at the same time the rarest. There are typically no fittings outside the header house or the wellhead cover, only High Density PolyEthylene (HDPE) pipe. Typical failures occur at connections or fusion joints. The flow rates and pressures for injection and production wells will normally be monitored and compared against themselves through the main system. This is what is normally referred to as differential flow and pressure analysis. An upset will usually be defined in the 10% to 25% range and generate an alarm for the operator's attention. It is percentage based, so the individual alarm status will depend on the flow and pressure input/output.*

*As with all leak detection systems, they are augmented by a strong operations and field presence with routine checks on pipelines, wellheads and other production components.*

**Response not acceptable.** Section OP 3.6.1 describes the alarm systems that will be utilized. Paragraph 4 states that “During mine operations, injection pressures shall not exceed the MIT pressures, yet the MIT pressures are to be 120-125% of the injection pressure. This statement needs to be corrected to state that the pressure will not be within 80% of the MIT pressure. In addition, a formal inspection program of the leak detection alarm system should be outlined in the permit application. The program should commit to a frequency level of formal documented inspection with a checklist and which personnel will be responsible for the inspections should be specified. (AB)

- 63) Section OP 2.9.3 Buildings. Header house and pumphouse details should be presented which indicate the inclusion of a sump and fluid detection sensors. (AB)

*LC's Response:* Please see Response to Comment V5, OP#60.



**Response not acceptable.** The response to OP#60 details the leak detection alarm system with discussions on Leak Detection, System Integrity, Tolerance Limits, Oversight and Redundancy. This detailed information should be included in Section OP3.6 of the Operating Plan. (AB)

- 64) **Section OP 2.9.3 Buildings.** The height of the concrete curbing, the capacity and location of the sumps in the buildings, and the sloped curb at the overhead doors should all be described in greater detail. What will the storage capacity be of the building acting as a secondary containment should there be a leak, spill, or tank failure. i.e. how many tank failures can the storage capacity accommodate? (AB)

**LC's Response:** The Plant design incorporates concrete berms designed to contain a spill of one or more vessels. The largest tanks in the plant are approximately 21,000 gallons each and the total berm containment volume is approximately 163,000 gallons. The berms will also contain waste fluid released if either the piping or the transfer pumps were to fail. All the systems will use instrumentation in the form of level indication and pump operation indication to support leak detection. The volume of containment in each of the main areas of the Plant is:

**Precipitation Room:**

Area of precipitation room:  $39 \text{ ft} \times 178.5 \text{ ft} \approx 6961 \text{ ft}^2$   
Area taken up by tanks/filter presses/pumps/ramps:  $\approx 700 \text{ ft}^2$   
Total useable area:  $6961 \text{ ft}^2 - 700 \text{ ft}^2 = 6261 \text{ ft}^2$   
Volume of sloping foundation:  $(0.5) \times (6261 \text{ ft}^2) \times (.396 \text{ ft}) \approx 1240 \text{ ft}^3$   
Minimum height of berm: 0.5 ft  
Volume of bermed area:  $0.5 \text{ ft} \times 6261 \text{ ft}^2 \approx 3130 \text{ ft}^3$   
Volume of sumps (2 at  $18 \text{ ft}^3$  each) =  $36 \text{ ft}^3$   
Total containment volume:  $3130 \text{ ft}^3 + 1240 \text{ ft}^3 + 36 \text{ ft}^3 = 4406 \text{ ft}^3$  or  $\approx 33,000$  gallons

**Chemical Room:**

Area of chemical room:  $39 \text{ ft} \times 77 \text{ ft} \approx 3003 \text{ ft}^2$   
Area taken up by tanks/pumps/berms:  $\approx 1075 \text{ ft}^2$   
Total useable area:  $3003 \text{ ft}^2 - 1075 \text{ ft}^2 = 1928 \text{ ft}^2$   
Volume of sloping foundation:  $(0.5) \times (1928 \text{ ft}^2) \times (.396 \text{ ft}) \approx 382 \text{ ft}^3$   
Minimum height of berm: 1 ft  
Volume of bermed area:  $1 \text{ ft} \times 1928 \text{ ft}^2 = 1928 \text{ ft}^3$   
Volume of sumps (2 at  $9.5 \text{ ft}^3$  each) =  $19 \text{ ft}^3$   
Total containment volume:  $1928 \text{ ft}^3 + 382 \text{ ft}^3 + 19 \text{ ft}^3 = 2329 \text{ ft}^3$  or  $\approx 17,400$  gallons

**MAINTENANCE/FUTURE DRYER/AREA:**

Area of interest:  $39 \text{ ft} \times 178.5 \text{ ft} \approx 6961 \text{ ft}^2$   
Area taken up by tanks/pumps/berms:  $\approx 1030 \text{ ft}^2$   
Total useable area:  $6961 \text{ ft}^2 - 1030 \text{ ft}^2 = 5931 \text{ ft}^2$   
Volume of sloping foundation:  $(0.5) \times (5931 \text{ ft}^2) \times (.396 \text{ ft}) \approx 1175 \text{ ft}^3$   
Minimum height of berm: 0.5 ft  
Volume of bermed area:  $0.5 \text{ ft} \times 5931 \text{ ft}^2 = 2966 \text{ ft}^3$   
Volume of sumps (3 at  $9.5 \text{ ft}^3$  each) =  $28.5 \text{ ft}^3$   
Total containment volume:  $2966 \text{ ft}^3 + 1175 \text{ ft}^3 + 28.5 \text{ ft}^3 \approx 4170 \text{ ft}^3$  or 31,200 gallons.

**Ion Exchange / Elution / Restoration:**

Area of interest:  $\approx 18563 \text{ ft}^2$   
Area taken up by tanks/pumps/berms:  $\approx 2927 \text{ ft}^2$   
Total useable area:  $18563 \text{ ft}^2 - 2927 \text{ ft}^2 = 15636 \text{ ft}^2$

*Volume of sloping foundation:  $(0.5) \times (15636 \text{ ft}^2) \times (.396 \text{ ft}) \approx 3096 \text{ ft}^3$*

*Minimum height of berm: 0.5 ft*

*Volume of bermed area:  $0.5 \text{ ft} \times 15636 \text{ ft}^2 = 7818 \text{ ft}^3$*

*Volume of sumps (2 at  $9.5 \text{ ft}^3$  each) =  $19 \text{ ft}^3$*

*Total containment volume:  $3096 \text{ ft}^3 + 7818 \text{ ft}^3 + 19 \text{ ft}^3 \approx 10,933 \text{ ft}^3$  or 81,780 gallons*

**TOTAL STORAGE VOLUME OF BERMS =  $21,838 \text{ ft}^3$  or  $\approx 163,350$  gallons**

**Response not acceptable.** This information should be presented in Section OP 2.9.3 of the Operations Plan. **(AB)**

- 65) Section OP 2.9.4, Storage Ponds, Page OP-16: In the first paragraph of this section it is stated that pond capacity will be designed to accommodate two weeks of plant operation. However, the sixth paragraph of this section (on Page OP-17) states that the ponds will be kept full at all times to maintain the integrity of the liner (due to exposure of the elements including UV from sunlight). It appears, then, that at any given time the pond will actually have no capacity if it is full all the time. Please explain. Additionally, actual pond design plans must be provided. The schematic view of the ponds provided in Plate OP-1 are not sufficient. **(MLB)**

*LC's Response: The discussion of the ponds being kept full is misleading as the permit states that "water will be kept in the ponds at all times" to "reduce" (not prevent) liner exposure to sun, wind, and freezing temperatures. LC ISR, LLC's primary intent is to maintain a small amount of water in the bottom of the ponds to insure the liner stays in place during elevated winds. The depth of fluid is expected to be no more than one foot. The normal use of the storage ponds will be for waste water holding during a "Falloff Test" of a disposal well. Pond use will only be required if the remaining wells will be used to their capacity. The response to Volume 5, Comment # 9 discusses in detail the specifications for the storage ponds as well as the construction drawings and supporting engineering information.*

**Response not acceptable.** The text is still misleading. The text in Section 2.9.4 should be revised to indicate LC's response and that sufficient capacity will be maintained in each pond to accommodate two weeks of production while maintaining adequate freeboard. Please revise the text accordingly. **(BRW for MLB)**

- 66) Section OP 2.9.4 Storage Ponds. The ponds are said to be designed to store two weeks of plant operations at a rate of 60 gpm, yet according to the water balance on Figure OP-5c, the maximum capacity should be based on 115 gpm of flow during maximum operations. **(AB)**

*LC's Response: The water balance (Figures OP-5a-5f) details the anticipated normal operating scenarios at the Lost Creek Project. Testing or a failure of a disposal well when operating at maximum capacity would not be considered a normal scenario. During this case, non-essential activities would be reduced, all other disposal wells would be brought up to full injection capacity and only mandatory flows to disposal would be maintained. In the case of Figure OP-5c, these might include:*

- *A temporary shutoff of low production wells not necessary to maintain wellfield balance;*
- *A reduction in groundwater sweep flow while still maintaining a cone of depression, and*
- *A reduction in reverse osmosis flow and treatment while still maintaining restoration balance.*

*This reduction is estimated to be as much as 55 gpm, yielding a maximum flow to the storage ponds of 60 gpm. The pond design is for redundant capacity to allow 4 feet of storage in one pond with the other on standby.*

**Response not acceptable.** Please incorporate the information presented in the response into Section OP 2.9.4 of the Operations Plan. **(AB)**

- 67) **Figures OP-5a, b, c, Water Balance Diagrams:** According to water balance diagrams presented, the deep disposal well(s) must have a minimum capacity of roughly 100 gpm. No information has been provided regarding the viability of a deep disposal well(s) and whether the characteristics of the intended formation would be sufficient to meet the project demand stated above. Prior to WDEQ/LQD permit approval, plans and specifications and approval for a deep disposal well(s) must be secured from the appropriate regulatory authority. Permits for such wells must be included in the WyDEQ/LQD permit application. This comment can be cross referenced with comment number 115 below which addresses "Section 5.2.3.2, UIC Class I Wells". Please provide. **(BRW)**

*LC's Response: LC ISR, LLC submitted the UIC Class I Disposal Well Application on June 29, 2009 for the Lost Creek Project to WDEQ-WQD. The application requests a disposal capacity of 50 gpm per well with a total of five wells (250 gpm). The data in the application is supported by actual field data obtained during the drilling and testing of the Lost Creek Test Well #1. Figures OP 5a – 5f detail the required disposal requirements. Figure OP-5c details the worst case with Production, Reverse Osmosis and Groundwater Sweep all occurring simultaneous. The required disposal in this case is 115 gpm.*

*The WDEQ-LQD was copied on this application when it was submitted, and a copy is included in Attachment OP-4A. Also, Table ADJ-1 has been updated to show the status of each permit/license required to construct and operate the facility.*

**Response acceptable.** Attachment OP-4A was not included in the October 19, 2009 response as indicated above. The reviewer believes that the response was actually referring to Attachment OP-2. Review of the calculations provided in the application indicates that the requested disposal capacity appears reasonable. Please note that approval of the first wellfield package will not be granted until the UIC Class I Disposal Well Application is approved as the Site Operations Plan as presented is entirely dependent on the availability of a Class I Disposal Well. **(BRW)**

- 68) **Section OP 2.9.4 Storage Ponds:** What consideration has been given to the ponds freezing over. With only four feet of fluid capacity it is possible that the materials in the ponds could freeze solid. Does this have any implications to the liner strength and integrity. **(AB)**

*LC's Response: LCI contacted the manufacturer and vendor with the questions above. The response from Mr. Steve Wilson of Geotec Industrial Supply is:*

*"The 45mil Polypropylene Liner is a very durable choice for this application. The material is black which has a tendency to absorb heat year round. I haven't heard of a pond this size ever completely freezing. If the pond becomes covered with ice you will not want to drain the pond." The staff at LCI has had similar experience with pond liners. It is normal for a thin layer of ice to form during extreme cold temperatures, however the ice does not typically last for long.*

**Response acceptable.** Based on the knowledge of the manufacturer and past operation experience, it is not anticipated that the pond will freeze over entirely. **(AB)**

- 69) Attachment OP-2, Figure titled Embankment Details: If the excavated material at the pond site is not suitable for embankment material, it states that material will be removed from a borrow area. Given the amount of drilling that has taken place within the permit area, has a source for embankment material been identified? The proposed borrow area should be identified, and its size, depth of excavation, and reclamation requirements should be outlined in the attachment. **(AB)**

*LC's Response: Appendix B of the Design Report for the storage ponds, included in Attachment OP-7 provides the results of the geotechnical investigation at the pond location (see Response to Comment V5, OP#9). The results of the investigation indicate the conditions under the Plant and the storage ponds and allows for the use of native soils in construction. During excavation and construction of the storage ponds, an engineer will be on-site monitoring the soil quality and the compaction. If the engineer deems the excavated material unfit for construction purposes, a borrow area will be defined at that time.*

**Response acceptable.** Attachment OP-7 includes the specifications for the Storage Ponds designed by Western States Mining, Inc., and based on geotechnical boring B-2 drilled by Inberg Miller on August 14, 2008. No borrow area is anticipated based on the report. **(AB)**

- 70) Attachment OP-2, Figure titled Embankment Details: Although the text says fluid height will be four feet and freeboard 3, please indicate on the figure that the embankment height is 7.0 feet. Also there appears to be a typo on the Embankment Detail typ. Cross section, with a number three (3) in large font. **(AB)**

*LC's Response: The typo on Attachment OP-2, Figure "Embankment Details" has been fixed.*

**Response acceptable. (AB)**

- 71) Plate OP-1, Plant Site Plan: This plate must be upgraded to an actual design including a conventional scale (the current scale is 1" = 16') and the location of the Plant Site must be depicted on a topographic map with township, range, and section lines as well as roads and other pertinent landmarks. **(MLB)**

*LC's Response: Please see Response to Comment V5, OP#4.*

**Response not acceptable.** LC has provided revised plates to address the items outlined in the comment. However, the contour labeling on Plate OP-2 is incorrect. Please revise and resubmit Plate OP-2. **(BRW for MLB)**

- 72) Section OP 2.9.2, Fuel Storage Areas: More detail is needed in this section. Specifically, secondary containment must be addressed and explained. Additionally, the weekly inspection criteria should be stated here. If an inspection checklist is to be used, the items on the checklist should also be listed. **(MLB)**

*LC's Response: Fuel storage at the site will consist of an above ground gasoline tank with a maximum volume of 5,000 gallons and an above ground diesel tank with a maximum size of 5,000 gallons (Plate OP-2). The tanks will be within a lined spill containment system sized to contain at least 110% of one of the largest tank. A Spill Prevention Control and Countermeasure Plan is required and will be in place before the tanks are placed into service. The tanks and the containment area will be checked at least weekly for vessel, piping and containment integrity as*

*well as indications of leaks or spills. All are planned to be documented as part of the routine inspection process.*

**Response not acceptable.** Section OP 2.9.5, Fuel Storage Areas, needs to be revised to include the information outlined in the above response. (MLB)

- 73) **Section OP 2.9.5 Fuel Storage areas.** How much fuel will be on-site? The Plant Site Plan (Plate OP-1) shows a gasoline and diesel tank. Is there enough fuel to qualify for Spill Prevention Control and Countermeasure Plan requirements under the Clean Water Act? If the volumes are less than the threshold, good management practices would dictate that there should be secondary containment for the tanks, capable of holding the capacity of the largest of the two tanks. (AB)

*LC's Response: Please see response to the previous comment.*

**Please refer to the response to Comment #72. This item is dropped.** (AB)

- 74) **Section OP 2.10, Air Monitoring:** Please indicate the source and quantity of water expected to be used for dust suppression, potable water supply, etc. for the proposed mine activity. (BRW)

*LC's Response:*

**Dust Suppression:**

*The Air Quality Permit submitted to WDEQ-AQD addresses dust suppression and/or the use of a chemical suppressant such as magnesium chloride (Attachment OP-1). The need for dust suppression will be highly variable dependant on weather conditions, moisture content in the soil/roadbase, drilling density and construction activities. It is anticipated that some water will be used for dust suppression during the late summer months. The normal anticipated volume during a calendar year is estimated at 8 to 80 barrel water trucks per suppression event and 4 suppression events per year. The total usage is estimated at 110,000 gallons per year or 300 gallons per day. The source for the water supply is planned to be one of the permitted water supply wells within the Permit Area.*

**Potable Water:**

*For the Lost Creek Project, potable water is defined as that which will be used for drinking, handwashing or showering. That volume is estimated at 250 gallons per day. The supply will typically be from the water well installed adjacent to the Plant (well LC229W).*

**Non-Potable Water:**

- 1. Toilets/Urinals: is estimated at 270 gallons per day and the supply will be from the Plant water well.*
- 2. Plant Use: will consist of water for process and wash water. That amount is estimated at 10 gallons per minute or 14,400 gallons per day and will come from the Plant water well or treated water from the production stream as is appropriate.*
- 3. Drill Water: LCI estimates it will use 10 drill rigs per week day during the drilling phase of the project. Each drill rig will typically use 150 to 200 barrels of water per day while drilling. Estimated drill rig productivity is four days per week for 50 weeks per year. Therefore, the total estimated drill water usage is 34,500 gallons per day. Supply will normally come from any/all of the permitted water supply wells on the Lost Creek Permit Area.*

**Response not acceptable.** None of the information provided above has been incorporated into the permit application. Additionally, there is no indication as to what formation the well(s) will be completed in. Please provide. (BRW)

- 75) Section OP 2.11.1, On-Site Wells, Page OP-18: Is the reference to "17 wells used to establish baseline" now outdated in light of the new wells installed at the site in late 2008? Please update if necessary. (MLB)

*LC's Response: Section OP 2.11.1 was updated to reflect the addition of ten monitor wells in 2008 (MB-01 thru MB-10).*

**Response acceptable.** The text in Section 2.11.1 has been updated. (BRW for MLB)

- 76) Section OP 2.11.2 Off-Site Wells. The BLM stock wells are said to be analyzed quarterly at a minimum for natural uranium and radium-226, yet if the mine operations are going to impact these off-site wells there are other parameters that would be early detectors of a problem that should be analyzed. Quarterly analysis should also include Cl, sulfate, bicarb, TDS, and pH. If these elements are showing trends, then action will be required, similar to the monitoring well ring. Please revise the text accordingly. (AB)

*LC's Response: The commitment to sample operational BLM stock wells near the Permit Area was made in order to comply with NRC Regulatory Guide 4.14 Table 2 and is not intended to satisfy any WDEQ requirements. The commitment was placed in the state permit to mine application to maintain consistency across the agencies. The monitor well system surrounding each respective mine unit is the sole detection system for excursions. The stock wells near the permit area (within 2 kilometers of an active wellfield pursuant to the standard interpretation of Regulatory Guide 4.14) will be so far from active mining that it is not reasonable to expect an undetected excursion to reach the wells within the life of the project; especially given a natural groundwater flow rate of approximately 4 feet per year. Therefore, the analyte list presented in OP 2.11.2 will be maintained to comply with NRC requirements.*

**Response partially acceptable.** Please add water level to the list of monitoring parameters. (MM for AB)

- 77) Section OP 2.11.2 Off-Site Wells Section OP 3.6.4.1 Mine Unit Baseline Water Quality and Upper Control Limits. These sections reference Lost Creek's Environmental Manual, and states that it discusses the sampling protocols. What is and where is this document? Sampling protocols need to be outlined in the permit document, as stated in Comment 28 from my August 26, 2008 comments on Appendix D-5 and D-6. (AB)

*LC's Response: The Lost Creek Water Well Sampling Procedure is attached as Attachment OP-8.*

**Response not acceptable.** Attachment OP-8 is a welcome addition to the application. Please include a Table which lists the monitoring wells, grouped by category, and includes their screened interval, which formation is being monitored, and the frequency and constituents to be monitored. In addition, please address Chain of Custody procedures and the disposal of purged water on the ground. If the monitoring well is impacted in any way the purge water may need to be disposed in either the storage ponds or deeper injection wells. Section III, Part C-iii, the text stating that if a parameter is below detection limit during the initial round of sampling that no additional analysis will be performed during quarterly sampling is unacceptable and should be removed from the text. Section IV, note 1 in both tables should be revised to indicate water level as a field parameter.

Section 5, Part E should indicate that all sampling will follow the preservation and holding time procedures as outlined in Methods for Chemical Analysis of Water and Wastes, USEPA, 1983. Section VII regarding the use of compositing is not acceptable for several reasons, which include the fact that compositing tends to mask the presence of analytes at low levels and it will be impossible to detect if there are only parts of the wellfield are problematic. See also the text in Section RP 2.4. **(AB and BRW)**

- 78) Section OP 3.2, Mine Unit Design: LQD Chapter 11, Section 6(d), states that casing requirements must be specified to prevent casing collapse during installation; convey liquid at the predicted injection / recovery rate and pressure; and allow for sampling. **(AB)**

*LC's Response: Please see Response to Comment V5, OP#90*

**Response not acceptable.** The information detailed in the response to OP Comment #90 should be incorporated into Section OP3.3 of the application. **(AB)**

- 79) Section OP 3.2, Excursions: A section specifying the corrective action that will be taken in the event of an excursion must be added to this section. A concrete commitment describing the handling of an excursion must be provided. Specifically, if an excursion is not in control within 60 days the [LQD] Administrator, with concurrence of the Director of the DEQ, has the authority to terminate the mining operation and revoke the permit (Chapter 11, Section 12(d)(ii)). Additionally, this reviewer would like to see text in this section regarding the steps Lost Creek plans to take in the event of an excursion. A discussion of the cessation of injection into the area under question, prior to 60 days into the corrective action process may be warranted. **(MLB)**

*LC's Response: The comment refers to Section OP 3.2 which is entitled Wellfield Design and is not intended to address excursions. The language regarding excursion detection and corrective action can be found in Section OP 3.6.4. Commitments within Section 3.6.4.3 include suspending injection into the pattern area adjacent to the monitor well where the excursion is being detected. A cross-reference to Section OP 3.6.4 has been added at the end of the 3<sup>rd</sup> paragraph in Section OP 3.2*

**Response acceptable.** The text in Section 3.2 has been updated to reference Section 3.6.4 regarding excursions. Section 3.6.4 details the process for detection and mitigation of an excursion. **(BRW for MLB)**

- 80) Figures OP-8a, 8b, and 8c. How far is the sand trap and base of the well bore expected to extend into the lower aquitard? With the Sage Brush shale pinching out to five feet in some locations, this aquitard should not be intersected if its integrity could be questioned. **(AB)**

*LC's Response: The typical screen and trap assembly is less than three feet in length. Figures OP-8a, 8b and 8c depict worse case scenarios where the desired screen interval is immediately above the underlying aquitard. This is typically not the case. Every effort will be made to insure production and injection well assemblies do not penetrate through the lower aquitard. In the unlikely event that the wellbore penetrates the lower aquitard into the underlying zone, the penetrating portion of the wellbore will typically be plugged with the appropriate sealing material (grout or cement). In addition, the wellbore is typically resealed during the casing and cementing phase as the cement is pumped down the casing and up the annulus.*

*Also, because baseline water quality and water levels are obtained in the underlying sand prior to operational activities, injection or production from the underlying sand would typically be seen in*

*the nearest underlying monitor well. This would typically be seen first in the water level changes and second in water chemistry.*

**Response not acceptable.** In areas where the Sage Brush Shale is thin, there should be a commitment not to place the screened interval directly above the aquitard, or to penetrate the aquitard risking the integrity of the confining layer. Please add language to the permit document which provides these assurances that the lower aquitard will not be compromised. **(AB)**

- 81) Section OP 3.2 Mine Unit Design. Mine Unit 1's well field package will need to be submitted for review and approval prior to approval of the ISL Permit application. **(AB)**

*LC's Response: Please see Response to Comment V5, OP#1.*

**Response acceptable.** The first wellfield package is pending submittal. **(AB)**

- 82) Section OP 3.2 Mine Unit Design. Mine Unit 1's monitoring wells will require at least four sampling events to establish the upper control limits for the indicator constituents. The process to develop the UCL's, the number and spacing of the samples required should be outlined in the Operations Plan. **(AB)**

*LC's Response: Please see OP Section 3.6.4.1*

**Response not acceptable.** Well spacing will be submitted as part of the first wellfield package. Four rounds of sampling at 14 day intervals and establishing the UCL's as the mean plus five standard deviations is presented. This is consistent with Guideline 4. However, text concerning an evaluation of the data collected to determine outliers, etc. has not been included. Please revise the text to indicate that the procedure for establishing UCL's will follow the outline in Attachment I of LQD Guideline 4 (rev. 3/2000) prior to the last sentence in Section 3.6.4.1. **(BRW for AB)**

- 83) Section OP 3.2 Mine Unit Design. The details for the Hydrologic Test Report for the first wellfield package should include a refined water balance based on the hydrologic information for the wellfield. Minimum, maximum and average pumping rates, as well as the capacity of the ion exchange units, injection well(s) and evaporation pond(s) should be included. **(AB)**

*LC's Response: The requested data will be included in the respective mine unit packages.*

**Response acceptable.** This information will be included in the first wellfield package which is pending submittal. This item is resolved, as it will be addressed as part of the wellfield package review. **(AB)**

- 84) Section OP 3.2 Mine Unit Design. The last paragraph of this section states that the operator has made an effort to properly abandon historic drill holes or wells. As noted earlier regarding Section D5.2.4 Historic Uranium Exploration Activities, all historic drill holes must be located and a determination made if they were properly abandoned. If they were not, then they must be re-entered and grouted from the bottom up to the surface. All of this effort must be clearly documented in the permit, on a hole by hole basis. **(AB)**

*LC's Response: The requested data will be included in the respective mine unit packages.*

**Response not acceptable.** Drilling currently taking place in the Battle Springs formation has illustrated the problem with plug gel loss down the hole. The plug gel will fall 100-300 feet, often exposing the water table. If past practices were to inject plug gel to the surface and cap the hole



then there is no documentation of the plug gel falling back down the hole. The Tg NOV provides some documentation that historically the holes were left in various stages of abandonment. It can be stated with fair certainty that many of the historic drill holes are open more than a hundred feet below any surface cap, and many of them most likely are in at least the first water table. Ur Energy has made an effort to locate these holes, without much success (only finding 2 out of 20 which were searched). The DEQ will make an independent effort to locate the holes within the first mine unit, with the commitment by Lost Creek to plug them if we find them. (AB)

- 85) Section 3.2.1, Injection and Production Well Patterns: The text on page OP-22 indicates that each sand within the HJ horizon will be mined separately beginning from the bottom and progressing up. Restoration will begin with the upper most sand and progress downward. It is conceded that there is communication between the three sands. However, following the schematic in Figure OP-9a when mining the upper sand, the screens in the middle and lower sands are to be sealed off. Monitoring wells are to be screened in all three sands. Given that pumps will be set in the production zone only, please explain how stability will be maintained in the middle and lower sands until restoration occurs. Furthermore, given the above scenario and the fact that monitoring wells are screened in all three sands; if an excursion occurs, how can the source sand from which the excursion is associated be detected? Alternately, there is the potential that an excursion will not be detected due to dilution. Please address. (BRW)

*LC's Response: Mine planning has been changed with regard to the production sequence in areas where multiple mineral horizons are to be mined. The original plan, as discussed above, called for the mineral horizons to be mined in sequence from bottom to top, and then subsequently restored in sequence from top to bottom. Within that scenario, all of the mineral horizons would be mined by one set of wells. The current revised plan calls for all of the multiple mineral horizons to be addressed simultaneously by multiple sets of wells. In other words, each individual mineral horizon will be addressed by its own set of wells completed within that particular horizon. Under the new plan, all horizons will be mined concurrently. Restoration would also be concurrent for all of the mineral horizons.*

*As outlined in Section 3.2.2 Monitor Well Locations in the Operations Plan, the monitor wells will be screened only in the stratigraphic horizons which are being mined in the vicinity and at a spacing prescribed by regulations. This has been previously reviewed by WDEQ. This will minimize the risk of dilution of potential excursion parameters and maximize the ability of excursion detection. In addition, these wells will be sampled during stabilization to demonstrate the success of groundwater restoration.*

**Response acceptable.** The text in Section 3.2.1 has been modified to indicate that where multiple sands exist, they will be mined and restored concurrently. Therefore, the proposed monitoring scheme is acceptable. See also the response to Comment OP-86. (BRW)

- 86) Section 3.2.2 Monitor Well Locations. Paragraph one states that monitor wells will be completed in ore-bearing sands to be mined and in the overlying and underlying horizons. Depending on the hydraulic connectivity between multiple ore-bearing sands, multiple monitoring wells may be required in each sand unit within the HJ horizon. (AB)

*LC's Response: The three sub-sands units within the HJ Horizon are only loosely defined stratigraphically. While the HJ Horizon commonly contains interbedded low permeability units, these shaley units are localized in areal extent and therefore do not divide the HJ Horizon into well defined, separate confined aquifers. Thus, hydraulic connectivity exists between the HJ Sands. This allows for groundwater movement vertically. Results of site pumping tests indicate that the various*

*sand units within the HJ Horizon are hydraulically well connected and respond as a single, confined hydro-stratigraphic unit. As a result, the water quality throughout the HJ remains significantly consistent regardless of vertical position.*

*The first indication of a potential excursion will typically be a noticeable change in water level in adjacent monitor wells. This usually will precede the detection of elevated chemical parameters. Recognition of this situation will result in an immediate review by wellfield operators to identify the cause of the problem and, if necessary, remedial action to correct the imbalance. The hydro-stratigraphic unity of the HJ aquifer will ensure that water level changes will be detected regardless of which sand is being mined or monitored within the HJ Horizon. Furthermore, pump test results have indicated that an excursion detected at the monitoring ring placed 500 feet from the wellfield could be readily recovered by adjusting extraction and injection rates in nearby well patterns (see Response to Comment V5, OP#88).*

**Response acceptable.** The HJ Horizon was previously defined as Upper, Middle and Lower HJ, yet pump test results indicate they are connected. The wellfield package will address the specifics of monitor well locations and their adequacy to monitor the different sands within the HJ Horizon. (AB)

- 87) Section 3.2.2 Monitor Well Locations. Section OP 3.6.3.3 states that mining of the overlying FG and underlying KM sands is anticipated in the future. Baseline conditions for the aquifer underlying the KM sands, should be conducted prior to any mining at the site. Regional monitoring wells of this lower aquifer will need to be installed prior to mining the HJ horizon. (AB)

*LC's Response: This permit application specifically addresses mining within the HJ Sand. Therefore, characterization of all aquifers potentially impacted by operations have been characterized (DE, FG, HJ, and KM). It is not necessary to characterize a deeper aquifer that will not be impacted by mining performed under this permit application. If in the future LC ISR, LLC desires to recover mineral from the KM Horizon then the underlying horizon will be characterized.*

**Response not acceptable.** Section OP 3.6.3.3 still states that the "LC ISR LLC will apply for a permit revision to conduct ISR in the overlying FG and underlying KM sands" If it is known that these units will be mined, then appropriate baseline studies must be conducted prior to any mining, which would likely result in disruption of the baseline conditions. If mining in these units is not anticipated, then the statement in Section OP 3.6.3.3 should be dropped. (AB and MM)

- 88) Section OP 3.2.2.4 Overlying and Underlying Monitor Wells. Paragraph 2 states that operational controls, such as higher production rates may be used to control fluid migration when vertical confining layers are thin or absent. How would higher production rates control fluid migration? Would a higher bleed rate be required? How would a higher bleed rate affect the water balance and facility capacity projections. (AB)

*LC's Response: Section OP 3.2.2.4 discusses the use of "higher production rates" as one operating scenario to control fluid through a thin or leaky aquitard. In essence, higher localized production rates without increasing injection rates provides a more focused bleed rate and therefore greater localized control of production and injection fluids. A higher overall bleed rate is not required as the overall bleed will typically remain the same, therefore the water balance would not change.*

**Response not acceptable.** Please include this added discussion and diagram to Section OP 3.2.2.4 of the permit application. (AB)

- 89) Section OP 3.2.2.4, Overlying and Underlying Monitoring Wells: Given the discussion that ensued in the September 22, 2008 meeting at the LQD Lander office among your staff and LQD staff regarding Ms. Boyle's preliminary technical comments, the third paragraph of this section may need to be reevaluated/reworded. The third paragraph of this section discusses the shallowest water table at the site. Specifically, LQD staff understands that in Fall 2008 Lost Creek ISR installed several new monitoring wells closer to the extents of the permit boundary in order to generate a potentiometric surface across the entire permit boundary. Some wells were installed at a relatively shallow depth of approximately 50 feet below ground surface (bgs) in order to assess the presence/absence of an aquifer at that depth. The results of the Fall 2008 well installation activities are not reflected in the version of the application reviewed here. This reviewer requests that Lost Creek ISR provide documentation regarding the presence/absence of water at depths shallower than 150' bgs in Section OP 3.2.2.4. Some of your staff may recall that during the summer 2006 drilling, one of Lost Creek ISR's field staff (Dawn Schippe) contacted Ms. Bautz at the LQD Lander office via telephone explaining that a shallow (potential) aquifer had been encountered during drilling at approximately 50' bgs. (MLB)

*LC's Response:* The ten new monitor wells installed in 2008 were completed in various horizons to provide additional piezometric and water quality data. The shallowest water level in any of the wells was at 123 feet in Well MB-07 which is completed in the DE sand; the uppermost aquifer. Section OP 3.2.2.4 was revised to reflect the most up to date information.

*The installation of over 80 monitor wells to date has not shown the presence of any perched water tables. Ms. Dawn Schippe was contacted to determine the nature of the conversation with Ms. Bautz which is referenced in the comment. Ms. Schippe had maintained her field notes from the conversation in question and they are attached to this response for review. The following two paragraphs from Ms. Schippe describe the events in question.*

*On Thursday, August 17, 2006, monitor well LC29M was airlifted to evaluate if there is any water in the targeted completion formation (the DE sand/the anticipated shallowest aquifer on site). The pilot hole on this well was 171 feet deep. The driller tripped in his drill pipe to the bottom of the hole and turned on his air compressor to force all of the drilling mud and any water the formation produced to the surface. After the drilling mud had been evacuated, the well produced approximately 1/4 gallon per minute. Due to the extremely low flow rate of the DE sand based on the airlifting of LC29M from a depth of approximately 171', Dawn Schippe (Lost Creek ISR's field staff) contacted Ms. Melissa Bautz at the WDEQ-LQD office in Lander to advise her of the situation. Ms. Bautz indicated that a yield of 1/4 gallon per minute is sometimes sufficient for watering cattle, therefore the DE sand is indeed an aquifer. Ms. Bautz re-emphasized the need for LC ISR to install the three agreed-upon monitoring wells in the DE sand, which Ms. Schippe promised to do. Subsequently, LC29M had slotted casing and a gravel pack installed from 140-164' (the target sand completion interval) with the rat hole from 164-171' filled in with drill cuttings as this depth was dominated by a non-water-bearing lithology. Also, LC30M and LC31M, the two remaining DE sand wells, were installed at other locations across the property.*

*Ms. Schippe also took photographs and a video of the airlifted yield of LC29M, which she believes she emailed to Ms. Bautz. These photos and video are available to WDEQ-LQD. However, the water was coming from a depth of approximately 164 ft bgs, not 50 ft bgs, as casing was later cemented in place from surface to 140 ft bgs at this location with no change in the yield. Therefore, this water could not have come from 50 ft bgs.*

**Response not acceptable.** The text has been revised to reflect the findings LC's exploratory and monitoring well drilling efforts. However, the text indicating that no monitoring will be performed at that level (the DE Sand) is unacceptable. Text in Section 3.6.3.3 indicates that the FG Sand is being considered for mining in the future and that a revised mine plan will be submitted to accommodate such. Thus, not only from an aquifer protection standpoint during the existing proposed mining, but also from a point of establishing baseline for future mining it is imperative that monitoring of the DE Sand be performed. Please revise the text accordingly. **(BRW for MLB)**

- 90) **Section OP3.3 Well Completion.** The burst pressure and collapse pressure of the SDR 17 pipe to be used is presented. Please also provide information on the pressures to be experienced with the well depths in the ore zone, i.e. at what depth and/or pressures will the SDR 17 be unsuitable for use. **(AB)**

*LC's Response: The HJ Production Zone is approximately 425 feet below surface while the static water level for the same formation is approximately 175 feet below surface. A typical casing will be CertainTeed's spline-locking standard dimension ratio (SDR) 17 PVC well casing, which has a nominal 4.5 inch diameter, 0.291 inch minimum wall thickness, and is rated for 160 pounds per square inch (psi) burst pressure and 224 psi collapse pressure.*

*The maximum external pressure possible is represented by the calculation below. A rare example of this would be if the well were to pump dry with no recharge, especially given the hydrologic properties of the HJ sand unit.*

$$\begin{aligned}\text{External Pressure} &= (\text{Depth of Casing} - \text{Depth to Water}) \times \text{Weight of Fluid} \times 0.052 \\ &= (425 \text{ ft} - 175 \text{ ft}) \times 8.33 \text{ lbs/gal} \times 0.052 \\ &= 108.3 \text{ psi which is less than the 224 psi collapse pressure}\end{aligned}$$

*The maximum internal pressure or injection pressure will be governed by the fracture pressure, which is governed by the regional fracture gradient, or 0.7 psi/ft.*

$$\begin{aligned}\text{Injection Pressure} &= \text{Depth to Injection Zone} \times (\text{Fracture Gradient} - \text{Water Gradient}) \\ &= 425 \text{ ft} \times (0.7 \text{ psi/ft} - 0.433 \text{ psi/ft}) \\ &= 113.5 \text{ psi which is less than the 160 psi burst pressure}\end{aligned}$$

*The pressure ratings provided by the manufacturer are at ambient conditions without the benefit of cement supporting the casing or the lower temperatures typically seen subsurface at the Lost Creek Project. Experience at other ISR operations has shown that, using the proper weighting materials during cementing, PVC casing can be used at depths in excess of 1,000 feet below ground surface. In addition, each well must pass a mechanical integrity test prior to operation.*

**Response not acceptable.** The burst pressure and collapse pressure values and calculation for the SDR17 pipe should be presented in the permit document. The reviewer does not necessarily agree with the calculations presented for external pressure. For example, Well LC24M is cased for 478 feet with a static water level of 204 feet. The grout used was Portland Cement and assuming a mixture of 1 sack per six gallons of water gives a unit weight of approximately 10.7 lbs/gal. So  $(478 \text{ feet} \times 10.7 \times 0.052) - (274 \times 8.34 \times 0.052) = 266 - 119 = 147$  psi net collapse pressure. While the estimated collapse pressure is less than the CertainTeed specification of 224 psi, the Factor of Safety (FOS) is estimated at approximately 1.5 which is less than the factory recommended FOS of 2.0. Please address the above. **(BRW for AB)**

- 91) **Section OP 3.3 Well Completion.** The last paragraph states that well completion information will be submitted to the WDEQ. In addition, a boring log indicating the stratigraphy of each hole should also be included. (AB)

*LC's Response:* Pursuant to discussions on June 22, 2009 at Casper between WDEQ and LCI ISR, LLC LCI will submit well completion information to WDEQ for all monitor wells; including geophysical log, stratigraphy, and completion information. Data for all open holes and production and injection wells will be maintained at the site and will be available for inspection.

**Response acceptable.** The well completion and log detail for all monitor wells is pending submission with the wellfield package. (AB)

- 92) **Section OP 3.4 Well Integrity Testing.** Paragraph 2 states that the pressure in the sealed casing is then increased to a specified test pressure. Please indicate what that test pressure will be, e.g: 125% of operating pressure (AB)

*LC's Response:* The mechanical integrity test (MIT) pressure is determined by the well properties and the type of well. As noted in Section OP 3.4, there are three types of wells that will be tested at the Lost Creek Project: monitor well; production well; and injection well. The following discusses the MIT tests for each:

**Monitor Well** – The purpose of an MIT on a monitor well is to insure casing integrity and that the samples received are only from the zone of interest; not from fluid leaking into the wellbore from other zones sealed off by the casing. Because a monitor well is only used for pumping fluid out of the well, no pressure is seen on the casing. Therefore, the MIT pressure cannot be based on the maximum operating pressure. Typically a representative MIT pressure will be chosen that will insure the well has mechanical integrity. Normally this pressure will be at least 50 pounds per square inch (psi) as measured at the wellhead.

**Production Well** – The purpose of an MIT on a production well is to insure casing integrity below the static and pumping fluid level and for potential future use as an injection well. Because a production well is used for pumping fluid out of the well, no pressure is seen on the casing other than that generated by the production fluid in the wellbore. Therefore, the MIT pressure cannot be based on the maximum operating pressure. However, during the operational life of a wellfield, injection and production wells may be switched to modify production flow paths and increase overall recovery. Because of this, the production well MITs are performed at the same pressure as the injection wells within the same header house. That pressure is detailed in this response under "Injection Well".

**Injection Well** – The purpose of an MIT on an injection well is to insure casing integrity through the entire cased well. The MIT will typically be performed at 125% of the maximum injection pressure as dictated by the fracture gradient and the casing depth. An example is shown below:

$$\begin{aligned} \text{MIT Pressure} &= \text{Casing Depth} \times (\text{Fracture Gradient} - \text{Water Gradient}) \times 1.25 \\ &= 425 \text{ ft} \times (0.7 \text{ psi/ft} - 0.433 \text{ psi/ft}) \times 1.25 \\ &= 142 \text{ psi} \end{aligned}$$

**Response not acceptable.** This information should be incorporated into Section OP 3.4 of the Permit document. (AB)

- 93) Section OP 3.4, Well Integrity Testing: should describe protocols for investigating, evaluating and tracking MIT failures and also determining the impacts of the casing failure and any resulting leakage from the well. (MM)

*LC's Response: As with any operational or engineering activity, any abnormal or unexplained failures will be investigated. A variety of measures may be used during the investigation including subsequent tests at varying depths and pressures. In addition, a downhole camera may be used to support data obtained during the MIT(s). Also, typical to any investigation will be the correlation of materials, equipment, personnel and downhole conditions to the failure to determine if there is an ongoing problem. Any documentation associated with investigations will typically be kept in the well files and may be included as part of the Quarterly MIT Report to the WDEQ-LQD.*

*In the event of a casing failure on an operating well, investigations will typically include all of the above as well as a determination of the extent of the leakage. Once the areal/vertical extent of the release has been determined, a program of remediation will be reviewed with the WDEQ-LQD and appropriate measures determined for containment and/or recapture. Once approved, the remedial action will be initiated and reported in the Quarterly MIT Report to the WDEQ-LQD*

***Response not acceptable.*** Please incorporate the comment response into the permit, eliminating words such as "may" and "typically" to make the commitments more definitive. LQD is also requesting that a tracking system be implemented so that records of MIT failures are compiled and can be reviewed over time to determine if there are common elements or factors that contribute to the failures. (MM)

- 94) Section OP 3.5, Mine Unit Piping and Instrumentation: should clearly specify the instrumentation that will be installed for each well (i.e. each well, production and injection, will have a flow meter, a control valve and a pressure alarm installed). (MM)

*LC's Response: Each injection well and production well will have what is known as a "meter run" inside its associated header house. The meter run will include a control valve, a flow meter, and a pressure gauge. Each group of injection wells and production wells within a house will be attached to a header.*

*Fluid detection systems will be used in the header houses and at the wellheads to alarm the Operators of potential upset conditions. These systems will typically use the leaking fluid to complete a circuit and initiate an alarm in the form of either an audible/visible alarm locally or by transmitting an alarm to the operations center. The second component of fluid detection systems is a local shutdown of operations at a header house. This will typically occur in the case of a large failure where a sump level reaches the shut down point and flow is stopped and the Operators are notified via alarm at the Plant. As with all leak detection systems, they are augmented by a strong operations and field presence with routine checks on pipelines, header houses, wellheads and other production components.*

*There will be three layers of protection associated with the wellfield instrumentation:*

- 1. Monitoring and Data Output*
- 2. Alarm and Notification*
- 3. Control and Shutdown*

**Response not acceptable.** LQD expects that systems will be installed to allow each individual production and injection well to be remotely monitored for pressure and flow rates and controlled remotely from the control room. Please revise the text so this point is clear. (MM)

- 95) Section OP 3.5 Mine Unit Piping and Instrumentation. Please also describe how the pressure and flow rate information will be managed at one control point. (AB)

*LC's Response:* Please see Response to Comment V5, OP#60.

**Response not acceptable.** Please see the response to Comment OP-60. (BRW for AB)

- 96) Section OP 3.5 Mine Unit Piping and Instrumentation. It is stated that individual well lines and trunk lines will be buried to prevent freezing. Figure OP-7c indicates the typical trench layout to be 6.0 feet deep. In Section OP 3.5 please discuss the burial depth relative to the known frost line in the Red Desert, as well as how the lines under high traffic areas will be protected. (AB)

*LC's Response:* For discussion of pipeline freezing, please see Response to Comment V5, OP#59. Pipelines under traffic areas will typically be constructed of High Density PolyEthylene (HDPE). They will be buried at approximately 6 feet below the lowest point of the travel route (including the borrow ditch). Compaction during backfill will more than adequately support the pipeline from the traffic load.

*Due to the flexibility of HDPE pipe, it will deflect when it is buried. The Plastic Pipe Institute's Handbook of PE Pipe (Second Edition), Chapter 6, Section 3 details the requirements in which HDPE pipe will support direct burial and traffic loads. As seen in Table 3-1 from the handbook, the minimum cover required for the buried pipe is 3 feet.*

**TABLE 3-1**  
**AWWA M-55 Design Window Maximum and Minimum Depth of**  
**Cover Requiring No Calculations**

DR	Min. Depth of Cover With H2O Load	Min. Depth of Cover Without H2O Load	Maximum Depth of Cover
7.3	3 ft	2 ft	25 ft
9	3 ft	2 ft	25 ft
11	3 ft	2 ft	25 ft
13.5	3 ft	2 ft	25 ft
17	3 ft	2 ft	25 ft
21	3 ft	2 ft	25 ft

\* Limiting depths where no calculations are required. Pipes are suitable for deeper depth provided a sufficient E' (1,000 psi or more) is accomplished during installations. Calculations would be required for depth greater than 25 ft.

**Response acceptable.** The permit application text has been revised to indicate that pipes will be buried four to six feet bgs. Average frostline in the Red Desert area is approximately four feet. (BRW for AB)

- 97) Section OP 3.6.3.1, Water Balance: should contain an explanation for why the restoration flow rates are so low in comparison to production flow rates (i.e. less than 10%). Would it not be feasible to have higher restoration flow rates, perhaps equal to production flow rates? (MM)

*LC's Response:* It would not be technically feasible to have restoration flow rates equal to production flow rates. The restoration processes produce a higher ratio of waste water to produced water than production processes, creating a more pronounced drawdown of the aquifer's piezometric surface. Therefore, to avoid 'pulling in' considerable quantities of unaffected groundwater (i.e., a higher bleed rate), dropping water levels below pumps; and other consequences of pronounced drawdown, the flow rate during restoration is not the same as the production flow rate. Further, restoration is expected to be completed in a fraction (1/10<sup>th</sup>) of the pore volumes it takes to complete production. If an operator restored wellfields at a flow rate equal to the production flow rate, the restoration circuit would be idle nearly 80% of the time and the required waste water disposal rate would be many times higher (when operated) than the disposal rate included in the operating plan. This scenario could not be justified because of: the extreme rate and volume of waste water generated over short periods of time (estimated at 1,150 GPM); extreme and unsustainable drawdown and recharge during the periodic restoration activities; and economic considerations (capital requirements for a 6,000 GPM water purification facility).

It should however be feasible to maintain a rate of restoration progress equal to the rate of production progress. The result of a proper design would be that wellfields are restored in an equal amount of time as the production life of a typical wellfield. This is the design basis for LC ISR LLC's proposed mine plan (**Figure OP-4a**) and water balance (**Figures OP-5a through OP-5f**). LC ISR, LLC planned for a 60 pore volume (PV) production life at 6,000 GPM. The critical restoration stage (RO) is projected to require 10% of the production PVs (i.e., 6 PVs) and to thus operate at 10% of the production flow rate (average over life-of-project is approximately 600 GPM). The rate of completion of the groundwater sweep (GWS) phase of restoration would also match the rate of depletion of the production areas when properly designed and planned. Since GWS will involve less than one pore volume (see response to Response to Comment OP5, RP#1 for complete explanation), the required flow rate for GWS is designed to commonly be 30 GPM. Operating GWS at pre-determined/controlled flow rate will minimize the likelihood of excessive consumption of groundwater resources for this minimally effective restoration activity. The end result of proper design and planning is that there is adequate and appropriate restoration capacity available for each wellfield at the point in time that it is expected to be depleted and ready for restoration. When the restoration rate equals the production rate, operations would not be extended in one operational phase due to lack of capacity for the next sequential phase.

As required in LQD NonCoal R&R Ch. 3 Sec. 2(k) and Ch. 11 Sec. 5(a)(i), restoration is planned to occur concurrently with mining, the schedule demonstrates a coordinated sequence of mining and reclamation and there is a clearly demonstrated correlation between the capacity of the water/waste water treatment systems and of the capacity requirements of the mining and restoration operations.

**Response partially acceptable.** The information included in the comment response should be incorporated into section OP 3.6.3.1 of the permit. Also, please identify which formation the plant water supply well will be completed in. (MM)

- 98) **Section 3.6.3 Projected Water Balance and Water level Changes.** This section states that the water balance considers the "capacity of the Plant and Class III UIC wells for production and for restoration". Other critical factors will include the capacity of the Class I UIC well(s) and the capacity of the evaporation ponds. These should be included in the discussion and in Figures OP - 5a through 5f. (AB)

*LC's Response:* Please see Response to Comment V5, OP#67.



**Response acceptable.** LC has filed an application with WyDEQ/WQD for five Class I deep disposal wells. Each well appears to have a capacity of 50 gpm, which, assuming all five are constructed is approximately double the projected volumetric requirement for disposal. Based on this assessment, the capacity of the plant and Class III UIC wells appear to be the limiting factor. However, please also see the response to Comment OP-67. **(BRW for AB)**

- 99) **Section OP 3.6.3.1 Water Balance.** (Table OP-6). Are the flow capacity's presented in this Section, Table and in Figures OP-5a through 5f, for the first mine unit or for multiple mine units? Please clarify by indicating how many mine units will be in production and restoration at one time, and how the rates presented are a compilation of that information. A table detailing this information for each mine unit, at each stage of production and restoration, for each year in the life of the mine would be useful. **(AB)**

*LC's Response:* Figure OP-4a illustrates the Lost Creek Project Development, Production and Restoration Schedule. A review of the schedule reveals that normally two mine units are anticipated to be in production and up to three mine units are anticipated to be in various phases of groundwater restoration (GWS, RO, Recirculation and Stability), not including the time required for regulatory approval and surface reclamation.

Section OP 3.6.3.1 states; "The water balance discussion, figures and tables included in this section consider the production and restoration phases to be operating at maximum flow capacity. At maximum flow capacity, the full potential contribution of each unit operation to the water balance can be analyzed." LC ISR, LLC as operator, will have the full discretion to determine the actual operational flow rates that meet the economic objectives of the project. Since portions of mine units are brought into and out of production and restoration as a function of the daily operational control of the facility, a table detailing the contribution of each mine unit to each stage of production and restoration summarized for each year in the life of the mine, would not provide any more useful information than Figure OP-4a already provides.

**Response not acceptable.** Text in the third full paragraph on page OP-34 states "The design basis for the Lost Creek Project is derived to provide the nominal maximum production plant capacity (6,000 gpm) from each typical mine unit. Therefore, each typical mine unit includes approximately 180 (32 x 180 = 5,760 gpm) production wells..." Figure OP-4A indicates that in year two there will be production in MU-1 and MU-2 with no restoration indicated. Given the description in the text above, it would seem that the plant would essentially be operating at capacity with one unit in production, let alone the additional production from a second wellfield. Therefore, the text does not appear to jive with the schedule. Additionally, though not stated in the text, but only in the response, that "LC ISR, LLC as operator, will have the full discretion to determine the actual operational flow rates that meet the economic objectives of the project." is not completely acceptable as the LQD has indicated to LC that restoration will not suffer at the hand of production. Please address. **(BRW for AB)**

- 100) **Section OP 3.6.3.1 Water Balance.** Paragraph 2 mentions the supplemental use of WYPDES discharge as part of the water balance for liquid waste. What is the source of this end of pipe discharge? What treatment standards will apply? What flow rates are anticipated? If a WYPDES discharge is going to be part of the water balance for the site, it should be included in Figures OP-5a through 5f. **(AB)**

*LC's Response:* LC ISR, LLC does not intend to discharge water under a WYPDES permit. The reference to a WYPDES permit was put into the application to show that it might have been an

*option in the future (after a permit revision). However, the language is confusing so the reference to the WYPDES discharge has been removed.*

**Response acceptable.** LC has removed reference to a WYPDES, other than a stormwater, discharge permit from the text. **(BRW for AB)**

- 101) Section OP3.6.3.1 Water Balance. Paragraph 3 states that in the operational mode of production operations, restoration sweep, and groundwater treatment, that the net consumptive removal will be 3% or 190 gpm. It is not clear how this correlates with Figure OP-5c, Project Water Balance Production with GWS and RO. Please provide greater details regarding each stage of the mine life and water balance. **(AB)**

*LC's Response: It is not necessary to determine net consumptive removal from Figures OP- 5a through 5f since the net consumptive removal is clearly presented in Table OP-6. However, Section OP 3.6.3.1 has been modified. A discussion of how Figures OP- 5a through 5f correspond with Table OP-6 to determine the net consumptive removal has been added. Details regarding how the water balance figures relate to each stage of the mine life have also been added.*

**Response acceptable.** LC has revised the text such that it corresponds to Figures OP-5A through OP-5E. **(BRW for AB)**

- 102) Section OP 3.6.3.1 Water Balance. Please provide details on the storage capacity of the permeate storage pond(s) and the concentrated brine storage pond(s), and the estimated average evaporation rate for these facilities. This information should also be included on Figures OP-5c through 5f. **(AB)**

*LC's Response: Please see Response to Comment V5, OP#9 (3<sup>rd</sup> paragraph).*

**Response acceptable.** LC has indicated that the storage ponds are to provide surge capacity and are not intended for evaporation. **(BRW for AB)**

- 103) Section OP 3.6.3.1 Water Balance. If efforts will be made to enhance the evaporation rate from the ponds with sprayers, this should be discussed. **(AB)**

*LC's Response: Please see Response to Comment V5, OP#9 (3<sup>rd</sup> paragraph).*

**Response acceptable.** LC has indicated that the storage ponds are to provide surge capacity and are not intended for evaporation. **(BRW for AB)**

- 104) Section OP 3.6.3.1 Water Balance. The required injection / disposal rate for the UIC Class I well(s) should also be included in the water balance. Once the aquifer characteristics are known, the capability of the aquifer to handle the disposal rate will need to be presented in detail. **(AB)**

*LC's Response: Please see Response to Comment V5, OP#67.*

**Response not acceptable.** LC has provided general information supporting the use of 50 gpm in their assumption for disposal well capacity within the WyDEQ/WQD Class I application. However, in-situ stress tests have not been conducted to date to determine the actual capacity. Please revise the text in Section 5.2.3.2 to provide a commitment concerning the incorporation of test data once obtained. **(BRW for AB)**

- 105) Section OP 3.6.3.3, Cumulative Drawdown: W.S. 35-11-428(a)(iii)(E) requires an assessment of impacts to water resources on adjacent lands and the steps that will be taken to mitigate the impacts. Section OP 3.6.3.3 should include drawdown projections for all aquifers that could potentially be affected by the operation for the life of the mine, including drawdown maps to illustrate the horizontal and vertical extent of projected drawdown. (MM)

*LC's Response:* The parameters necessary to provide an estimate of drawdown during life of the mine include transmissivity, storativity, net extraction rate, and duration of operation. Transmissivity of the HJ Production Zone has been determined from pumping tests, conducted on either side of the Lost Creek Fault. Because of the influence of the fault, the transmissivity determined from this pumping test is viewed as an "effective" transmissivity.

A value of transmissivity that is not influenced by the fault can be estimated using the principle of superposition and image well theory (Stallman 1952). The principle of superposition simply states that the total effect resulting from pumping multiple wells simultaneously is equal to the sum of the individual effect caused by each of the wells acting separately. The principle of superposition is commonly used to evaluate well interference problems by summing the drawdown determined using the Theis equation for a homogeneous, isotropic, infinite extent aquifer. Image well theory is used to address hydraulic impacts of a bounded (non infinite extent) aquifer for either no flow or recharge boundaries (Domenico and Schwartz 1990). In the application of image well theory for a no flow barrier, an imaginary well is placed directly across the no flow boundary at an equal distance from the boundary as the pumping well. The image well is assigned a pumping rate equal to that of the real pumping well. Then the drawdown can be calculated at any point within the aquifer (on the side with the real well) by summing the impacts from both the real and image well, using a modification of the Theis equation.

*Residual Drawdown After End of ISR Operations*

Distance	Time Since End of Operations			
	1 yr	2 yr	4 yr	8 yr
2 miles	20.5 ft	15.1 ft	10.3 ft	6.5 ft
5 miles	18.9 ft	14.4 ft	10.0 ft	6.4 ft

*Average pumping rate of 89 gpm (or 17,134 ft<sup>3</sup>/d).*

*Distance measured from centroid of production.*

**Response partially acceptable.** Impacts to the HJ aquifer have been projected to extend well beyond five miles from the permit area. Other aquifers that may be affected must also be addressed. Drawdown maps must be provided to show the extent of projected drawdown in each affected aquifer. All known water resources (wells, lakes, wetlands, springs, etc.) within the projected 5 foot drawdown area must be identified on the maps. Monitoring plans must be presented for monitoring of impacts to these water resources. Actions to be taken to mitigate the impacts must be described. (MM)

- 106) Section OP 3.5.4.2 Excursion Detection: In addition to the use of water levels to detect excursions, will barometric pressure within the well be monitored to detect excursions? (MLB)

*LC's Response:* In addition to water levels, water quality (indicator parameters) will be used to detect excursions. Monitoring of barometric pressure will not be used to detect excursions. Barometric pressures can undergo large fluctuations due to changing weather patterns. These fluctuations would be unrelated to water level changes that would be caused in the event of an excursion. Monitoring of water levels to observe trends in water level elevation, coupled with changes in water quality will provide the best indication that an excursion may be occurring.

**Response acceptable. (MLB)**

- 107) Section OP 3.6.4.1 Mine Unit Baseline Water Quality and Upper Control Limits. The last sentence of this section states that ‘UCL’s will be set at five standard deviations to the baseline average for the indicator.’ It would be clearer to state that “the UCL will be set as the baseline mean plus five standard deviations”. (AB)

*LC's Response: The last sentence in Section OP 3.6.4.1 has been changed as requested.*

**Response acceptable.** The text has been revised as requested. (BRW for AB)

- 108) Section OP 3.6.4.2 Excursion Detection. The second paragraph states that increased water levels could be indicative of casing failure, and that isolation and shutdown of individual wells would be used to isolate the problem. In addition, please add to the text that MIT testing of suspect wells will be conducted. (AB)

*LC's Response: The second paragraph of Section OP 3.6.4.2 has been revised to include a reference to MITs if water levels change unexpectedly in the overlying or underlying aquifers.*

**Response acceptable.** The text has been revised as requested. (BRW for AB)

- 109) Section OP 3.6.4.3 Excursion Verification and Corrective Action The second paragraph states that if it is determined that a well is on excursion status, that the DEQ will be notified within 24 hours. This should be changed to read verbally notified within 24 hours. (AB)

*LC's Response: Section OP 3.6.4.3 has been revised to state that notification will be verbally.*

**Response acceptable.** The text has been revised as requested. (BRW for AB)

- 110) Section OP 5.0 Effluent Controls. Within this section there are many subsections which address the multiple solid and liquid waste streams from the facility. Please also provide a table which lists each of the facilities solid and liquid waste streams, the estimated monthly predicted volume to be generated, the storage location, and the disposal location. (AB)

*LC's Response: Table OP-10 has been inserted into the permit application to further define the types of solid waste that will be generated at the site. It is not practical to anticipate and list all waste streams but Table OP-10 attempts to quantify the major types of waste.*

**Response acceptable.** LC has included a Table that identifies the major wastes that are anticipated to be generated as requested. (BRW for AB)

- 111) Section OP 5.1 Gaseous Emissions and Airborne Particulates. No mention is made of the Air Quality Division permit(s) that will be required for the site. Please add this information to the discussion within this section. (AB)

*LC's Response: The Air Quality Permit was noted in Section OP 2.2 (Additional Regulatory Requirements), OP 2.10 (Air Monitoring), and Table ADJ-1. A cross-reference to Section OP 2.2 and Table ADJ-1 has been added to Section OP 5.1.*

**Response acceptable.** The text has been revised as requested. (BRW for AB)

- 112) Section OP 5.2.1.3 Waste Petroleum Products and Chemicals. It is not clear from this section specifically where petroleum and chemical products, or hazardous and non-hazardous waste streams will be stored. Preferably these containers will be stored in-doors where they are not subjected to the elements and have adequate secondary containment. If they are to be stored outdoors, please indicate whether there will be roofing, locked fencing, and secondary containment. **(AB)**

*LC's Response: Storage of waste petroleum products is planned within the maintenance shop at the Lost Creek Facility. This shop will have a specific area adjacent to the maintenance area that will be bermed and adequately vented. The area will be indoors and will, therefore, be controlled and not subject to the elements.*

*Waste chemicals will typically be associated with the laboratory and its operations. All liquid wastes will be captured in the drains and/or sumps within the laboratory and will go straight to plant waste tanks for eventual deep well disposal.*

**Response not acceptable.** The text concerning the storage of waste petroleum products has not been revised as indicated in the response. Additionally, the Table OP-10 is in conflict with the text. Please make the appropriate revisions. **(BRW for AB)**

- 113) Section OP 5.2.1.4, Domestic Liquid Waste: The permit for the domestic sewage/septic system should be included in the mine permit application. Additionally the disposal of domestic waste must be addressed. **(MM and BRW)**

*LC's Response: A permit application for the installation of two septic systems with leach fields was submitted to Sweetwater County on June 29, 2009. The septic system to support the Maintenance Shop will be located north of the shop, while the septic system for the office will be located southwest of the Plant (Plate OP-2). Portable chemical toilets to support drilling and field staff will be placed in appropriate locations relevant to ongoing work and will be maintained by a licensed contractor.*

*Pursuant to discussions held on June 22, 2009 in Casper between WDEQ and LC ISR, LLC, Table ADJ-1 of the application has been updated to include the status of the various permits/licenses required to construct and operate the facility.*

**Response not acceptable.** Thank you for updating Table ADJ-1 that indicates an application for two separate septic system permits. It is assumed that the permit(s), once received will either be incorporated into Appendix E or as an attachment to the Operations Plan. The issue with the currently submitted information is associated with the inconsistencies between the text and Table OP-10. Please revise. **(BRW)**

- 114) Section OP 5.2.1.4 Domestic Liquid Wastes. There is no previous discussion of a water supply well for potable water. Please provide a discussion within the permit of the proposed aquifer and location for the potable water supply. **(AB)**

*LC's Response: Please see Response to Comment V5, OP#74.*

**Response not acceptable.** Please see the response to Comment OP-74 and if Well LC229W is to be used as the potable water supply well furnish a copy of the UW-6 associated with this well. **(BRW for AB)**

- 115) Section OP 5.2.3.2, UIC Class 1 Wells: This section addresses deep disposal wells which are a key component of this project. Permits for these wells should be included as part of the mine permit application. (MM)

*LC's Response: Please see Response to Comment V5, OP#67.*

**Response acceptable. (MM)**

- 116) Section OP 5.3.2, Disposal of Liquid 11(e)(2) Byproduct Materials should specify the disposal site for 11(e)(2) byproduct waste. (MM)

*LC's Response: As discussed on June 22, 2009 at Casper between WDEQ and LC ISR, LLC, an 11(e)(2) byproduct disposal agreement has not been reached. However, the expected disposal cost, based on discussions with the managers of various disposal sites, is between \$150 and \$325 per cubic yard. Shipping costs, based on quotes from a hazardous materials shipper currently contracted to haul byproduct material from the Smith Ranch/Highland Project to the Shirley Basin Pathfinder facility or the White Mesa Mill in Blanding Utah are \$1,075 and \$2,600 per shipment, respectively.*

**Response acceptable. (MM)**

- 117) Section OP 5.3.2 Solid 11(e)(2) Byproduct Materials. Will there be any employee Personal Protection Equipment (PPE) that will be generated on a regular basis as 11(e)(2) waste? If a waste stream, it should also be listed in paragraph one of this section. (AB)

*LC's Response: Please see Response to Comment V5, OP#110.*

**Response acceptable.** LC has provided Table OP-10 that estimates monthly waste volumes and revised Section OP 5.3.2 to include PPE. (BRW for AB)

- 118) The operations plan should include a section detailing procedures for exploration and delineation drilling, including: topsoil protection measures; drill hole abandonment procedures, including provision for backfilling to the surface with bentonite chips; and surface reclamation procedures. (MM)

*LC's Response: The following procedures are expected to be used during normal drilling operations:*

**Exploration Drilling:** will typically occur prior to installation of fences or roads to an area. This type of drilling will occur at various depths and may or may not conform to a grid. Density of drilling is highly dependent upon the results of previous work. Drill locations should be modified, where possible, to reduce the need for drilling in major drainage ways and/or major modifications to terrain. If successful, exploration drilling will be followed by Delineation drilling at, typically, a higher density.

*The steps in exploration drilling are normally as follows:*

1. *Surveying – initial target locations are surveyed in with stakes placed. For exploration drilling, very few locations are known initially.*

2. *Access Planning* – the access routes for the initial holes are planned and the backhoe operator and drill contractor informed of the routes. If necessary, access may be delineated with markers or posts.
3. *Drill Pits* – will be installed by the backhoe operator.
  - a. Install erosion protection as necessary;
  - b. Excavate drill pit, segregating topsoil and subsoil;
  - c. Clear/level drill pad as necessary.
4. *Fence Drill Pit*
5. *Drill Exploration Hole*
6. *Geophysical Log*
7. *Abandonment* – use drill rig or LCI equipment to plug the hole
  - a. *Initial* – typically, grout or cement is pumped into the hole from the bottom up. Depending on hole conditions, bentonite chips may be used to assist in the plugging process. A temporary cover is placed over the hole after plugging is complete.
  - b. *Topoff* – after the plugging material is allowed to settle, the hole will be revisited and the grout or cement will be topped off to approximately 17 feet below the ground surface. Approximately 10 feet of bentonite chips will be placed on top of the grout or cement column.
  - c. *Surface plug* – A plug capable of supporting approximately 5 feet of cement or concrete will be placed on top of the plug. The remaining upper two feet of the hole will be backfilled with native soil.
8. *Backfill Pit* – the drill pit will be backfilled with subsoil so as not to allow the displacement of drilling fluid from the pit. The temporary fence will be permanently removed once the pit is backfilled. After the pit is backfilled and the fence removed, the topsoil will be evenly applied over the excavated area.
9. *Seeding* – surface preparation and reseeded will occur at the next available time period appropriate for planting.

***Delineation Drilling:*** may occur prior to installation of fences or roads to an area or may occur in areas with significant infrastructure. This type of drilling will occur at various depths and may or may not conform to a grid. Density of drilling is reasonable dependent upon the results of previous work. Drill locations may be modified, where possible, to reduce the need for drilling in major drainage ways and/or major modifications to terrain. Once completed, delineation drilling will be followed by monitor well and production well installation.

The steps in delineation drilling are normally as follows:

1. *Surveying* – initial target locations are surveyed in with stakes placed. Drilling may be expanded depending on results.
2. *Access Planning* – the access routes for the holes are planned and the backhoe operator and drill contractor informed of the routes. If necessary, access may be delineated with markers or posts. Existing access routes will be used wherever possible.
3. *Drill Pits* – will be installed by the backhoe operator.
  - a. Install erosion protection as necessary;
  - b. Excavate drill pit, segregating topsoil and subsoil;
  - c. Clear/level drill pad as necessary.
4. *Fence Drill Pit* as necessary. If drilling is within existing wellfield fencing, then temporary fencing will not be required.
5. *Drill Delineation Hole*
6. *Geophysical Log*
7. *Abandonment* – utilize drill rig or LCI equipment to plug the hole

- a. *Initial* – typically, grout or cement is pumped into the hole from the bottom up. Depending on hole conditions, bentonite chips may be used to assist in the plugging process. A temporary cover is placed over the hole after plugging is complete.
- b. *Topoff* – after the plugging material is allowed to settle, the hole will be revisited and the grout or cement will be topped off to approximately 17 feet below the ground surface. Approximately 10 feet of bentonite chips will be placed on top of the grout or cement column.
- c. *Surface plug* – A plug capable of supporting approximately 5 feet of cement or concrete will be placed on top of the plug. The remaining upper 2 feet of the hole will be backfilled with native soil.
8. *Backfill Pit* – the drill pit will be backfilled with subsoil so as not to allow the displacement of drilling fluid from the pit. The temporary fence will be permanently removed once the pit is backfilled. After the pit is backfilled and the fence removed, the topsoil will be evenly applied over the excavated area.
9. *Seeding* – surface preparation and reseeding will occur at the next available time period appropriate for planting.

**Response partially acceptable.** The discussion provided in LC's comment response should be incorporated into Section OP 2.12 of the permit. (MM)

- 119) The operations plan should include a section detailing procedures and a schedule for locating, investigating and properly abandoning all historical drill holes on the permit area. (MM)

*LC's Response: Please see Response to Comment V5, #84.*

**Response not acceptable.** The issue of how to address old abandoned drill holes is one that will obviously require continuing evaluation and discussion. Questions relating to who is responsible for the old holes are irrelevant at this point. We are not blaming LC for the existence or the condition of the holes. We would not be asking LC to plug the holes, except for the fact that LC is proposing an ISL operation on a site that resembles Swiss cheese. ISL operators are responsible for controlling their production fluids and for restoring the groundwater affected by their operations. We believe that the old improperly abandoned drill holes will seriously impair these efforts and thus affect LC's ability to conduct a successful operation. LQD cannot ignore this issue. We acknowledge that locating old abandoned drill holes is problematic and that efforts involving extensive surface disturbance are not desirable. LQD will continue to evaluate information (e.g. pump tests) as it becomes available. It is hoped that we can jointly arrive at a reasonable approach to address the problem. (MM)

### **Reclamation Plan (RP)**

- 1) **Section RP 2.3** must specify and describe in detail the methods and efforts that will be employed to restore the ground water to background water quality levels (i.e. define BPT). This description should specify the volumes of water (pore volumes, including the PV calculation) to be treated, re-injected and circulated and the specific treatments to be used. The application must provide detailed justification to demonstrate that the prescribed process has been proven to be successful in restoring ground water to background water quality levels and thus constitutes BPT. Once approved, LQD will expect the operator to employ these prescribed restoration efforts. The reclamation bond will be calculated based on the estimated cost of completing these prescribed efforts. BPT will thus be defined and approved up-front for each well field. Restoration will be considered to be complete once the approved BPT efforts have been conducted, assuming that the class of use has been achieved. This process of defining and approving BPT will provide a measure of certainty to all



parties. It is envisioned that the definition of BPT could change for future well fields, based on changes in technology and/or results of on-site restoration efforts. (MM)

**Response acceptable.** LC's restoration plan will employ 0.3 PV of groundwater sweep, 6.0 PV of RO and 1.0 PV of recirculation. The PV calculation includes 20% vertical flare and 20% horizontal flare. The facilities necessary for restoration will be installed prior to production start-up. The restoration plan as outlined is accepted as BPT for the first mine unit. Based on the results, the restoration plan may require revision for future mine units. (MM)

- 2) **Section RP2.3 Groundwater Restoration Methods.** Please provide greater detail including chemical equations (similar to Figure OP-6) to explain the processes that the groundwater will undergo to create the reducing conditions. The chemistry that will take place in the ion exchange and RO circuits should be presented. Further explanation of the how possible reductants or bioremediation additives will affect the chemistry of the groundwater should also be provided. (AB)

*LC's Response: Ion Exchange. The chemistry of the ion exchange circuit used in restoration is identical to the chemistry of the ion exchange circuit used in production. Ion exchange resins preferentially remove the uranyl dicarbonate and/or uranyl tricarbonate compounds from the solution. Bicarbonate compounds are displaced from the resin into the solution.*

*Reverse Osmosis. Reverse osmosis systems are physical separation units and do not rely on chemical processes. Water containing chemical impurities is pressurized to force small molecules through a semi-permeable membrane barrier. The membrane is designed to allow water molecules, gases and other small molecules to permeate (pass) through the membrane. Larger ions, molecules and chemical compounds are physically unable to pass through the membrane due to their size and are thus separated and collect as a concentrate (brine) (See Table RP-2).*

*Reductants. No specific chemical reductant additives have been proposed in the application. LCI advocates an approach where WDEQ-LQD would review and approve any proposed chemical reductant additive, and how such additives will affect the chemistry of the groundwater, prior to commencement of addition at the site. Text to this effect has been added in Section RP 2.3.*

*Bioremediation. No specific bioremediation process has been proposed in the application. The field of bioremediation is rapidly advancing as is the technical understanding of the technique. It would be highly speculative at this time to discuss any or all potential additives. LCI advocates an approach where WDEQ-LQD would review and approve any proposed bioremediation technique, and how such additives will affect the chemistry of the groundwater, prior to commencement of addition at the site. Text to this effect has been included in Section RP 2.3.*

**Response acceptable.** The proposed reclamation method does not call for the use of reductants or methods that will create a reducing environment. Rather, the reclamation, in simple terms, just calls for the removal of materials that created an oxidized environment and ground water replacement. Therefore, equations as requested in the comment were not supplied. LC proposes an "exchange" of 7.3 pore volumes of water, which they believe will allow them to meet the reclamation standard. If this does not occur, LC will either continue to treat using the original processes proposed in the application's reclamation section or may propose the use of reductants or bioremediation. If there is a change in the reclamation technology used, a permit revision will be sought. (BRW for AB)

- 3) **Section RP2.3 Groundwater Restoration Methods.** This section provides pore volume exchanges for groundwater sweep (one pore volume) groundwater treatment (six pore volumes) and groundwater recirculation (one pore volume). Please cite where this is documented to be BPT. Is it based on any real life success of an existing well field? (AB)

*LC's Response: Please see the Response to Comment V5, RP #1.*

**Response acceptable.** Section RP 2.3 provides a comparison of the proposed restoration process to that completed at Christensen Ranch in the Powder River Basin. The LQD is willing to accept the proposed restoration process for the first wellfield. However, it will be incumbent upon LC to attain the Class of Use standard established for the wellfield. If this cannot be met, either additional treatment using one or more of the methods cited will be required, alternately LC will need to investigate alternate technologies, such as bioremediation. **(BRW for AB)**

- 4) **Figure RP-1.** The timeline gap for the Process Plant should indicate plant decommissioning. **(AB)**

*LC's Response: Figure RP-1 has been updated and clarified (including removal of the 'gap').*

**Response acceptable.** Figure RP-1 has been revised as requested. **(BRW for AB)**

- 5) Please provide a hydrologic impact assessment (surface and ground water) of the final anticipated conditions. This should include recovery times ground water, potential changes in water chemistry, etc. **(BRW)**

*LC's Response: Surface Water - As discussed in Appendix D6, Section D6.1.1, all of the surface water features at the site are ephemeral and relatively small. The only anticipated temporary impacts to the surface water system during operations may occur along roads, where it may be necessary to route drainages through culverts under the roads (Section OP 2.6) or route runoff around facilities (Operations Plan Attachment OP-4). These features should not affect flow rates or water quality because: of the low relief across the site and the limited surface water flows; only the drainage pattern in the immediate vicinity of the roads and structures may need to be altered (if at all); the culverts will be appropriately sized; and any disturbances associated with installation of the structures will be reclaimed immediately after installation (Section OP 2.7). The Stormwater Pollution Prevention Plan also has provisions for evaluating construction impacts and unanticipated impacts such as spills. Provisions for spill detection and response are also addressed in Section OP 2.9.*

*Once reclamation of the site is completed, no permanent impacts to the surface water system are anticipated. As discussed in Sections RP 3.0 and 4.0 of the Reclamation Plan, all of the surface facilities are scheduled for removal and reclamation. The landowner (BLM) could request that a road (and associated culverts) be left in place, which may mean a permanent change to the drainage pattern. However, by that time, any potential problems with the function of the culvert(s) should have been detected and repaired. As noted above, any spill-related impacts will be addressed at the time of the spill.*

*Groundwater - Please see OP 3.1 and Response to Comment V5, OP#105.*

**Response not acceptable.** While the reviewer admits there will generally be no measureable impacts to the surface water drainage system as described in the text above. However, the reviewer could not find the summary discussion provided as a response within the application text. The permanent postmine impoundment at the Sweetwater Mill, whose source of supply is the Battle Springs aquifer, is not that far away from the proposed operation. There is no mention as to what impacts, if any, the project drawdown may have on this facility.

Regarding ground water, LC has provided some information in response to Comment OP #105. The majority of the response provided information could not be found in the application text. As requested, please provide maps that illustrate projected areal extent of five or more feet of drawdown. Please provide an estimated recovery time and include the methodology used to make the calculation. While the reviewer understands that wells within one-half mile of the projected disturbance will be plugged and abandoned, there are several wells, some of which are assumed to serve as stock water supply, that are outside one-half mile radius, but easily within two miles of the permit area boundary. No assessment has been provided regarding the potential impacts to these wells, nor a commitment to replace if the well is impacted. Please make the appropriate revisions to the application text and also see the response to Comment OP #105. **(BRW)**

- 6) Section RP 2.3.1: The use of ground water sweep with direct disposal of the produced water, is not considered to be BPT due to excessive consumption of ground water and resultant impacts to ground water resources. This section should be revised to clarify that ground water sweep will only be employed when the produced water can be treated and re-injected. **(MM)**

*LC's Response: Please see Response to Comment V5, OP#16.*

**Response acceptable. (MM)**

- 7) Section RP 2.4: The ground water stability monitoring phase should be 12 months with quarterly sampling (i.e. a total of 5 sampling events). **(MM)**

*LC's Response: WDEQ-LQD Guideline 4 Section D(1)(d) recommends a stabilization period of at least six months. LC ISR, LLC has already exceeded the minimum LQD recommendation by stating that stabilization will last nine months. Samples will be collected at the beginning of the nine-month period and once every three months for nine months. This will result in a total of four sampling rounds.*

**Response not acceptable.** Four samples in a nine month period is not sufficient to evaluate stability. Guideline No. 4 recommends a stability period of at least six months with monthly sampling (i.e. a minimum of 6 sampling events) and analysis of the full suite of parameters. The reviewer is only requesting 5 sampling events over a 12 month period. **(MM)**

- 8) Section RP 2.4 should be revised to specify that during the stability monitoring period all monitoring wells (inside and outside of the pattern, including underlying, overlying and perimeter wells) will be individually sampled and analyzed for the complete suite of parameters, including water levels. **(MM)**

*LC's Response: Section RP 2.4 has been revised to state that, during stability monitoring, all overlying, underlying and perimeter monitor wells will be analyzed for all UCL parameters once every three months. If groundwater restoration has not been successful and an excursion occurs during stabilization then the sampling will revert to weekly for affected monitor wells.*

**Response not acceptable.** LC is proposing to take composite samples from the wellfield instead of sampling and analyzing each well and averaging the data. This is not acceptable. An average is an arithmetic mean (defined in Webster's as: The value computed by dividing the sum of a set of terms by the number of terms.) Baseline/background water quality is characterized based on analysis of samples from individual wells. Restoration will be evaluated in the same manner.

LC is also proposing to drop the analysis of any parameter found to be below the detection limits. This is not acceptable. Every sample must be analyzed for the complete suite of parameters. The

purpose of stability monitoring is to demonstrate that the water quality is stable based on an evaluation of all parameters. Just because a parameter is non-detectable during one sample round does not insure that it will remain non-detectable throughout the stability period. (MM)

- 9) Section RP 3.1, Well Abandonment: Item number 1 in the list beginning at the bottom of page RP-10 must specify that grouting will occur from the bottom of the well to the top. (MLB)

*LC's Response:* Item 5 indicates that grouting will occur from the bottom of the well.

**Response acceptable.** Item 5 indicates that grout will be injected from the bottom of the well through the use of drill pipe or a tremie tube. (BRW for MLB)

- 10) Section RP 3.1, Well Abandonment: Item number 7 in the list on Page RP-11 must be changed to acknowledge the new policy of LQD to require that all drill holes and abandoned wells are backfilled to within three feet of the surface. It is no longer considered BPT to allow open holes to be left in the ground. This means if grout settles to 40 feet bgs (or any other level greater than two or three feet bgs) and no water is on top of the grout plug, bentonite chips or a reasonable substitute must be poured into the hole to bring it to the proper level. If there is still water on top of the grout plug, the operator is expected to re-enter the hole and tremie to the bottom so the hole may, again, be backfilled from the bottom to the top. (MLB)

*LC's Response:* Please see the Response to Comment V5, OP #118.

**Response not acceptable.** While the text is generally acceptable, WDEQ/LQD NonCoal Rules and Regulations, Chapter 8 is not applicable to which this section addresses, well abandonment. The citation should be WDEQ/LQD NonCoal Rules and Regulations, Chapter 11, Section 8. Within this section, the requirement is for the entire casing is to be filled. The text of this section only indicates that if settlement is greater than 40 feet, additional grout will be added. A statement should be added that makes a commitment to have the sealant material remain within three feet bgs for a period of 24 hours before cutting the casing and installing the concrete cap. Please make the appropriate revisions to the text. (BRW for MLB)

- 11) Section RP 3.1, Well Abandonment: Item number 12 in the list on Page RP-11 must include the words "and LQD" at the end of the sentence ending with "WSEO". (MLB)

*LC's Response:* Item 12 has been revised to include LQD.

**Response acceptable.** The text has been revised as requested. (BRW for MLB)

- 12) Section RP 3.2 Facility and Road Reclamation. Paragraph 3 states that culverts and road surfacing materials will be removed. Please indicate their final disposal location(s). (AB)

*LC's Response:* The bond calculation provided in Table RP-4 accounts for the replacement of topsoil and revegetation for the roads in Worksheet 7. However, LC ISR, LLC neglected to include the cost of culvert and road surface removal in the bond estimate. Table RP-4 has been revised to include those items.

*The bond estimate will assume that the culverts will be disposed of at the nearest municipal landfill (Rawlins, WY). The estimate will also account for the cost to gather and load the gravel surfacing from the roads. However, because there is significant value in the road material, no cost for trucking or disposal is planned. If these assumptions become invalid, LCI will modify the bond estimate in the Annual Report.*

**Response acceptable.** LC's response indicates that culverts will be disposed of in a permitted landfill facility. Review of the bond calculations suggests that the proposed figure of \$3.48 per linear foot is probably low, especially if the assumption is to truck the material to Rawlins. Cost and assumptions for reclamation will be reviewed as part of the bond. **(BRW for AB)**

- 13) Section RP 4.0, Reclamation and Decommissioning of Processing and Support Facilities: Ponds, laydown yards, parking areas, and topsoil and subsoil stockpile location, should be included in the bullet list at the beginning of this section. **(MLB & AB)**

*LC's Response:* The list at the beginning of Section RP 4.0 has been updated as requested.

**Response acceptable.** The text has been revised to include the requested items. **(BRW for MLB and AB)**

- 14) Section RP 4.1 discusses on-site waste disposal. Any on-site waste disposal must be permitted as part of the mine permit application. Detailed plans and specifications must be provided along with landowner's consent. **(MM)**

*LC's Response:* LC ISR, LLC has decided to not pursue an on-site landfill at this time and as such has deleted the portions of the 2<sup>nd</sup> paragraph of Section RP 4.1 describing a landfill. The bond calculation includes the cost of shipping and disposal of all material at appropriate offsite locations.

**Response not acceptable.** LC's response states that they will not pursue an on-site landfill, yet the text in section RP 4.1 still describes on-site disposal of waste materials. Please revise the text in the permit to clarify that there will be no on-site disposal of waste materials. **(MM)**

- 15) Section RP 4.5.2, Surface Preparation: On Page RP-15 there must include a commitment to rip to a minimum depth of 12 inches as part of seedbed preparation. **(MLB)**

*LC's Response:* The text has been revised to specify a minimum depth for the seedbed preparation.

**Response acceptable.** The text has been revised as requested. **(BRW for MLB)**

- 16) RP4.5.2, Surface Preparation: It is stated that "Seed bed preparation will be performed under appropriate soil and climatic conditions". Please define appropriate soil and climatic conditions. **(CS)**

*LC's Response:* The purposes of performing seed bed preparation under appropriate conditions have been noted in the second paragraph of Section RP 4.5.2, along with examples of conditions under which seed bed preparation would be inappropriate.

**Response acceptable.** **(CS)**

- 17) RP4.5.3, Soil Placement: Stating that "soils will be replaced where excavated, whenever possible" seems inappropriate. If soils are stripped and stockpiled it should be possible to replace them. **(CS)**

*LC's Response:* The intent of LC ISR, LLC's Section RP 4.5.3 is to say that the soil will be replaced at the same location from which it was excavated, whenever possible. The text at the beginning of Section 4.5.3 has been clarified.

**Response acceptable. (CS)**

- 18) Section RP 4.5.3 Soil Replacement. This section states that Section OP 2.5 describes that separate handling of topsoil and subsoil is not required. No discussion of this topic was found in Section OP 2.5. Topsoil is always more valuable a planting bed than a topsoil / subsoil mixture. Especially given the desert conditions, all efforts should be made to be protective of the topsoil layer, especially by handling it separately from the subsoil. (AB)

*LC's Response: The reference to subsoil has been removed, and the discussion about topsoil and subsoil in Section OP 2.5 has been clarified.*

**Response not acceptable.** Specific to salvage and replacement, Section OP - 2.5 indicates that a qualified professional will be on hand and that the soil will be replaced at a uniform depth. Baseline soil surveys should define the salvage depth at various locations and if this has not been done, the survey is incomplete. The text should commit to salvaging topsoil to depths as specified in the Appendix D-5 surveys and replaced at a uniform depth according to salvage. Please revise the text accordingly. (BRW for AB)

- 19) Section RP 4.5.4 Seed Mix, Reseeding Methods and Fencing. Paragraph 4 states that re-seeded areas outside fenced mine units will be restricted until vegetation is successfully re-established. The only way to ensure access restriction from wildlife is with fencing. Please state that these areas will have fencing installed to prevent access. (AB)

*LC's Response: Those portions of the Permit Area that will require reseeding, outside the Plant and the mine units, are generally long, narrow areas, such as roads and pipeline corridors. The intent was to indicate that vehicular access will be restricted; exclusion of wildlife from such corridors is impractical and the use of fencing that could exclude wildlife would probably not be approved by the WGFD. In addition, most of the cattle in the general area do not congregate on the Permit Area because of the lack of water. The text has been revised to indicate that vehicular access will be restricted and that particular attention will be given to these areas in terms of evaluating revegetation practices and success to determine if additional weed control, use of a cover crop, or other supplemental practices will be necessary because of the exposure to forage.*

**Response acceptable.** The text has been revised to indicate that vehicular traffic will be restricted. If reclamation performs poorly for various reasons, LC will submit a plan to the LQD to address. (BRW for AB)

- 20) RP4.5.4, Seed Mix, Reseeding Methods, and Fencing: The last paragraph states that "When reseeding areas outside fenced mine units or the Plant, grazing and access to reseeded areas will be restricted until vegetation is successfully re-established". Please clarify how access is going to be restricted. For example "with BLM and DEQ approved fencing". (CS)

*LC's Response: Please see response to previous comment.*

**Response acceptable. (CS)**

- 21) RP4.5.5, Revegetation Success Criteria: The second point in the list states that "the total vegetation cover of perennial species (excluding noxious weed species) and any species in the approved seed mix is at least equal to the total vegetation cover of perennial species (excluding noxious weed species) before operations". Consider rewording to "the total vegetation cover of perennial species

(excluding noxious weed species) and any species in the approved seed mix is at least equal to the total vegetation cover of perennial species (excluding noxious weed species) of the undisturbed areas of the mine permit". This would add consistency with your proposed vegetation study parameters and helps account for climatic variability between when mining began and when reclamation evaluation occurs. (CS)

*LC's Response: The text has been revised to indicate that undisturbed areas will be used for the evaluation of revegetation success.*

**Response acceptable. (CS)**

- 22) Reclamation Plan, Page RP-15. The sequencing of the sections goes from RP4.4 Roads on page RP-14 to Section RP 1.1 Soil Replacement and Revegetation on page RP-15. According to the table of Contents, this should be RP 4.5 Soil Replacement and Revegetation. (AB)

*LC's Response: The typo has been corrected.*

**Response acceptable.** The typo was corrected. (BRW for AB)

- 23) Section RP 5.0 and Table RP-4: The reclamation cost estimate should be revised to include the following:

- a. A detailed critical-path time schedule including all phases of the reclamation.
- b. A detailed description of labor requirements and assumptions for all phases of the reclamation. It is this reviewer's position that the reclamation cost estimate should include a workforce/payroll comparable with the production workforce/payroll or justify why this would not be the case. (MM)

*LC's Response: A detailed critical-path schedule is included as Figure RP-4 for the operation, restoration and reclamation of the Plant and the first mine unit. This schedule supports the associated bond presented in Table RP-4. The schedule also details the projected manpower requirements through the restoration/reclamation cycle. Restoration occurs concurrently with production during most of the project life; therefore, the "production workforce/payroll" already includes the workforce required for restoration during much of the mine life. Restoration and reclamation do not require a workforce/payroll comparable with the production workforce. The need for several segments of the workforce are eliminated and or substantially reduced when drilling, construction and production activities cease. When production ends and restoration continues, the workforce required for production is cut while the workforce required for restoration is retained.*

*The operational flow rate required for restoration is a small fraction of the operational flow rate for production. The requirement for groundwater sweep and the rate of consumptive removal of groundwater during that stage limit the ability for an operator to increase the restoration flow rate. Lower required flow rates translate to lower workforce/payroll levels.*

*Table RP-4 and Figure RP-4 have been revised to include the actual monitor well counts and proposed injection and production counts. Figure RP-4 details the labor requirements during all phases of the initial bonded work. The following is a discussion of the major labor components:*

**Drilling and Construction:** *For the purposes of Figure RP-4, construction occurs from the beginning of Year 1 through the second month of Year 2. Construction includes installation and testing of wells, pipelines, powerlines and field production facilities. Because the surety bond*

*calculation assumes shutdown of production after Mine Unit 1 (MU-1), all construction associated personnel and contractors will cease work at the project after completion of their assignments except for those that will be employed in the restoration and/or reclamation of the facility.*

**Production Operations:** *For the purposes of Figure RP-4, production will occur from the beginning of Year 1 through the second month of Year 3. Production includes injection of lixivient, production of uranium solutions, monitoring of solutions and wells, maintenance of wells and operation/maintenance of the plant facility. Because the surety bond calculation assumes shutdown of production after Mine Unit 1 (MU-1), all production associated personnel will cease work at the project after completion of their assignments except for those that will be employed in the restoration and/or reclamation of the facility.*

**Restoration:** *For the purposes of Figure RP-4, restoration will occur in two phases: Active and Passive. Phase 1, Active Restoration, will include groundwater sweep, reverse osmosis and recirculation. This will occur from the third month of Year 3 through fifth month of Year 4. Phase 2, Sampling, will include stability sampling and regulatory approval. This will occur from the sixth month of Year 4 through the eighth month of Year 5. Personnel in these phases will be responsible for plant operation and maintenance, field operation and maintenance and sampling. All associated personnel will cease work at the project after completion of their assignments except for those that will be employed in the reclamation of the facility.*

**Reclamation:** *For the purposes of Figure RP-4, reclamation will occur from the ninth month of Year 5 through the eighth month of Year 6. Reclamation includes plugging of wells, demolition and removal of all production systems and removal of roads.*

**Response partially acceptable.** The information presented in the response to comments needs to be incorporated into the permit in section RP 5.0. The projected restoration workforce appears to be very lean. Please address the following considerations:

- a. Restoration will be conducted on a 24 hour, 7 days per week basis.
- b. Uranium will be produced during restoration.
- c. Maintenance operations must continue in all areas through the restoration and stability period, including the plant and the wellfield. RO units have high maintenance requirements.
- d. MIT's must be conducted on wells at least through the active restoration period.
- e. All monitoring, sampling, analysis and reporting requirements continue through restoration and stabilization.
- f. The facility must be manned on a 24/7 basis.
- g. The restoration/reclamation will take approximately 4 years, yet the labor worksheet (page 12 of 37) only covers 2 years.
- g. Labor costs must include benefits and should be no less than \$35/hr. (MM)

- 24) **RP5.0, Financial Assurance; Category 2:** The paragraph addressing worksheet seven indicates a "conservative" estimate of 5 out of 40 acres will need topsoil handling. Please clarify what a "conservative" estimate is and the justification for stating only 5 out of 40 acres will need topsoil handling. (CS)



*LC's Response:* Figure OP-7c details the vegetation and soil impacts on a "per header house" basis. The short term disturbance associated with piping and mud pits are estimated at 10%. The long term disturbance is estimated at 3%. Additional long term disturbance would be in the form of roads and laydown areas outside the pattern boundaries, as shown in Figure OP-7b. The disturbance detailed above is "conservatively" estimated at less than 12.5% or 5 of 40 acres.

**Response acceptable. (CS)**

- 25) **Section RP 5:0 Financial Assurance. Paragraph one.** Please add the cost of groundwater monitoring and analysis to the list of costs. **(AB)**

*LC's Response:* The costs associated with groundwater monitoring and analysis are dispersed within the existing bond estimate and are not just incorporated as the 0.5% allotted for on-site monitoring under the Miscellaneous Costs Associated with Third Party Contractors in the Bond Summary (Page 1 in Table RP-4). For example, in Worksheet 1 (Groundwater Restoration), there are entries in Item IV (Stability Monitoring) specifically for the samples collected during that phase and in Item V (Labor), there are costs for a Sampler and for a Chemist. The surety will be reviewed annually and adjusted to reflect changes in cost and in the Project.

**Response not acceptable.** Aside from the monitoring during the stability period mentioned in the comment response, there does not appear to be any sampling and analysis cost included during the active restoration phase of the operation. **(MM)**

- 26) **Table RP-4 Reclamation / Restoration Bond Estimate.** Groundwater sampling and analysis could be conducted for many years, and should not be handled as a overhead cost of 0.5%, but as a separate line item in the bond estimate. Please indicate the initial number of monitoring wells that will be in place at the initial start-up of the mine and calculate their cost for sampling and analysis based real costs. **(AB)**

*LC's Response:* Please see response to previous comment.

**Response not acceptable.** See comment no. 25 above. **(MM)**

- 27) **Table RP-3, Seed Mix:** It is requested that the seed mix be revised, contingent on BLM concurrence, to eliminate Prairie sandreed and Rubber rabbitbrush. This would reduce the overall seeding rate to 15 lbs/ac which is a more reasonable drill seeding rate. This lower seeding rate would be more conducive to sagebrush establishment, which is a primary focus of the revegetation efforts. Prairie sandreed is not native to the area and is not adapted to the arid conditions of the Red Desert. Rubber rabbitbrush is native, however it is not particularly desirable. Species that could be listed as possible alternates would include winterfat, needle-and-thread and squirreltail. **(MM)**

*LC's Response:* LC ISR, LLC has sent a letter to BLM requesting concurrence on WDEQ-LQD's requested changes to the seed mix, including elimination of Prairie sandreed and Rubber rabbitbrush, which results in an overall seeding rate of 16 lbs/acre, and identifying needle-and-thread and bottlebrush squirreltail as alternatives (for all but sagebrush). If BLM concurs, LC ISR, LLC will update Table RP-3.

**Comment remains outstanding pending a response from the BLM. (BRW for MM)**

- 28) Please provide a sediment control plan for the reclamation phase of the operation. **(BRW)**

*LC's Response:* The Storm Water Pollution Prevention Plan (Operations Plan Attachment OP-4) addresses sediment control for the life of the mine (cross-referenced in the second paragraph in Section RP 4.5).

**Response not acceptable.** Thank you for providing the cross reference to SMPP. The comment remains unacceptable until resolution is reached to Comment OP #19. **(BRW)**

- 29) As required by LQD, Chapter 11, Section 5 (a) (v), the Reclamation Plan must include a contour map showing the approximate post-reclamation surface contours for affected land and the immediate surrounding areas if the operation will substantially alter the premining contours. The absence of this map must be explained in the permit text in the context of the above rule. **(MLB)**

*LC's Response:* Text has been added to Section RP 4.5.2 to indicate that a post-reclamation contour map is not necessary.

**Response acceptable.** Given that there will be no excavation within the various proposed wellfields and that excavations in the Facilities Area will be relatively minor, the disturbance will be returned to approximate original contour, thus, no map is required. **(BRW for MLB)**

- 30) A new section should be added to the Reclamation Plan entitled "Determination of Successful Groundwater and Site Restoration". The purpose of this section is to clearly state unequivocally the criteria that will be used by the WDEQ/LQD to determine whether the site has been adequately restored. It is envisioned that this section of the Reclamation Plan may become more pertinent as staff in Lost Creek ISR and WDEQ/LQD change over the upcoming 10 to 20 years. Fulfillment of the criteria in this section will be required before the operator may request/achieve final bond release. This section should include the following six bond release criteria:

- a. Ground water treatment/restoration using approved BPT as described in Section RP 2.3 (Groundwater Restoration Methods) of the Permit;
- b. Achievement of baseline ground water conditions. If baseline is unachievable, proceed to c.;
- c. If baseline ground water conditions are unattainable, achievement of approved Class of Use is required;
- d. Ground water stability monitoring of a 12 month duration with quarterly sampling (i.e. a total of 5 sampling events). If water quality trends during stability monitoring indicate class of use standards are (or will be) exceeded, the operator must return to step "a" above). Alternately if class of use standards, at a minimum, are met for the 12 month period then the well field will be considered eligible for bond release;
- e. Reclamation of surface disturbance as described in the Reclamation Plan of the Permit which shall include all requirements of LQD Chapter 11, Section 5;
- f. Documentation of LQD and landowner (primarily BLM) concurrence that the project is adequately reclaimed to the standards outlined in the approved WDEQ/LQD permit.

The above bond release criteria can be considered on a well field by well field basis. Once criteria a – d have been met, the operator may request partial bond release for an individual well field. Final bond release cannot be considered until all of six of the above criteria have been met by the operator: **(MLB and BRW)**

*LC's Response:* Pursuant to discussions on June 22, 2009 in Casper between WDEQ and LC ISR, LLC, please see the Response to Comment V5, RP #1.

***Response not acceptable.*** The reviewer's concede that LC has expanded the discussion on the various methods to be used during ground water restoration. However, there is still disagreement concerning what constitutes a reasonable stability period and the number of samples required, see Comment RP #7. Additionally, the reviewer's believe it is in the best interest of LC as well as the LQD to clearly define the success criteria to which bond release will be judged instead of having pieces in various sections. Please see the original comment and revise the text as requested. **(BRW for/and MLB)**

**NEW COMMENTS BASED on REVISED MATERIAL RECEIVED 10/19/2009**

**Volume 5 – (Operations Plan and Reclamation Plan):**

***Operations Plan (OP)***

- NC1. Section OP 2.8, Page OP-15: the citation, "(WGFD, 2008)" is not listed in the "References" (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. **(SP)**
- NC2. Section OP 2.8, Attachment OP-6, Wildlife Protection and Wildlife Monitoring (WP&WM), Table of Contents (TOC): in the TOC on page ii, the last heading (i.e., "ADDENDUM") with the next two lines of text (i.e., ending with References) are inserted in the document after the text sections and should be moved to a position just ahead of "FIGURES". **(SP)**
- NC3. Section OP 2.8, Attachment OP-6, WP&WM, TOC: tabbed and labeled dividers for "References", "Addenda", "Figures", and "Tables" should be included as was done with Appendix D-9. **(SP)**
- NC4. Section OP 2.8, Attachment OP-6, WP&WM, TOC: figure OP-A6-2 is the same as Figure D9-6. Past LQD experience has found it is difficult to remember to change the information and more than on location, resulting in conflicting information being retained within the mine permit when future plan revisions are made. Please cite the same figure number in both (or more) places but only include the figure in its most logical location. **(SP)**
- NC5. Section OP 2.8, Attachment OP-6, WP&WM, TOC: figure OP-A6-3e was added to the document; however, it was not added to the TOC. Please correct. **(SP)**
- NC6. Section OP 2.8, Attachment OP-6, WP&WM, TOC: the titles on all but the first 2 Figures and several Tables are not the same as on the TOC. Please correct. **(SP)**
- NC7. Section OP 2.8, Attachment OP-6, WP&WM, TOC: tables OP-A6-3 and -4 are the same as Tables OP-3 and -5. Past LQD experience has found it is difficult to remember to change the information and more than on location, resulting in conflicting information being retained within the mine permit when future plan revisions are made. Please cite the same figure number in both (or more) places but only include the tables in its most logical location. **(SP)**
- NC8. Section OP 2.8, Attachment OP-6, WP&WM, Section 1.0: the citation, "(WGFD 2008)" appears twice on page 2 and is not listed in the "References" (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. **(SP)**
- NC9. Section OP 2.8, Attachment OP-6, WP&WM, Section 1.1: the "WDEQ" is referenced twice and in both instances it appears that the Land Quality Division (LQD) is being referenced rather than the

entire WDEQ and all its divisions. The "ABBREVIATIONS AND ACRONYMS" list on page OP-v identifies the "LQD" as the proper acronym to be consistent. Please correct the above 2 references here and the mine permit text accordingly. Please correct. (SP)

*NC10.* Section OP 2.8, Attachment OP-6, WP&WM, Section 1.3.1 in the second to last paragraph "If the annual raptor nest survey locates a new...nest within 0.5 miles of projected activities...". The underlined words that follow should be added after the word "...activities..." (e.g., "...of projected mining activities and those activities proposed for the coming year"...). Please correct. (SP)

*NC11.* Section OP 2.8, Attachment OP-6, WP&WM, Section 1.3.3.1: the section cites "Section RP-4.5.5" regarding fence removal and mentions that "The fences will be removed after... and vegetation has become established in accordance with permit requirements"; however, this statement is not written in the referenced section. It should also be written in the RP text. Please correct. (SP)

*NC12.* Section OP 2.8, Attachment OP-6, WP&WM, Section 1.3.3.3: the storage ponds are planned to be surrounded first by a 6 foot high chain link fence and then by a barbed wire fence. The text mentions that the amount of freeboard (3h:1v) should make it difficult for land birds to drink from the ponds. Northern sage grouse (NSG) are highly attracted to water and could easily fly over the fences to land inside it. NSG also find their way into "old tire" and vertical-sided metal tanks at livestock waters, often drowning. Escape ramps are being installed across the state. In this situation; however, exiting the pond area might be difficult, especially for waterfowl. LC ISL, LLC, should consider netting to cover the ponds and creating one or more water sources (i.e., off-site mitigation; generally to the north of the mine units and plant) to draw NSG and other wildlife to an alternate water source and potentially, increase NSG survival. Please correct. (SP)

*NC13.* Section OP 2.8, Attachment OP-6, WP&WM, Section 1.3.3.3: the section cites "Section 2.9.4" and it be "Section OP 2.9.4". Please correct. (SP)

*NC14.* Section OP 2.8, Attachment OP-6, WP&WM, Section 1.4.3: in the noise discussion and at the top of page 12, "OP-A6-5a" is cited. It should be "Table OP-A6-5a". Please correct. (SP)

*NC15.* Section OP 2.8, Attachment OP-6, WP&WM, Section 1.4.3: in the last paragraph of the noise discussion and on page 12, "Figure OP-A6-4" is cited. It should be "Figure OP-A6-5". Please correct. (SP)

*NC16.* Section OP 2.8, Attachment OP-6, WP&WM, Section 1.5.1.3: the WDEQ is composed of several divisions [i.e., air (AQD), land (LQD), water (WQD), etc.]. The use of "WDEQ" is listed in this section; however, if referencing a specific division (e.g., "LQD"; see "ABBREVIATIONS AND ACRONYMS" list on page OP-v) and not the department as a whole [(WDEQ)(i.e., all divisions)], specific divisions should be cited. Please correct throughout the permit document. (SP)

*NC17.* Section OP 2.8, Attachment OP-6, WP&WM, Section 1.5.3.1: "birds of prey" or "raptors" should be included in the list of predators. Please correct. (SP)

*NC18.* Section OP 2.8, Attachment OP-6, WP&WM, Section 1.5.4: the WDEQ is composed of several divisions [i.e., air (AQD), land (LQD), water (WQD), etc.]. The use of "WDEQ" is listed in this section; however, if referencing a specific division (e.g., "LQD"; see "ABBREVIATIONS AND ACRONYMS" list on page OP-v) and not the department as a whole [(WDEQ)(i.e., all divisions)], specific divisions should be cited. Please correct throughout the permit document. (SP)

NC19. Section OP 2.8, Attachment OP-6, WP&WM, Section 2.0: the citation, “(WGFD 2007)” appears in the text on page 17 and is not listed in the “References” (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. (SP)

NC20. Section OP 2.8, Attachment OP-6, WP&WM, Section 2.3.1 the first 3 paragraphs of this section (i.e., all on page 21) do not adequately mirror the Appendix B requirements for raptor “**Nest Status and Production Success**”. Please replace these 3 paragraphs with the following and more specific Appendix B language. “From on or before mid-February through March, surveys for golden eagle and great horned owl nests shall be initiated with ½ mile of existing mining activities and those activities proposed for the coming year. In areas of potential conflict situations LC ISL will document early courtship behavior because once eggs are laid, mitigation options become restricted. [End of Paragraph] In addition, three surveys covering the entire permit area and a one mile perimeter will be conducted within the following time frames. The first shall be conducted in March to check known **and** to locate any new golden eagle and great horned owl nests [i.e., territory: (a) not occupied (inactive), (b) occupied by one occupant (active), **or** (c) occupied by a pair (active)]. A second survey shall be conducted in April to check known nests most other raptor species [i.e., territory: (a) not occupied (i.e., inactive), (b) occupied by one occupant (active), **or** (c) occupied by a pair (active)]. A third survey shall be conducted from mid-May through mid-June to locate new raptor nests and to check the status of all known nests. [End of Paragraph] Follow-up visits to previously identified nests, as many as necessary, shall be timed to facilitate documentation of occupied territories (see above), nest building (if yes, record observation), incubation [i.e., the subject pair: (a) did not lay eggs [no reproductive attempt]; (b) did lay eggs (made a reproductive attempt)], and fledging success [(a) eggs did not hatch **or** young did not fledge (the nesting attempt was not successful), (b) the number of young that reached that age of fledging (the nesting attempt was successful)] according to the biology of the species present and variations in breeding chronology.” [End of Paragraph]. (SP)

NC21. Section OP 2.8, Attachment OP-6, WP&WM, Section 2.3.1: the previous comment causes Table OP-A6-6 to need revision regarding raptor monitoring which often continues into mid-July in order to make “age of fledging counts”. Please update the figure accordingly, in addition on page 17 (i.e., end of Section 2.0) the table is cited as a “Figure” but is in-fact a table in the OP. This is probably because in D-9 it was labeled and listed as a “Figure” (i.e., not necessary to change it D-9). (SP)

NC22. Section OP 2.8, Attachment OP-6, WP&WM, Section 2.4: the WDEQ is composed of several divisions [i.e., air (AQD), land (LQD), water (WQD), etc.]. The use of “WDEQ” is listed in this section; however, if referencing a specific division (e.g., “LQD”; see “ABBREVIATIONS AND ACRONYMS” list on page OP-v) and not the department as a whole [(WDEQ)(i.e., all divisions)], specific divisions should be cited. Please correct throughout the permit document. (SP)

NC23. Section OP 2.8, Attachment OP-6, WP&WM, Section 2.4: the citation, “(WDEQ 1994)” appears in the text on page 23 and is not listed in the “References” (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. (SP)

NC24. Section OP 2.8, Attachment OP-6, WP&WM, Section 2.4: the citation, “(WDEQ 1994)” appears in the text regarding MBHFI non-game bird surveys. This type of survey is related to the USFWS and the methodology may not match the citation. Please correct as needed once a consultation response letter is received from the USFWS. (SP)

- NC25. Section OP 2.8, Attachment OP-6, WP&WM, Section 2.7: the section indicates that non-game bird surveys (i.e., except for raptors and MBHFI) will be conducted as incidental observations to other work. Section 2.4 commits to “breeding bird surveys” for MBHFI and this type of survey requires recording all species encountered, including non-game birds. Section 2.7 should mention that non-game birds will only be recorded incidental to other work but will be formally surveyed only when in association with breeding bird surveys described in Section 2.4 (MBHFI). (SP)
- NC26. Section OP 2.8, Attachment OP-6, WP&WM, References: on page 26 “(DOE 2004)” has not been cited in the text. Please correct. (SP)
- NC27. Section OP 2.8, Attachment OP-6, WP&WM, References: on page 26 “(WYDEQ 2007a)” has not been cited in the text. Please correct. (SP)
- NC28. Section OP 2.8, Attachment OP-6, WP&WM, References: on page 26 “(WYDEQ 2007b)” has not been cited in the text. Please correct. (SP)
- NC29. Section OP 2.8, Attachment OP-6, WP&WM, References: the “ABBREVIATIONS AND ACRONYMS” list on page OP-v does **not** identify WYDEQ; however, it does identify “WDEQ” to be consistent. Please correct the above 2 references here and the mine permit text accordingly. (SP)
- NC30. Section OP 2.8, Attachment OP-6, WP&WM, References: the citation, “(Olendorf et al. 1996)” appears in the text on page 5 and is not listed in the “References” (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. The spelling of “Olendorff” is incorrect on page 5 and in Section OP-5 References on page OP-55; however, a word search (by either spelling) does not locate the reference as cited in the OP except in Attachment OP-6. Please correct. (SP)
- NC31. Section OP 2.8, Attachment OP-6, WP&WM, References: the citation, “(Holloran 2005)” appears in Table OP-A6-1; however, it is not listed in the “References” (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. (SP)
- NC32. Section OP 2.8, Attachment OP-6, WP&WM, References: the citation, “(Carr 1967)” appears in Table OP-A6-1; however, it is not listed in the “References” (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. (SP)
- NC33. Section OP 2.8, Attachment OP-6, WP&WM, References: the citation, “(Wallestad & Schadweiler 1974)” appears in Table OP-A6-1; however, it is not listed in the “References” (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. (SP)
- NC34. Section OP 2.8, Attachment OP-6, WP&WM, References: the citation, “(Rothenmaier 1979)” appears in Table OP-A6-1; however, it is not listed in the “References” (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. (SP)
- NC35. Section OP 2.8, Attachment OP-6, WP&WM, References: the citation, “(Schoenber 1982)” appears in Table OP-A6-1; however, it is not listed in the “References” (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. (SP)

- NC36. Section OP 2.8, Attachment OP-6, WP&WM, References: the citation, "(Lyon & Anderson 2003)" appears in Table OP-A6-1; however, it is not listed in the "References" (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. (SP)
- NC37. Section OP 2.8, Attachment OP-6, WP&WM, References: the citation, "(Inglefinger 2001)" appears in Table OP-A6-1; however, it is not listed in the "References" (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. (SP)
- NC38. Section OP 2.8, Attachment OP-6, WP&WM, References: the citation, "(Nicholoff 2003)" appears in Table OP-A6-1; however, it is not listed in the "References" (i.e., pages Att. OP-6, pages 25 & 26). Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. (SP)
- NC39. Section OP 2.8, Attachment OP-6, WP&WM, Table OP-A6-1 (page 1 of 3): in the table Figure OP-A5-2" is cited. It should be "Figure OP-A6-2". Please correct. (SP)
- NC40. Section OP 2.8, Attachment OP-6, WP&WM, Table OP-A6-1 (page 2 of 3): in the table, "Table OP-A5-3" is cited. It should be "Table OP-A6-3". Please correct. (SP)
- NC41. Section OP 2.8, Attachment OP-6, WP&WM, Table OP-A6-1 (page 2 of 3): in item (5) and part (a), the text reads "...is to reduce raptor and corvid **roosting**...". Consider that power poles are used as hunting perches, for resting, and roosting. Availability of an elevated hunting perch increases the distance that predatory birds can effectively hunt; therefore, prevention of "use" not only protects the predatory birds from being electrocuted, but also, should reduce predation on northern sage grouse. Please change the word "roosting" to "use". (SP)
- NC42. Section OP 2.8, Attachment OP-6, WP&WM, Table OP-A6-1 (page 3 of 3): in item (6) and part (a), the text reads "...is analogous to topsoil stripping at **coil** mines...". It should read "...at **coal** mines...". Please correct. (SP)
- NC43. Section OP, References: the citations, "(BLM, 1996)" and "(BLM, 2003)" appear in the text and "References" (i.e., page OP-55); however, in the "References" they are listed as "Bureau of Land Management (US)..." and should be "Bureau of Land Management (BLM)..." Also, some text references have a comma before the date and others do not and all should be consistent. Please correct. (SP)

### Summary:

There are still a number of outstanding issues, several of which can be rectified by merely incorporating the response into the application text. Several new comments were generated on the revised material received on October 19, 2009. Many of these comments are associated with incorrect references. Once the application is found to be technically complete and approval / concurrence of technical adequacy from the Bureau of Land Management is obtained, second public notice will be authorized (in writing from WDEQ Land Quality Division). Should you have any questions concerning this memorandum, please contact the individual reviewer(s) at the WDEQ-LQD District 2 Office in Lander (307-332-3047).

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been decontaminated and that previously held an incompatible waste or material, unless §264.17(b) is complied with.

### § 264.200 Air emission standards.

The owner or operator shall manage all hazardous waste placed in a tank in accordance with the applicable requirements of subparts AA, EB, and CC of this part.

[61 FR 59950, Nov. 25, 1996]

## Subpart K—Surface Impoundments

SOURCE: 47 FR 32357, July 26, 1982, unless otherwise noted.

### § 264.220 Applicability.

The regulations in this subpart apply to owners and operators of facilities that use surface impoundments to treat, store, or dispose of hazardous waste except as §264.1 provides otherwise.

### § 264.221 Design and operating requirements.

(a) Any surface impoundment that is not covered by paragraph (c) of this section or §265.221 of this chapter must have a liner for all portions of the impoundment (except for existing portions of such impoundments). The liner must be designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life (including the closure period) of the impoundment. The liner may be constructed of materials that may allow wastes to migrate into the liner (but not into the adjacent subsurface soil or ground water or surface water) during the active life of the facility, provided that the impoundment is closed in accordance with §264.228(a)(1). For impoundments that will be closed in accordance with §264.228(a)(2), the liner must be constructed of materials that can prevent wastes from migrating into the liner during the active life of the facility. The liner must be:

(1) Constructed of materials that have appropriate chemical properties

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and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

(2) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and

(3) Installed to cover all surrounding earth likely to be in contact with the waste or leachate.

(b) The owner or operator will be exempted from the requirements of paragraph (a) of this section if the Regional Administrator finds, based on a demonstration by the owner or operator, that alternate design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituents (see §264.93) into the ground water or surface water at any future time. In deciding whether to grant an exemption, the Regional Administrator will consider:

(1) The nature and quantity of the wastes;

(2) The proposed alternate design and operation;

(3) The hydrogeologic setting of the facility, including the attenuative capacity and thickness of the liners and soils present between the impoundment and ground water or surface water; and

(4) All other factors which would influence the quality and mobility of the leachate produced and the potential for it to migrate to ground water or surface water.

(c) The owner or operator of each new surface impoundment unit on which construction commences after January 29, 1992, each lateral expansion of a surface impoundment unit on which construction commences after July 29, 1992 and each replacement of an existing surface impoundment unit that is to commence reuse after July 29, 1992 must install two or more liners and a leachate collection and removal system between such liners. "Construction commences" is as defined in §260.10 of this chapter under "existing facility".



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(1)(i) The *liner system* must include:

(A) A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner during the active life and post-closure care period; and

(B) A composite bottom liner, consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life and post-closure care period. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least 3 feet (91 cm) of compacted soil material with a hydraulic conductivity of no more than  $1 \times 10^{-7}$  cm/sec.

(ii) The liners must comply with paragraphs (a) (1), (2), and (3) of this section.

(2) The *leachate collection and removal system* between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also a *leak detection system*. This leak detection system must be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate during the active life and post-closure care period. The requirements for a leak detection system in this paragraph are satisfied by installation of a system that is, at a minimum:

(i) Constructed with a bottom slope of one percent or more;

(ii) Constructed of granular drainage materials with a hydraulic conductivity of  $1 \times 10^{-1}$  cm/sec or more and a thickness of 12 inches (30.5 cm) or more; or constructed of synthetic or geonet drainage materials with a transmissivity of  $3 \times 10^{-4}$  m<sup>2</sup>/sec or more;

(iii) Constructed of materials that are chemically resistant to the waste managed in the surface impoundment and the leachate expected to be generated, and of sufficient strength and

thickness to prevent collapse under the pressures exerted by overlying wastes and any waste cover materials or equipment used at the surface impoundment;

(iv) Designed and operated to minimize clogging during the active life and post-closure care period; and

(v) Constructed with sumps and liquid removal methods (e.g., pumps) of sufficient size to collect and remove liquids from the sump and prevent liquids from backing up into the drainage layer. Each unit must have its own sump(s). The design of each sump and removal system must provide a method for measuring and recording the volume of liquids present in the sump and of liquids removed.

(3) The owner or operator shall collect and remove pumpable liquids in the sumps to minimize the head on the bottom liner.

(4) The owner or operator of a leak detection system that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water.

(d) The Regional Administrator may approve alternative design or operating practices to those specified in paragraph (c) of this section if the owner or operator demonstrates to the Regional Administrator that such design and operating practices, together with location characteristics:

(1) Will prevent the migration of any hazardous constituent into the ground water or surface water at least as effectively as the liners and leachate collection and removal system specified in paragraph (c) of this section; and

(2) Will allow detection of leaks of hazardous constituents through the top liner at least as effectively.

(e) The double liner requirement set forth in paragraph (c) of this section may be waived by the Regional Administrator for any monofill, if:

(1) The monofill contains only hazardous wastes from foundry furnace emission controls or metal casting molding sand, and such wastes do not contain constituents which would

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render the wastes hazardous for reasons other than the EP toxicity characteristics in §261.24 of this chapter; and

(2)(i)(A) The monofill has at least one liner for which there is no evidence that such liner is leaking. For the purposes of this paragraph, the term "liner" means a liner designed, constructed, installed, and operated to prevent hazardous waste from passing into the liner at any time during the active life of the facility, or a liner designed, constructed, installed, and operated to prevent hazardous waste from migrating beyond the liner to adjacent subsurface soil, ground water, or surface water at any time during the active life of the facility. In the case of any surface impoundment which has been exempted from the requirements of paragraph (c) of this section on the basis of a liner designed, constructed, installed, and operated to prevent hazardous waste from passing beyond the liner, at the closure of such impoundment, the owner or operator must remove or decontaminate all waste residues, all contaminated liner material, and contaminated soil to the extent practicable. If all contaminated soil is not removed or decontaminated, the owner or operator of such impoundment will comply with appropriate post-closure requirements, including but not limited to ground-water monitoring and corrective action;

(B) The monofill is located more than one-quarter mile from an underground source of drinking water (as that term is defined in §144.3 of this chapter); and

(C) The monofill is in compliance with generally applicable ground-water monitoring requirements for facilities with permits under RCRA section 3005(c); or

(ii) The owner or operator demonstrates that the monofill is located, designed and operated so as to assure that there will be no migration of any hazardous constituent into ground water or surface water at any future time.

(f) The owner or operator of any replacement surface impoundment unit is exempt from paragraph (c) of this section if:

(1) The existing unit was constructed in compliance with the design stand-

ards of sections 3004 (o)(1)(A)(i) and (o)(5) of the Resource Conservation and Recovery Act; and

(2) There is no reason to believe that the liner is not functioning as designed.

(g) A surface impoundment must be designed, constructed, maintained, and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and wave action; rainfall; run-on; malfunctions of level controllers, alarms, and other equipment; and human error.

(h) A surface impoundment must have dikes that are designed, constructed, and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

(i) The Regional Administrator will specify in the permit all design and operating practices that are necessary to ensure that the requirements of this section are satisfied.

[47 FR 32357, July 26, 1982, as amended at 50 FR 4514, Jan. 31, 1985; 50 FR 28747, July 15, 1985; 57 FR 3487, Jan. 29, 1992]

**§ 264.222 Action leakage rate.**

(a) The Regional Administrator shall approve an action leakage rate for surface impoundment units subject to §264.221 (c) or (d). The action leakage rate is the maximum design flow rate that the leak detection system (LDS) can remove without the fluid head on the bottom liner exceeding 1 foot. The action leakage rate must include an adequate safety margin to allow for uncertainties in the design (e.g., slope, hydraulic conductivity, thickness of drainage material), construction, operation, and location of the LDS, waste and leachate characteristics, likelihood and amounts of other sources of liquids in the LDS, and proposed response actions (e.g., the action leakage rate must consider decreases in the flow capacity of the system over time resulting from siltation and clogging, rib layover and creep of synthetic components of the system, overburden pressures, etc.).

(b) To determine if the action leakage rate has been exceeded, the owner