



OGMCOAL DNR <ogmcoal@utah.gov>

Re: West Ridge Seismic Monitoring Information

Steve Christensen <stevechristensen@utah.gov>

Wed, Dec 28, 2016 at 12:53 PM

To: Marc Stilson <MARCSTILSON@utah.gov>, David Hibbs <dhibbs@coalsource.com>, Karin Madsen <kmadsen@coalsource.com>, mdimick@blm.gov, "Falk, Stephen" <sfalk@blm.gov>, "SWRigby@blm.gov" <SWRigby@blm.gov>, mhansen@rbgengineering.com, bprice@rbgengineering.com, David Avery <djavery1971@gmail.com>, eccitybkrauss@yahoo.com, mike@eastcarboncity.org, Susan Parsons <douglasparsons53@yahoo.com>, tax@emerytelecom.net, Bret Dixon <bretdixon@utah.gov>, Dana Dean <danadean@utah.gov>, Daron Haddock <daronhaddock@utah.gov>, Cheryl Parker <cherylparker@utah.gov>, David Marble <davemarble@utah.gov>, OGMCOAL DNR <ogmcoal@utah.gov>

Good afternoon,

I hope everyone had a fun and relaxing holiday. I've attached the comments that I received from the City of East Carbon, UT DWri (Dam Safety), BLM and DOGM. Once everyone has had a chance to review the documents, I'd suggest we schedule another sit down to discuss a path forward. I'll work with Karin Madsen to determine the date/time/place. Until then...Happy New Year to you and yours.

Regards,
Steve

On Wed, Nov 23, 2016 at 9:42 AM, Steve Christensen <stevechristensen@utah.gov> wrote:

Good morning,

I wanted to give a quick update following our meeting late last month. I've received comments from Dam Safety and East Carbon City. Once I receive comments to the proposed seismic monitoring reduction from the BLM, I'll send the comments out to the group for review.

I hope everyone has a relaxing and fun Thanksgiving.

Best regards,
Steve

On Thu, Oct 27, 2016 at 5:51 PM, Steve Christensen <stevechristensen@utah.gov> wrote:

Good afternoon,

Thank you all for taking the time to meet this morning. As we discussed, I've attached the seismic monitoring requirements that are laid out in the West Ridge Mining and Reclamation Plan (i.e. SMCRA permit). It's these monitoring requirements that West Ridge is proposing to revise in their SMCRA permit and that we must come to a consensus on.

Please send me your written comments on the proposed revisions to the seismic monitoring by November 10th. Once I've received all the comments, I will compile them and distribute them to the group for review.

At that point, I would foresee another meeting and/or conference call to work through the comments and see if we can't come to an agreement on where we go from here.

Thanks again for you time.

Regards,
Steve

Steve Christensen
Utah Division of Oil, Gas and Mining
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4 attachments

 **BLM Seismic Monitoring Requirements.pdf**
92K

 **DOGM Seismic Comments.pdf**
361K

 **East Carbon City Comments.pdf**
29K

 **UT DWRi Comments.pdf**
132K

C/007/041 Incoming
cc: Steve C.



United States Department of the Interior
BUREAU OF LAND MANAGEMENT

Green River District
Price Field Office
125 South 600 West
Price, UT 84501
www.blm.gov



RECEIVED

DEC 08 2016

DIV. OF OIL, GAS & MINING

In Reply Refer To:
3400 (LLUTG02000)
UTU-88553 (LMU)

DEC 06 2016

Steve Christensen
Utah Division of Oil, Gas and Mining
1594 W. North Temple, Suite 1210
Salt Lake City, Utah 84116

Re: Curtailed Monitoring on Grassy Trail Reservoir

Dear Mr. Christensen:

According to special stipulations 9 and 10 (see attached) of the coal leases, the Lessee is responsible for any surface damage caused by subsidence. The mining of the longwall panel closest to the reservoir and dam was completed in September 2015. Historically, any substantial impacts from subsidence occur within six months of the final recovery of coal in a panel. However, to be sure there are no residual effects from subsidence, it is recommended that monitoring continue through September 2017 and be reviewed again at that time.

Based on the timing of the completed mining, the Bureau of Land Management concurs that the full monitoring over the mined out areas is not required for the purpose of subsidence monitoring. East Carbon City could decide to continue with the monitoring above the mined out areas, however; it would not be required for monitoring of mining affects.

If you have any questions, please contact Steve Rigby of this office at (435) 636-3604.

Sincerely,

Ahmed Mohsen
Field Manager

Attachment:

Special Stipulations (1p)

cc: Roger Bankert,
BLM, Utah State Office (UT-922)

Special Stipulations Attachment

*9. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

*10. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: 1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, 2) cause damage to existing surface structures, or 3) damage or alter the flow of perennial streams.



JON M. HUNTSMAN, JR.
Governor

GARY R. HERBERT
Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Division of Oil, Gas and Mining

JOHN R. BAZA
Division Director

December 27, 2016

SUBJECT: West Ridge Mine- Seismic Monitoring Plan

Dear Sir or Madam:

The intent of the West Ridge Grassy Trail Reservoir monitoring plan was to identify any effects of mining induced seismicity on the dam and reservoir during and following the mining of Panels 7, 18, 19 and 20. The monitoring plan is detailed in the West Ridge Mine and Reclamation Plan (MRP) Appendix 5-13 and 5-13A. RB&G was retained to generate the specified reports within said appendices.

The Division agrees with the final report RB&G's *Grassy Trail Dam and Reservoir Dam Safety Study* October 16, 2016 (RB&G report). The RB&G report establishes that sufficient monitoring data has been compiled to show no adverse effect of mining induced seismicity on the dam. The RB&G's report documents that all applicable SMCRA, Utah Code R645-301-525 regulations, and West Ridge Mining and Reclamation Plan commitments have been satisfied. There is no evidence that additional monitoring would show mining related seismic events as all mining operations within any reasonable proximity to the dam have ceased beyond the site recorded delay is expected subsidence.

For a further detailed analysis of the Division's review of the West Ridge Grassy Trail Reservoir see attached file.

Sincerely,

Cheryl Parker, M.S., P.E.
Coal Program Engineer

SC/CP
Enclosure



Memorandum

To: Steve Christensen

CC: Daron Haddock

From: Cheryl Parker, M.S., P.E.

Date: 12/28/2016

Re: Review of West Ridge RB&G's Grassy Trail Dam and Reservoir Dam Safety Study

The intent of the West Ridge Grassy Trail Reservoir monitoring plan was to identify any effects of mining induced seismicity on the dam and reservoir during and following the mining of Panels 7, 18, 19 and 20. The monitoring plan is detailed in the West Ridge Mine and Reclamation Plan (MRP) Appendix 5-13 and 5-13A. RB&G was retained to generate the specified reports within said appendices. Three reports that were provided to the Division and other relevant parties to review between 2005 and 2016. The Division believes the final report RB&G's Grassy Trail Dam and Reservoir Phase II Dam Safety Study (October 16, 2016) establishes that sufficient monitoring data has been compiled to show no adverse effect of mining induced seismicity on the dam and that all applicable SMCRA, Utah Code R645-301-525 regulations and MRP commitments have been satisfied.

The MRP currently states the methods and instruments utilized to collect baseline data prior to mining and monitor requirements at the dam during and subsequent to the mining of Panels 7, 18, 19, and 20:

- 1) Appendix 5-13 deals with monitoring requirements regarding the mining solely in Panel 7 (the closest panel to Grassy Trail Reservoir). Appendix 5-13A deals with the additional monitoring requirements regarding the mining in panels 18-20
 - a. Prior to longwall mining of Panel 7:
 - i. Additional subsidence control monuments will be established across the crest of the dam on 100 ft centers, 200 ft centers across the face of the dam midway down the slope, and along the toe of the dam on 200 ft centers
 - ii. The upper hillside accelerometer will be removed, recalibrated, and relocated at the dam. The dam site accelerometer will be removed, recalibrated, and relocated at a new location on the hillside approximately midway between the dam and the previous upper hillside location.
 - iii. Collect and compile a complete set of premining baseline data collected from the following instruments:
 1. Piezometer, Accelerometer, inclinometer, relative elevations, flow rates, visual inspection, electronic photographs
 - b. After longwall mining has commenced in Panel 7
 - i. Weekly basis
 1. Site reconnaissance/visual inspection
 2. Electronic photographs
 3. Flow rates
 4. Reservoir level
 5. Electronic reports
 - ii. Monthly basis
 1. Accelerometer readings
 2. Piezometer readings

3. Inclinometer readings
 4. Relative elevations
 5. Electronic reporting
- iii. Event-driven basis
1. University of Utah seismic readings will be monitored on a daily basis and in the event any events are recorded greater than a magnitude 3.0 within 5 miles of the dam then within 24 hours a full site reconnaissance will be taken
- 2) Additional Notes:
- a. BLM special stipulation #17 to the federal lease states, "The lessee is and will remain liable for any and all damages or hazardous conditions resulting from mining operations under the lease."
 - b. The Utah Division of Dam Safety has the authority to stop any longwall mining and to increase the level or frequency of monitoring at any time as required to ensure safety of the dam and reservoir.

This memorandum is in response to the third RB&G Grassy Trail West Ridge Seismic Monitoring report that was provided to all relevant parties in October 2016 for comment.

The MRP Appendix 5-13 and 5-13A pre mining commitments for monitoring of the Grassy Trail Dam and Reservoir were completed and documented within the RB&G's Grassy Trail Dam and Reservoir Phase II Dam Safety Studies, see MRP Appendix 5-12. The specific commitment to add additional subsidence monuments (item 1.a.i. listed previously) was completed in November 18, 2005. The MRP was amended to include two additional figures showing the location of the additional subsidence control points and monitoring locations at the end of Appendix 5-13. The additional subsidence control monuments added include C-1 through C-7 along the crest, M-1 through M-4 along the face of the dam midway down the slope, and T-1 through T-3 along the tow of the dam. The second figure also shows the removal and relocation of the upper hillside accelerometer to the dam site. The pre mining commitment to gather a complete set of pre mining baseline data was completed within the first RB&G's Grassy Trail Dam and Reservoir Phase II Dam Safety Study. The first report contains all baseline data for the various instrumentations ranging from March 1998 to August 2005 to meet MRP commitment to compile a complete set of pre mining base line data for Piezometer, Accelerometer, inclinometer, relative elevations, flow rates, visual inspection, and electronic photographs, see Appendix 5-11.

The mining of Panels 7, 18, 19 and 20 began in various parts between 2005 and 2015. Panel 7 of the West Ridge mine was completed in 2005-2006. The panel was approximately 1,660 vertical feet below the crest of the dam and 995 feet horizontally west of the dam right abutment. Panel 18 and 20 were mined in 2012-2013 and the closest the panel workings were located to the dam was 2,400 horizontal feet to the north. Panel 19 was mined in 2015 and was 3,000 horizontal feet north of the dam. The last panel mined at West Ridge Mine was Panel 34 which was approximately 2.25 horizontal miles west of the dam.

The MRP Appendix 5-13 and 5-13A detail various post mining commitments that were completed and documented within all the RB&G's Grassy Trail Dam and Reservoir Dam reports. RB&G reports include a discussion of the results from the monthly accelerometers at the dam and hillside. Data presented in Figures A-1 through A-6a coincides with the conclusions drawn in the summary and Conclusions Section 3.1 of the RB&G report.

The proximity of longwall mining resulted in an increase of mining induces seismic events at the dam. Monthly reporting of the accelerometers at the hill side and dam required as part of the MRP commitment are met in RB&G reports Table A-1 and Figure A-1a . The site accelerometers during the mining of Panel 7 recorded significantly more daily events than the University of Utah Seismograph Station BCE (UUS). Figure A-2 shows the same relationship established in Figures A-1a that mining induced seismic events increase with increased proximity to the dam as well as the decrease in events

after the, “later part of February 2009, when mining operation were changed to a panel barrier configuration” (RB&G, July 2016 to October 2016 report). However, after the adoption of panel barrier configuration in mining methods and decreased proximity in mining panels to the dam the number of events recorded per day by the accelerometer at the Grassy Trail dam, accelerometer at the hillside, and the UUSS show a similar total recorded events (RB&G, July 2016 to October 2016 report). The table shown on page 13 of the report presents the events/year registered at station BCE and shows the same results of increased events through the mining of Panel 7 and a decrease in events after the adoption of the panel barrier configuration (RB&G, July 2016 to October 2016 report). Figure A-4 and Figure A-4a show the weekly number and magnitude of earthquakes registered at the site accelerometers and UUSS MIS. These figures show the site accelerometers registered fewer and less vibrations than the established UUSS sites after the mining of Panel 7. This result shows that the UUSS accelerometers are just as likely to record any movement at the dam as the site accelerometers.

While no information was gathered from the accelerometer on the Hillside from January 2013 until October 2016, the Division believes it is insignificant as site specific data shows the UUSS station measures more events than either of the hillside or dam accelerometers once mining moved out of Panel 7 in 2006. For all mine panels beyond Panel 7, data shows it took about eight events recorded at UUSS before any events were triggered at hill/dam. No significant moment was detected at the survey subsidence points and any movement shown in the inclinometers is likely the result of poor site materials around the dam construction. Continued monitoring is suggested but is outside the scope of mining induced landslides.

The RB&G reports include monthly inclinometer readings along with an in-depth discussion of the results seen from each of the four inclinometers to meet MRP commitments detailed previously. Figures B-1 through B-10 show the relevant data collected from the four inclinometers installed along the dam crest and western embankment (RB&G, July 2016 to October 2016 report). Overall inclinometers 2 and 3 are the only ones that documented movement according to RB&G. The majority of the movement seen in Inclinometer 3, “took place shortly after the dam was constructed and long before current mining operations.” The movement recorded by Inclinometer 3 during this time matches an, “apparent MIS related movement of this slide started in 2005.” (RB&G, July 2016 to October 2016 report). The initial RB&G report contained a discussion of the landslide hazards present predominately along the western side of the dam and that, “An access road which cuts into the slope along the right (west) abutment appears to be responsible for some of the moment in this area.” (RB&G, July 2005) The majority of movement related to mining was 3.5 inches of deflection along the western side of the dam that was recorded in 2006 (RB&G, July 2016 to October 2016 report). Inclinometer 3 also measured minimal deflections of 0.3 inches between February and June of 2006 likely related to the mining of Panel 7 (RB&G, July 2016 to October 2016 report). Overall, all RB&G reports discuss the historic landslides in the area as a result of the stratigraphy of the area being prone to landslides. However, the monitoring data does not point towards any evidence of significant mining induced landslides at the hillside.

The MRP commitment to include monthly relative elevations is met within the RB&G reports with the inclusion of Ware Surveying reports. The reports show the additional subsidence control monuments added include C1 through C-7 along the crest, M-1 through M-4 along the face of the dam midway down the slope, and T-1 through T-3 along the tow of the dam. The survey of the subsidence points showed the maximum movement of 0.33 feet from 2004 to 2016. This range of movement is within the survey equipment’s measurement of error and does not suggest that significant movement has occurred at any of the subsidence monitoring points.

All figures presented within the RB&G reports show no single event registered at the UUSS greater than 3.0 in magnitude, therefore no event driven monitoring was triggered throughout January 2009 to October 2016.

In summary all the pre-mining, concurrent, and post mining monitoring obligations written within the West Ridge MRP to satisfy SMCRA and Utah State Code R645-301-525 have been met within the three RB&G reports.

- The conclusions from the reports found that there was a positive correlation between the proximity of longwall mine working and mining induced seismic events registered at the dam.
- The site specific results drawn from the data show there is a several month delay, as expected, before subsidence occurs, but the majority of all major subsidence events occur within less than a year.
- The data also shows the number of events can be significantly reduced by the longwall layout of a barrier panel.
- No significant movement or damage occurred to the Grassy Trail Dam and Reservoir due to mining induced seismic events

SUMMARY

The Division has determined there is sufficient data present to show no significant movement or damage occurred to the Grassy Trail Dam and Reservoir due to mining induced seismic events and the mine should be relieved of all future monitoring. There is no evidence that additional monitoring would show mining related seismic events as all mining operations within any reasonable proximity to the dam have ceased beyond the site recorded delay is expected subsidence.



City of East Carbon

101 West Geneva Drive
East Carbon, Utah 84520
888-6613

Steve Christensen
DOGM
November 10, 2016

Mr. Christensen:

This is the response by East Carbon City (city) of the Mining Induced Study provided by RB&G Engineering, INC. and West Ridge Resources INC., presented on October 27, 2016.

As discussed during the meeting, the city requests further evaluation of monitoring of Grassy Trail Reservoir for another year, there was no information from the Accelerometer on Hillside from January 2013 till October 2016. There was however a seismic event recorded on August 2015. During this time, there was damage to the accelerometer power supply of unknown cause, animal or event of activity.

The city requires monitoring from this area for at least one (1) year and continued monitoring from all other sites. A meeting can be arranged after continued monitoring for one (1) year from the establishment of metering device is installed on the hillside or on stable ground near the northwest end of the reservoir and as mentioned the southwest side.

The city is concerned of any possible damage to the reservoir and surrounding area that supplies much needed water to the residents and businesses of this area.

I would like to thank all that are concerned with the preservation of our water supply and look forward to working with all involved.

Doug Parsons, Mayor
East Carbon City



GARY R. HERBERT
Governor
SPENCER J. COX
Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

Division of Water Rights

MICHAEL R. STYLER
Executive Director

KENT L. JONES
State Engineer/Division Director

November 3, 2016

Steve Christensen
Utah Division of Oil, Gas and Mining
1594 W North Temple, Suite 1210
Salt Lake City, Utah 84116

RE: Grassy Trail / UT00126
West Ridge Seismic Monitoring

Dear Mr. Christensen:

We are in receipt of the RB&G's Mining-Induced Seismicity Summary Update Report (dated October 26, 2016), for the Grassy Trail Dam. Based on our review of the submitted document, this office agrees with the proposed recommendations found on page 15 and 16 of that report. It is recommended that the recommendations be amended to include the following:

- Abandonment details for piezometer P-4 are provided.
- Inclinerometers I-2 and I-3 replaced with two new inclinometer installations. Due to the activation of the right (west) abutment landslide during the mining of Panel #6 and Panel #7, the functionality and service life for these two inclinometers may have been compromised. The new installations will allow for long-term monitoring of future movement of the suspect landslide and the impact it has on the Grassy Trail Dam.

If you have any questions or need to discuss these issues in further detail, please contact me at (801) 538-7376.

Sincerely,

David K. Marble, P.E.
Assistant State Engineer/Dam Safety

DKM/tg

pc: Marc Stilson - Regional Engineer