GARY R. HERBERT
Governor
GREG BELL
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

# Technical Analysis and Findings

## Utah Coal Regulatory Program

April 27, 2017

**PID:** C0070041
**TaskID:** 5433
**Mine Name:** WEST RIDGE MINE
**Title:** SEISMIC MONITORING

## Operation Plan

### Subsidence Control Plan Subsidence

*Analysis:*

The amendment meets the State of Utah R645 requirements for Subsidence Control Plan.

The Division of Oil, Gas and Mining (the Division) has completed a review of an amendment to the West Ridge Mining and Reclamation Plan (MRP). The amendment proposes to revise Appendices 5-13 and 5-13A. The two appendices discuss and outline weekly and monthly seismic monitoring requirements that were required for the mining of Panel 7 (Appendix 5-13) and panels 18, 19, 20 and 21 (Appendix 5-13A). In order for the Permittee to mine the aforementioned panels, a robust seismic monitoring plan was developed in consultation with the Bureau of Land Management (BLM), East Carbon City, Utah Division of Dam Safety (DWri) and the Division. The seismic monitoring plans were developed in response to concerns that the proximity of mining to the Grassy Trail Reservoir embankment could produce impacts.

Appendix 5-13 and 5-13A both contain language that requires a collective consensus determination between Dam Safety, the Division, BLM and East Carbon City prior to revising the seismic monitoring requirements. On October 27th, 2016, representatives from the aforementioned entities met at the Division's Price Field Office to discuss the seismic monitoring to date. At the October meeting, RB&G (the Permittee's consultant who performs the seismic monitoring) provided a report wherein revisions to the seismic monitoring within Appendix 5-13 and 5-13A was proposed. It was agreed that the group would review the RB&G report and its recommendations for reduced seismic monitoring. Following that review, the group was to submit their comments of the proposed seismic reduction.

On January 19th, 2017, a follow up meeting was conducted with representatives from East Carbon City, Utah Dam Safety, the Division, BLM, West Ridge Mine and Utah Water Rights. The City of East Carbon had indicated in their comments that they wanted an additional year of monitoring. Dam Safety indicated that they were comforable with the seismic data within the RB&G report, but wanted additional operational monitoring of the embankment and clarification as to the replacement of impacted incolonmeters. The BLM indicated on the call that they had essentially no jurisdiction as to whether or not the seismic monitoring be reduced. The Division indicated that the seismic data demonstrated that movement at the Grassy Trail Reservoir embankment had ceased and that continued monitoring was not necessary. Following the January 19th meeting, the Permittee circulated a proposed revision to the seismic monitoring information and solicited comments from the group.

The previously approved seismic monitoring included the following tasks be performed on a weekly basis: site reconnaissance/visual inspections, electronic photographs from pre-determined viewpoints, flow rates obtained from the east seep, west seep and toe drain, reservoir level elevations and electronic reporting. On a monthly basis, the following seismic monitoring was required: accelerometer readings, piezometer readings, inclinometer readings, relative elevations of

subsidence monitoring momumenets located on the dam and electronic reports e-mailed to the various stakeholders.

The Permittee has proposed the following seismic monitoring revisions. Monthly seismic monitoring would include site reconnaissance/visual inspection, accelerometer readings, inclinometer readings, electronic photographs from pre-determined viewpoints, relative elevations of subsidence monitoring monuments located on the dam and the subsequent monthly electronic reporting e-mails to the stakeholders.

The proposed seismic monitoring revisions identified East Carbon City personnel as being tasked with obtaining the reservoir elevations, piezometer readings and the seepage collection drain measurements. Per Dam Safety's recommentation, these monitoring requirements will be conducted on a monthly basis when the reservoir elevation is below 7,585' in elevation and a weekly basis when the reservoir elevation is equal or exceeds the 7,585' elevation.

The BLM indicated that the proposed revision was acceptable, but wanted the BLM removed as one of the entities listed in the seismic monitoring language. The Mayor of East Carbon indicated that he was in agreement with the proposed revisions. Utah Dam Safety requested clarification as to the replacement of inclinometers I-2 and I-3 as well as clarification as to the weekly/monthly monitoring requirements to be conducted by East Carbon City. Dam Safety asked that clarification be provided that East Carbon City personnel would monitor reservoir elevation, piezometers and seepage collection measurements on a monthly basis when the reservoir elevation is below 7,585' in elevation and weekly when the reservoir elevation is equal to o r exceeds the 7,585' elevation. Of note is that the 7,585' elevation corresponds to 7.5' below the embankment spillway. As noted above, the Permittee added the clarification that Dam Safety had requested relative to the reservoir elevation. The Division provided comments that the proposed revisions were reasonable, but did not request the Permittee to clarify the re-installation/replacement of inclonometers I-2 and I-3.

The Permittee provides a commitment in the proposed seismic monitoring plan that on or before the end of September 2017, West Ridge Resources agrees to installing two new inclinometers at the Grassy Trail Dam to replace inclinometers 2 and 3 per the request of the Division of Dam Safety.

Prior to the January 19th, 2017 meeting among the aforementioned stakeholders, Division engineer Cheryl Parker reviewed the seismic data submitted by RB&G Engineering. Ms. Parker determined that the provided data demonstrated that no significant movement or damage had occurred to the Grassy Trail Dam and Reservoir due to the mining induced seismic events and that the mine should be relieved of all future monitoring. Ms. Parker further found that there was no evidence that additional monitoring of the Grassy Trail embankment would show mining related seismic events as all mining operations within any reasonable proximity to the dam have ceased beyond the site recorded delay in expected subsidence. Ms. Parker summarized her findings that the RB&G reports demonstrated a positive correlation between the proximity of longwal mine workings and mining induced seismic events at the Grassy Trail dam. Additionally, it was found that no significant movement or damage had occurred to the Grassy Trail Dam and Reservoir due to mining induced seismic events. Ms. Parker indicated that the Permittee had satisfied all pre-mining, concurrent and post-mining monitoring obligations as outlined within the MRP as well as requirements outlined in the Surface Mining Coal Reclamation Act (SMCRA) and the State of Utah R645 rules.

Mining activity at the West Ridge Mine ceased in November of 2015. Mining within panel 19 (the last panel to be mined in close proximity to the Grassy Trail Embankment) was completed in September of 2015.

The revised seismic monitoring plan indicates that seismic monitoring will continue through September of 2017. At that time, the data will be reviewed by Dam Safety, the Division, the BLM and East Carbon City. Upon review of that data, if no significant movement has been detected which can be linked to mining-induced seismicity, the Permittee's monitoring responsibilities will cease with any ongoing monitoring of the Grassy Trail Dam to fall under the guidelines of Utah Dam Safety.

The previous review of the proposed seismic revisions identified a deficiency on page 5-31 of the amendment. In the 2nd paragraph on page 5-31, the Permittee had included a statement that no adverse effects of mining-induced seismicity had occurred on the dam and that additional monitoring would not show additional mining related seismic events. As the stakeholders (i.e. East Carbon City, Dam Safety, the Division and the BLM) agreed that continued seismic monitoring will continue through September of 2017 to provide additional data and confidence that seismic events caused by mining did not adversely affect the Grassy Trail embankment, the aforementioned statement was determined to be inappropriate at this time. The Permittee was directed to delete the paragraph. Upon review of the proposed seismic monitoring revisions, the Permittee has deleted the paragraph.

The Division recommends final approval of the amendment.

schriste