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Office of Inspector General—Office of Audit

**MINE SAFETY AND HEALTH
ADMINISTRATION**



MSHA COULD NOT SHOW IT MADE THE RIGHT DECISION IN APPROVING THE ROOF CONTROL PLAN AT CRANDALL CANYON MINE

Date: March 31, 2008
Report Number: 05-08-003-06-001

BRIEFLY...

Highlights of Report Number: 05-08-003-06-001, *MSHA Could Not Show It Made the Right Decision In Approving the Roof Control Plan At Crandall Canyon Mine*, to the Assistant Secretary for Mine Safety and Health, dated March 31, 2008.

WHY READ THE REPORT

In August 2007, "a major coal bump/bounce" occurred in the Crandall Canyon Mine (Emery County, Utah) precipitating a tragedy in which nine men lost their lives: six miners, and three rescue workers who died attempting to save the miners. At the time of the incident, the mine operator was conducting a high-risk mining technique known as retreat mining in which pillars of coal previously left to support the mine roof are removed to maximize resource recovery. The Mine Safety and Health Administration (MSHA) had previously reviewed and approved the mine operator's roof control plans associated with this activity. MSHA also conducted periodic inspections of the mine, in part, to assure compliance with the approved plan. The rigor and transparency of the plan approval and the mine inspection processes are critical to assuring the safety of miners.

WHY OIG CONDUCTED THE AUDIT

In a response to a request from the Senate Health, Education, Labor and Pension Committee, the Office of Inspector General (OIG) conducted a performance audit to (a) assess whether MSHA's process for reviewing, approving, and overseeing the implementation of selected amendments to the Roof Control Plan at Crandall Canyon provided reasonable assurance that miners were protected and (b) report on the decision-making process used during the August 2007 rescue operations.

We did not attempt to determine the cause of the tragedy. MSHA's ongoing Accident Investigation will report those conclusions at a future date.

READ THE FULL REPORT

To view the report, including the scope, methodology, and full agency response, go to:

<http://www.oig.dol.gov/public/reports/oa/2008/05-08-003-06-001.pdf>

March 2008

WHAT OIG FOUND

MSHA was negligent in carrying out its responsibilities to protect the safety of miners. Specifically, MSHA could not show that it made the right decision in approving the Crandall Canyon Mine roof control plan or that the process was free from undue influence by the mine operator. MSHA did not have a rigorous, transparent review and approval process for roof control plans consisting of explicit criteria and plan evaluation factors, appropriate documentation, and active oversight and supervision by Headquarters and District 9 management. Further, MSHA did not ensure that subsequent inspections assessed compliance with, and the effectiveness of, approved plans in continuing to protect miners.

MSHA and mine operator officials worked together to develop rescue plans related to the August 2007 tragedy, with MSHA exercising final approval authority over all activities. MSHA, however, lacked guidance on appropriate non-rescue activities.

WHAT OIG RECOMMENDED

We made nine recommendations to the Assistant Secretary for Mine Safety and Health designed to:

- Develop rigorous, standard, and transparent processes for the approval, implementation, and periodic reassessment of roof control plans, including active management oversight.
- Establish explicit criteria and guidance for assessing the quality of, and potential safety risk associated with, proposed plans.
- Re-evaluating the adequacy of existing roof control plans at all underground mines.
- Clarify the handling of non-rescue activities and non-rescue personnel during active rescue operations.

MSHA concurred with our recommendations and stated it has initiated or planned numerous corrective actions.

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Executive Summary

On Monday, August 6, 2007, at approximately 2:52 a.m., "a major coal bump/bounce" occurred in the South barrier of the Main West pillar section of the Crandall Canyon Mine (Crandall Canyon), operated by Genwal Resources, Inc. in Emery County, Utah. The bump precipitated a tragedy in which a total of nine men lost their lives: six miners, and three rescue workers who died attempting to save the miners.

Crandall Canyon is a bituminous (soft) coal mine in which working depths exceed 2,000 feet below ground. It is co-owned by Murray Energy, Inc. (Murray Energy), a privately held company and Intermountain Power Agency, a Utah electric cooperative. The mine operator was conducting "retreat mining" at Crandall Canyon - a high risk underground mining technique in which miners remove pillars of coal that had previously been left to support the mine roof. The deeper the mine, the greater the downward pressure on pillars caused by the weight of the soil, rock, and other materials above the mine. This pressure can cause pillars to fracture, violently ejecting coal into mine passageways (i.e., "bump" or "bounce").

As a result of the Crandall Canyon tragedy, the Senate Health, Education, Labor and Pension Committee asked the U.S. Department of Labor's Office of Inspector General (OIG) to look at the Mine Safety and Health Administration's (MSHA) roof control "plan approval process for Crandall Canyon Mine." Specifically, the Committee requested us to look at:

- The process MSHA District 9 employed to review Murray Energy's roof control plan and the plan amendment that was in effect at the time of the disaster.
- The rigor of that review.
- Information about how MSHA made the decision to allow rescuers into the Crandall Canyon Mine after the initial collapse on August 6, 2007.

Results

MSHA was negligent in carrying out its responsibility to protect the safety of miners. Specifically, MSHA could not show that it made the right decision in approving the Crandall Canyon roof control plan. Similarly, the lack of documentation to support the review and approval of the plan prevented MSHA from showing that the process was free from undue influence by the mine operator. Despite the critical importance of roof control to the high-risk retreat mining proposed for the South barrier of Crandall Canyon, MSHA could not show that it did everything appropriate to ensure the Crandall Canyon roof control plan was sufficient to protect miners. MSHA did not have a rigorous, transparent review and approval process for roof control plans consisting of explicit criteria and plan evaluation factors, appropriate documentation, and active oversight and supervision by Headquarters and District 9 management.

Once the plan was approved, MSHA could not demonstrate that it had adequately reassessed the roof control plan at Crandall Canyon or that the mine operator had properly instructed miners about roof control plans and procedures. During quarterly Regular Safety and Health Inspections, mine inspectors did not document the work they performed or the basis for their conclusions in addressing these responsibilities.

MSHA and mine operator employees worked together to develop rescue plans at Crandall Canyon, with MSHA exercising final approval authority over all activities. Throughout the rescue effort, specific activities were proposed, discussed, and finalized during recurring meetings and discussions between MSHA and mine officials. The resulting approved rescue activities were documented through amendments to MSHA's original withdrawal order and written rescue plans. However, MSHA lacked guidance on appropriate non-rescue activities.

The cause of the tragedy, including what role, if any, the roof control plan might have played, is the subject of several on-going investigations, and our audit was not designed to and does not make any such determinations.

Recommendations

The conditions identified in our report can be addressed by MSHA within its current statutory authority. We made several recommendations to the Assistant Secretary for Mine Safety and Health designed to:

- Develop rigorous, standard, and transparent processes for the approval, implementation, and periodic reassessment of roof control plans, including active management oversight.
- Establish explicit criteria and guidance for assessing the quality of, and potential safety risk associated with, proposed plans.
- Re-evaluate the adequacy of existing roof control plans at all underground mines.
- Clarify the handling of non-rescue activities and non-rescue personnel during active rescue operations.

Agency Response and OIG Conclusion

MSHA concurred with all of our recommendations and identified numerous corrective actions that MSHA has initiated or plans to initiate. However, MSHA stated that our use of the word "negligent" was misleading and expressed concern that we implied MSHA's review process had been subject to undue influence. Our findings and conclusions remain unchanged.

U.S. Department of Labor

Office of Inspector General
Washington, D.C. 20210



March 31, 2008

Assistant Inspector General's Report

Mr. Richard E. Stickler
Acting Assistant Secretary for
Mine Safety and Health
U. S. Department of Labor
1100 Wilson Boulevard
Arlington, VA 22209-3939

On Monday, August 6, 2007, at approximately 2:52 a.m., "a major coal bump/bounce" occurred in the South barrier of the Main West pillar section of the Crandall Canyon Mine (Crandall Canyon), operated by Genwal Resources, Inc. in Emery County, Utah. The bump precipitated a tragedy in which a total of nine men lost their lives: six miners, and three rescue workers who died attempting to save the miners. As a result of this tragedy, the Senate Health, Education, Labor and Pension Committee asked the Office of Inspector General (OIG) to look at the Mine Safety and Health Administration's (MSHA) "plan approval process for Crandall Canyon Mine." Specifically, the Committee requested us to look at:

- The process MSHA District 9 employed to review Murray Energy's initial mine plan and the plan amendment that was in effect at the time of the disaster.
- The rigor of that review.
- Information about how MSHA made the decision to allow rescuers into the Crandall Canyon Mine after the initial collapse on August 6, 2007.

Based on the nature of the August 6, 2007, incident at Crandall Canyon, we focused our work on the roof control plan. Roof control plans identify the methods used in a mine to control the collapse or shifting of the roof, face and ribs in underground coal mines.

Specifically, we conducted a performance audit of MSHA's process for reviewing and approving selected amendments to the existing Roof Control Plan (plan)¹ at Crandall Canyon. We examined the five amendments that had been submitted during the period in which Murray Energy Corporation (Murray Energy), co-owned and operated the mine. We also assessed how MSHA assured that the mine operator was properly

¹ In the context of this audit report, references to a "plan" mean the roof control plan and amendments unless otherwise stated.

implementing and complying with the approved plan. Finally, we obtained information on the decision making process used during rescue operations at the mine from August 6, 2007, through August 31, 2007.

We reviewed available documentation and interviewed MSHA personnel involved in the review, approval, and oversight of the roof control plan amendments to determine whether MSHA's process provided reasonable assurance that approved plans protected miner safety. We also reviewed extensive materials (some of which were redacted) that were provided by Murray Energy in response to an Administrative Subpoena issued by the OIG. We attempted to interview employees of Murray Energy and its subsidiaries, but they declined on the advice of their counsel. Because the OIG does not have the authority to subpoena or require testimony from non-DOL employees, we were not able to compel their participation. We also interviewed key MSHA personnel involved in decision-making during the rescue activities and reviewed related documents.

We conducted our audit in accordance with generally accepted government auditing standards for performance audits. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a sufficient basis for our findings and conclusions based on our audit objectives. Our audit scope, methodology and criteria are detailed in Appendix B.

Overall Conclusion

MSHA was negligent in carrying out its responsibility to protect the safety of miners. Specifically, MSHA could not show that it made the right decision in approving the plan or that the process was free from undue influence by the mine operator. MSHA did not have a rigorous, transparent review and approval process for roof control plans consisting of explicit criteria and plan evaluation factors, appropriate documentation, and active oversight and supervision by Headquarters and District 9 management. Further, MSHA did not ensure that subsequent inspections assessed compliance with, and the effectiveness of, approved plans in continuing to protect miners. Finally, requirements related to non-rescue activities need to be clarified.

The cause of the tragedy, including what role, if any, the roof control plan might have played, is the subject of several on-going investigations, and our audit was not designed to and does not make any such determinations.

Results and Findings

By way of background, MSHA is responsible for administering the provisions of the Federal Mine Safety and Health Act of 1977 as amended (Mine Act), which charges MSHA with approving various mine plans, performing periodic inspections of each mine, and citing mine operators for safety and health violations.

Crandall Canyon is an underground, bituminous (soft) coal mine. It is co-owned by Murray Energy, Inc, a privately-held company, headquartered in Cleveland, Ohio and Intermountain Power Agency, a Utah cooperative that generates electrical power for its member municipalities in Utah and California. Crandall Canyon was operated by Genwal Resources, Inc., which is a partially-owned subsidiary of UtahAmerican Energy, Inc., a wholly-owned subsidiary of Murray Energy, Inc.

The type of mining conducted at Crandall Canyon is known as “pillar extraction.” This is a high risk underground mining technique, designed to increase the amount of coal reserves recovered, in which miners remove pillars of coal that had previously been left to support the mine roof. The process is also called “retreat mining” because miners remove pillars as they “retreat” toward the mine entrance, allowing the unsupported roof to collapse behind them. The deeper the mine, the greater the downward pressure on pillars caused by the weight of the soil, rock, and other materials above the mine. This pressure can result in “bumps” (also called “bounces”) in which pillars fracture and coal is violently ejected into mine passageways. Since coal mines in Utah are among the deepest operating in the United States, they are particularly susceptible to these events.

When a mine operator decides to begin an underground mining operation, the operator develops a roof control plan suitable to the geological conditions and the mining system used. This proposed plan, and any subsequent revisions, is submitted in writing, to the MSHA District Manager for approval. Each MSHA District is required to have a Standard Operating Procedure that defines how proposed plans are to be reviewed and evaluated. While the Roof Control Specialist in the MSHA District typically handles this evaluation, the MSHA District Manager is responsible for final approval of all submitted plans. A mine operator cannot implement a proposed roof control plan or a revision to a roof control plan before MSHA approves it or before all miners who are affected by the revision are instructed in its provisions. Approved roof control plans and any revisions must be available to the miners and representatives of miners at the mine.

Between July 3, 2002, and the August 6, 2007, incident, MSHA approved a roof control base plan, 5 revisions to the base plan and 11 site-specific amendments. Five of these site-specific amendments, which related to developing and retreat mining the North and South barriers of the Main West section of the mine, were submitted and approved after Murray Energy became a co-owner in August 2006.

Additional background information is contained in Appendix A.

Objective 1 - Did MSHA’s review, approval, and oversight of the Roof Control Plan for Crandall Canyon provide reasonable assurance that miners were protected?

No, MSHA was negligent in its review, approval, and oversight of the Roof Control Plan and amendments and in ensuring that Crandall Canyon’s miners were protected. MSHA could not show that it exercised care in reviewing the Crandall Canyon plan, that it made the right decision in approving the plan, or that the process was free of undue

influence by the mine owner. Moreover, MSHA could not show that it took sufficient actions to determine whether the mine operator followed the approved plan, nor that the plan was sound as implemented and continued to be viable as conditions in the mine changed over time.

Finding 1 - MSHA Could Not Demonstrate It Exercised Due Diligence or Made the Right Decision in Approving the Plan

Despite the critical importance of roof control to underground mining operations in general and to the high-risk retreat mining proposed for the South barrier of the Crandall Canyon mine in particular, MSHA could not show that it did everything appropriate to ensure the Crandall Canyon plan was sufficient to protect miners. Specifically, MSHA did not assure that its districts had an adequate process for reviewing and approving the plan. Further, MSHA did not require the use of explicit criteria, consideration of potentially relevant information, creation of a record of plan review activities, nor provision of active supervision and oversight. With miners' lives at stake, it is incumbent upon MSHA to be thorough, to fully evaluate, and to document information leading up to critical decisions such as mine plan approvals.

MSHA Did Not Ensure an Adequate Standard Operating Procedure for Roof Control Plan Review and Approval

MSHA's Program Policy Manual² required that each District's Standard Operating Procedure (SOP) address 20 minimum controls necessary for proper administration of the plan and program approval process. Eleven of the twenty items relate to administrative procedures supporting plan review (e.g., logging, tracking, and required signoffs); the remaining nine items relate to assessing the plan's quality, but do not specify how such assessments should be made. For example, the manual required that the review identify and evaluate unusual proposals or requests. It does not define "unusual" nor provide further guidance on how to evaluate such plans.

While MSHA defined a set of minimum controls, each Office of Coal Mine Safety and Health (Coal) District Office was required to develop its own SOP for reviewing roof control plans. However, there was no requirement that MSHA headquarters review or approve these SOPs. As a result, the individual SOPs were inconsistent and did not include all of the minimum controls.

District 9 was responsible for reviewing the roof control plans at Crandall Canyon. As summarized in Table 1 below, the SOP for District 9 did not address 12 of these 20 controls.

² Release V-33, dated February 2003, pgs. 6-8

Table 1
Summary of District 9’s SOP versus MSHA’s Required Controls
For Review and Approval of Roof Control Plans

		Included in SOP?	
Administrative Controls			
1	Completion of final staff review at District Office	No	
2	Sets time frame for approving request (days)		Yes
3	Records date received		Yes
4	Records plan's progress through approval procedures	No	
5	Shows date approval or denial letter mailed to operator	No	
6	Shows distribution of mailing		Yes
7	Uniform mine file is current		Yes
8	Identifies date for formal review	No	
9	Check that required information is submitted		Yes
10	District Manager receives recommendations to approve or disapprove plan.	No	
11	Promptly provides approvals or amendments to field office supervisors for inclusion in uniform mine file.		Yes
Qualitative Controls			
12	Ensure that miners' representatives comments are addressed	No	
13	Identify and evaluate unusual proposals or requests	No	
14	Evaluate plan for provisions contrary to standards or regulations		Yes
15	Check mine files for information related to plan adequacy		Yes
16	Check for communication with other plan approval groups, when appropriate	No	
17	Technical specialist does on-site review, as necessary	No	
18	Acquire and consider field office input from local inspectors and address recommendations	No	
19	Designated MSHA personnel contact operator for additional information	No	
20	Discuss results of on-site evaluation with operator and identified miners' representatives	No	
		12	8

District 9’s SOP was largely concerned with administrative procedures and correspondence control, such as logging plan amendments into the Mine Plan Approval system and completing the reviews within 45 days of receipt of an amendment. Although not one of the required controls, District 9’s SOP contained a Roof Control Review Checklist that listed relevant regulatory requirements and provided technical guidance for review. However, District 9 staff told us that the checklist was rarely, if

ever, used to review plans. The Roof Control Supervisor stated he never used the checklist, and that the checklist was used only as a training guide for new employees.

Our review of the 11 Coal Districts' SOPs revealed that none of the SOPs addressed all of the controls MSHA Headquarters required. On average, the 11 District SOPs for roof control plans addressed only 14 of the 20 minimum controls, with the number of unaddressed controls ranging from 2 in District 6 to 12 in District 9. For an analysis of the Coal District SOPs by district, see Exhibit 1.

The extraordinary risk associated with retreat mining necessitates the highest degree of care, scrutiny, and transparency in MSHA's process for approving such activity. Just as airlines and hospitals rely on well-documented procedures and redundant controls and checklists to ensure every procedure is complied with to ensure safety (and to create a record should there be a need for subsequent review), so too should MSHA establish and document compliance with comprehensive, well-defined procedures for plan review and approval.

MSHA Did Not Provide Policy Guidance and Regulation for Defining and Using Roof Control Plan Evaluation Criteria

MSHA did not provide the District Managers with guidance on how to select and use criteria for evaluating the acceptability of proposed plans. As a result, plan approval criteria were left to the discretion of each individual District Manager. In addition, MSHA did not require that District Offices document whatever criteria they did use in assessing a specific plan. Moreover, MSHA Headquarters rarely reviewed plan approval decisions³ its District Managers made or the underlying evaluation criteria applied in making the decisions. This created a risk that appropriate criteria were not considered or that consistent criteria were not used for similar circumstances. In turn, this reduced the confidence that approved plans adequately protected miner safety.

Approval of Crandall Canyon Plan. For Crandall Canyon, the District Manager stated that he relied on the professional experience and expertise of the Roof Control Supervisor to review and recommend approval of the plan. The Roof Control Supervisor, in turn, stated that he relied on his knowledge and prior experience with individual mines, including past success in pillar extraction (retreat mining), in assessing whether the proposed plan was adequate. He stated he viewed roof control as unique to each mine. However, as previously noted, the Roof Control Supervisor did not document the specific criteria he used in evaluating Crandall Canyon's plan.

Regarding the Roof Control Supervisor's reliance on past success with pillar extraction in mines, such reliance carries risk when applied to an environment that changes constantly, as is the case with mining. This was especially true when a plan involved a high-risk activity such as retreat mining for a mine, like Crandall Canyon, whose depth increased the possibility of unpredictable bumps. The District Manager was responsible

³ MSHA Headquarters conducts a review of each District Office once every 2 years. These reviews include a review of required plans and enforcement activities for a selected mine(s).

for judging the acceptable level of risk involved in a roof control plan the Roof Control Supervisor submitted for approval. However, because MSHA did not require that District Offices to document the explicit criteria used in assessing a specific plan and the District Manager did not require such documentation in his SOP, he made the approval decision without such information.

Regulation and Policy Guidance. Although Title 30 of the Code of Federal Regulations (CFR) section 75.222 identifies specific items to be considered in the evaluation of roof control plans (e.g., distance between roof bolts, size and spacing of pillars, etc.), it gives the District Manager broad discretion to adjust those criteria.

This section sets forth the criteria that shall be considered on a mine-by-mine basis in the formulation and approval of roof control plans and revisions. Additional measures may be required in plans by the District Manager. Roof control plans that do not conform to the applicable criteria in this section may be approved by the District Manager, provided that effective control of the roof, face and ribs can be maintained.
(30 CFR 75.222(a))

While the above regulation provides the District Manager discretion to approve non-conforming plans, provided that “effective control of the roof, face and ribs can be maintained,” it does not specify how the District Manager is to demonstrate the basis for determining that effective control will be maintained. Neither the regulations nor existing MSHA materials provide the District Managers with guidance to determine when adjustments to the regulatory criteria are appropriate.

In addition, MSHA policy does not provide the District Managers with guidance on performing a risk assessment of plans, including how to (a) identify specific risk factors in a plan (e.g., depth of cover, mining method), (b) determine the overall level of risk associated with a specific plan, or (c) decide whether that level of risk is acceptable.

Computer Models. Although computer models (such as those produced by the National Institute for Occupational Safety and Health or NIOSH) are used to calculate load-bearing capacities and stability factors of pillars during retreat mining, MSHA has not issued any policy or regulatory guidance on the use of such models. NIOSH models were used by Murray Energy’s contracted engineering firm to develop and support the viability of the roof control plans for Crandall Canyon.

After the August 2007 incident, NIOSH used its computer modeling programs to analyze the roof control plan for Crandall Canyon. Its analyses and related conclusions differed from those of the mine operator’s engineering firm. For example, NIOSH used the model’s default value for “coal strength” while the engineering firm used a higher coal strength value. NIOSH described the engineering firm’s analyses as “very unconservative” and concluded that it had overstated the coal and remnant barrier pillar strengths in the mine. Subsequent to the Crandall Canyon incident, NIOSH made modifications to its model. One of these modifications states that the reliability of the

NIOSH model decreases substantially when coal strength values other than the default value are used.

MSHA Did Not Always Require or Consider Potentially Relevant Information as Part of Roof Control Plan Review

We identified four sources of potentially relevant information that were not considered in the Roof Control Supervisor’s review and District Manager’s approval processes for Crandall Canyon: (1) input from mine inspectors, (2) MSHA’s Technical Support Directorate, (3) historical seismic activity in the area of the mine, and (4) inspections of the mine conducted by personnel at the Bureau of Land Management.

1. Input from Mine Inspectors. One control that was not included in District 9’s SOP required the District Office to consider input from local inspectors during the review of roof control plans. Inspectors regularly travel the mine in completing inspections. As a result, they have specific knowledge of conditions within the mine, including those related to roof control. While the Roof Control Supervisor stated that he obtained field office input prior to approving plans at Crandall Canyon, inspectors in District 9’s local field office in Price, Utah, stated that they were not contacted prior to approval of any of the amendments to Crandall Canyon’s plan.
2. Assistance from MSHA’s Tech Support Directorate. The mission of the Roof Control Division of MSHA’s Pittsburgh Safety and Health Technology Center (Tech Center) is to provide engineering and geological technical services concerning the evaluation of roof support systems, mine design, and actual ground conditions at surface and underground mining operations. The Tech Center Director stated that they do not normally get involved in the review of roof control plans unless asked. Roof control specialists can, however, request assistance through MSHA Headquarters. District 9 did not request assistance when reviewing Crandall Canyon’s plans. The District 9 Manager stated that the Tech Center is not large enough to get involved in all plan approvals and he did not believe that they would have come up with a “different answer” related to Crandall Canyon’s plans.

We agree that resource limitations and varying degrees of risk associated with different plans may make it impractical and unnecessary to involve the Tech Center in every plan review. However, the Tech Center exists for a reason and, when faced with high-risk (e.g., retreat mining) or unusual plan requests (e.g., barrier mining or mining under deep cover), the additional expertise and analysis available through the Tech Center would strengthen the overall plan review, assessment, and decision.

3. History of Seismic Activity. In mines located in the Western portion of the United States, “bumps” are normal and necessary to relieve the pressure of tremendous overburden as a result of mining in mountainous terrain. These “bumps” are

often significant enough to be measured and recorded on monitoring equipment that routinely document seismic events. Data on seismic activity, which would include “bumps,” in the area of Crandall Canyon mine, were available from the University of Utah’s Seismograph Station. The frequency and severity of these events could be a useful part of an overall assessment of the risk associated with retreat mining in these areas. MSHA District 9 could have reviewed this information when evaluating the risk associated with retreat mining at Crandall Canyon, but did not. The District Manager stated that he does not see predictive value in historical information on “bumps” and that he knows of no correlation between underground events and seismic events detected that has analytical use.

4. *Bureau of Land Management Inspection Results.* As part of its mission, the Department of the Interior’s Bureau of Land Management (BLM) inspects mines on Federal land at least four times a year to ensure the mine operator is meeting the terms of the lease. BLM had a lease with Crandall Canyon because the North barrier and part of the South barrier are on Federal land. The BLM inspector told us that, on a typical inspection, he verifies the height and width of the areas mined and pillar sizes. The focus of the BLM inspections was on estimating coal production and not miner safety. However, inspection reports prepared by a BLM inspector as a result of three separate inspections he conducted at Crandall Canyon during Calendar Year (CY) 2007 sometimes contained observations regarding adverse mine conditions and possible safety risks.

In a report, dated July 12, 2007, based on his inspection of the North barrier on February 27, 2007, the BLM inspector wrote, “I have been concerned about pulling pillars in this environment with mining a narrow block with little coal barriers to mined out blocks on both sides ... So far no inordinate pillar stresses have been noted, though thing[s] should get interesting soon.” BLM conducted a special inspection on March 15, 2007, after a severe bump in the North barrier on March 11, 2007, caused the mine operator to discontinue mining in that area and before BLM approved termination of this lease obligation. The BLM inspector’s report, dated August 13, 2007, noted “Entryways ... had extensive rib coal thrown into the entry way,” “Stress overrides ... were very concerning,” and “[A mine engineer for the mine operator] said the risks are too great that this event will happen again” Although this latter report was not finalized until after the Crandall Canyon accident, the inspector’s observations could have been provided verbally if an agreement to exchange information had been in place.

Although MSHA was aware that BLM conducted mine inspections, it did not have a memorandum of understanding, or other mechanism, to share inspection results or information. District 9 only became aware of the BLM inspector’s observations after the August 6, 2007, tragedy.

According to the Roof Control Supervisor, the mine operator had not reported to MSHA the severity of damage the March 2007 bump caused. Although the mine operator did inform MSHA that there had been an event when it decided to discontinue mining the North barrier, the operator did not submit a written accident report. MSHA regulation 30 CFR 50.10 states:

The operator shall immediately contact MSHA...at the toll-free number...once the operator knows or should know that an accident has occurred.

30 CFR 50.20 requires the mine operator to submit a written report of the accident (Form 7000-1) to MSHA within 10 working days.

30 CFR 50.2(h) states in part:

(h) Accident means ...

(8) An unplanned roof or rib fall in active workings that impairs ventilation or impedes passage.

(9) A coal or rock outburst that causes withdrawal of miners or which disrupts regular mining activity for more than one hour.

As previously noted, we were not able to interview officials of Murray Energy to determine why they believed this event was not reportable. We did note in documents received from Murray Energy an assertion that local MSHA officials had agreed to a definition of a “reportable accident” that was less stringent than existing regulations. In an internal Genwal Resources, Inc. memo dated May 1, 2006, discussing an earlier, longwall mining operation at Crandall, a mine official wrote:

... Meeting was held at the Price field office with Ted Farmer and Bill Taylor in relation to the bounces and the reporting of such as referred to Part 50.2(h) and the definition of accident as it occurs on the longwall face. A consensus of the group was if the bounce occurs and it basically, does not cause harm to personnel then the reporting of the event does not need to be done ...

This memo was written three months before Murray Energy obtained ownership in the mine, but the memo’s author was employed by the mine operator both before and after Murray Energy’s ownership.

Ted Farmer and Bill Taylor acknowledge that a discussion of this regulatory reporting requirement did take place at the initiative of the mine operator. However, they deny that the discussion included any mention of adjusting the definition, much less an agreement. To further support its assertion that it had not agreed to a modification of the regulation, MSHA identified two citations that

it had issued to nearby mines owned by Murray Energy for violations of reporting requirements. In April 2007, MSHA cited the Aberdeen Mine for not immediately reporting “a pressure bounce/bump with floor heave” that occurred in a longwall section. In July 2007, MSHA cited the West Ridge Mine for not immediately reporting “a non-injury accident” in a longwall section. MSHA officials stated that had the revised definition been agreed to as described by the Crandall Canyon mine operator, neither of these citations would have been issued.

Whatever the reasons, MSHA did not receive complete information regarding the bump (from BLM or the mine operator) and did not pursue additional information (including conducting its own inspection of the area, see p. 19 for a further discussion of this issue). Had there been a mechanism in place for MSHA to receive the BLM inspection results, the Roof Control Supervisor’s review might have been more detailed or asked more questions about the bump to ensure the safety of miners working the South barrier.

Third-Party Engineering Reports. In addition to the proposed plan, mine operators may submit additional supporting documents, such as engineering analyses. Since MSHA does not require such reports, they are available only on a voluntary basis from the mine operator. When they are provided, MSHA has no guidance on how these analyses should be validated or used in the plan review process.

When Murray Energy submitted its proposed amendments to the roof control plan, it provided MSHA with related reports from an external engineering firm. The reports included a narrative summary and diagrams of computer modeling results related to the proposed plans and recommendations aimed at reducing safety risks. The Roof Control Supervisor stated that he did review these reports prior to recommending approval of the plans (see p. 14 for a discussion of changes the Roof Control Supervisor made to the plan that were contrary to the engineering report), but there were no records to show if/how he validated or used this information in his overall plan review.

The engineering report that Murray Energy submitted with its proposed plan to extract pillars in the South barrier contained particularly useful information. In this report, the engineering firm discussed the mine operator’s decision to cease mining in the North barrier as a result of “heavy damage” caused by “a large bump.” The report stated that the engineering firm was able to “analyze the stress and convergence conditions at the time of the bump and modify the pillar design accordingly to control the potential for similar events in the south barrier.” The report recommended increasing the pillar size from the 80’ by 92’ that had been used in the North barrier to 80’ by 129’ in the South barrier. The report concluded that “This size of pillar is expected to provide a reliable level of protection against problematic bumping for retreat mining under cover reaching 2,200 ft.” Although MSHA had not conducted its own inspection of the impacts of the March bump in the North barrier, it was informed by the mine operator within days that an event had occurred. In addition, the April 18, 2007, engineering report discussing the nature and severity of the bump was provided to MSHA on May 15, 2007. Therefore, MSHA had sufficient information to warrant further inquiries about the bump

and their meaning prior to considering and approving the proposed plan for the South barrier.

MSHA District 9 Did Not Document the Plan Review Process or the Basis for Approval

In reviewing and approving the roof control plan, District 9 did not document how it evaluated the proposed plans or on what basis it approved them. Other than a summary of events the Roof Control Supervisor prepared from memory after the August 6, 2007, mine tragedy, there were few supporting documents related to the reviews and approvals of the plan. As a result, MSHA could not demonstrate the activities comprising the plan review process, nor could District 9 demonstrate that it even followed its own SOP (however insufficient it might be) in reviewing and approving the plan amendments.

Because of the lack of written records, much of the information we obtained about MSHA's process for reviewing the proposed plan amendments came from interviews of MSHA personnel involved in the process or from a memo the Roof Control Supervisor prepared on August 14, 2007. However, after-the-fact interviews, as well as written records created from memory a significant period of time after the events occurred, are less reliable than contemporaneous records. This is due to the passage of time and also because the information recorded after the tragedy might have been influenced by the potential for criticism if it were demonstrated that individuals had not adequately fulfilled their responsibilities. While we were occasionally able to corroborate or validate this information through other sources or documents, overall there was insufficient documentation to assess the veracity of the information provided in interviews and of records created after August 6, 2007.

For example, prior to requesting MSHA's approval to mine the barriers, the mine operator provided District 9 with two reports prepared by its contracted engineering firm. According to the Roof Control Supervisor, a first-year roof control engineer ran a NIOSH computer model which identified inconsistencies in the proposed plan. In a letter dated November 21, 2006, the District Manager asked the mine operator to explain these inconsistencies. The Roof Control Supervisor stated that District 9 Roof Control staff subsequently met with the operator and satisfactorily resolved the differences between the two analyses in favor of the mine operator's engineering results. However, no written record of the content of the meeting or the basis for resolving the inconsistencies was prepared at that time. In a memo prepared after the August 2007 incident, the Roof Control Supervisor identified coal strength and modeling of the Main West pillars as two issues that had been resolved.

Another example of MSHA's inability to demonstrate it made the right decision relates to a revision the Roof Control Supervisor required in one plan. Before recommending approval of the mine operator's proposal to extract pillars in the South barrier, the Roof Control Supervisor required that the plan be revised to leave additional pillars near a bleeder entry. This would appear to conflict with the recommendation of the mine

operator's engineering firm that "skipping [not removing] pillars should be avoided in the south barrier" The Roof Control Supervisor stated that he did not discuss his required change with anyone from the engineering firm or perform new computer modeling because leaving additional pillars increased the stability of the mine. Officials from the engineering firm confirmed to the OIG that leaving these pillars was contrary to the suggestions in their report, but were uncomfortable assessing the potential impact because they lacked specific information about the revision. As a result, MSHA could not demonstrate what effect, if any, the required change had on the plan's acceptability. A complete chronology of the exchanges regarding the additional pillars and MSHA District 9's review and approval of the plan can be found in Exhibit 2.

Lack of documentation also prevented MSHA from demonstrating that District 9 had followed its own SOP in completing the plan reviews. Besides not having addressed 12 required controls in its SOP, District 9 had no documentation to support the completion of several key tasks in its SOP. While MSHA HQ officials stated that not all of these tasks would have applied to the conditions and circumstances at Crandall Canyon, District 9 had also not documented those judgments. Therefore, we could not confirm whether the plan review process had included:

1. Requesting comments, copies of plan review forms and previous roof control citations from the field office.
2. Obtaining the accident and injury report for the past 3 years.
3. Reviewing the accident and injury report for roof falls, rib failures, and / or bounces.
4. Reviewing comments from the roof control specialist or field office supervisor.
5. Documenting an explanation for not using or addressing comments from the field.
6. Reviewing plan review forms and previous roof control citations issued since the last plan review.
7. Checking the projected mining in relation to overlying and underlying workings.
8. Checking the projected mining in relation to overlying bodies of water.
9. Assessing the overall design to ensure that the operator was not creating future problems.
10. Assuring the plan contained required safety precautions for operating remote control continuous mining machine and ATRS roof bolter.
11. Describing the method of protecting persons from falling material at drift openings.
12. Comparing the materials in the roof control plan to materials in the ventilation plan.

As a result, MSHA could not demonstrate that it adequately evaluated the potential safety risks and made the right decision in approving the plan. In addition, without a written record of MSHA's actions leading up to its approval of the plan, MSHA had no capability to evaluate actions taken to determine whether mistakes were made in reviewing the plan or process improvements were needed. Further, the lack of a written

record of the plan review process denied MSHA and others the ability to verify information that would be potentially important to the investigations following the August 6, 2007, tragedy. Perhaps most importantly, without a well-defined and documented protocol, MSHA had no control over the introduction of human error into the plan approval decision-making process. Because the deficiencies were caused in part by the lack of an adequate process, they are likely to exist across all Coal Districts nationwide.

MSHA Headquarters and District Management Provided Little or No Supervision of the Plan Approval Process

Although MSHA regulations place the authority to approve mine plans with the District Manager, the District 9 Manager relied on the professional judgment of the Roof Control Supervisor, as has been discussed. The District's approval process consisted of a cursory review by the Assistant District Manager and District Manager of the Roof Control Supervisor's recommendations, assurance that the Roof Control Supervisor's name was on the plan, and a review of the content of the approval letter.

The District Manager said that MSHA Headquarters was rarely involved in the approval process. He said MSHA Headquarters would only get involved if the plan involved a "hot topic ... like Emergency Response Plans."

The lack of active supervision of the decisions of the Roof Control Supervisor, coupled with inadequate documentation of activities carried out as part of the approval process, left MSHA incapable of accounting for and demonstrating the soundness of its decision to approve the roof control plan.

MSHA Cannot Show Process Was Free From Undue Influence by Mine Operator

The Committee also requested information on whether Murray Energy had improperly influenced the review and approval of the plans. Documents we reviewed as part of our audit indicate that the mine operator had requested that MSHA "expedite" plan reviews. For example,

- The mine operator submitted a plan to extract pillars in the North barrier on December 20, 2006. In an internal company memo, a mine official states that in a February 1, 2007, meeting "[The District manager and I] discussed the need for approval of the [North barrier] pillaring plan at Crandall within the next twenty days. He said he would help expedite the process." MSHA approved the plan on February 2, 2007.
- The mine operator submitted a plan to extract pillars in the South barrier on May 16, 2007. In a June 13, 2007, email to the Roof Control Supervisor, a mine official wrote "I am in a staff meeting right now and they are all asking when the plan for the [South barrier] pillaring in Crandall will be approved ... I have a fire

under my axxxxxx to get this approved. I need your help.” In a June 14, 2007, email the mine official wrote, “Are you making any headway? Is there anything I can do to help you?” MSHA approved the plan on June 15, 2007.

In looking for indications that MSHA had bowed to pressure from the mine operator, we attempted to compare MSHA District 9’s review and approval process for the Crandall Canyon plan to the process it used at mines Murray Energy did not own. A less rigorous plan review process at Crandall Canyon would have been one indication that Murray Energy had received preferential treatment. However, the lack of plan review documentation for all the plans we reviewed prevented us from making this comparison.

MSHA offered examples of strong enforcement actions as indications that it had not provided preferential treatment to Murray Energy. On October 26, 2006 and June 20, 2007, MSHA issued citations at the Aberdeen Mine operated by Andalex Resources, Inc. and owned by Murray Energy. These citations were subsequently determined by MSHA to represent “flagrant violations” because of repeated violations of the same safety standards. Flagrant violations carry potential penalty assessments up to \$220,000 each. On March 20, 2008, MSHA announced that it had assessed penalties of \$220,000 and \$200,300 respectively for these flagrant violations.

These citations against another Murray Energy owned mine may indicate the absence of preferential treatment in these specific enforcement actions. However, the absence of documentation specific to the roof control plan review process at Crandall Canyon prohibited us from concluding whether the mine operator had received preferential treatment in these decisions and prevented MSHA from showing that its approval process was free from undue influence by the mine operator.

Finding 2 - MSHA Did Not Ensure that Approved Plans were Properly Implemented or Continued to Provide Protections as Conditions in the Mine Changed

Once the plan was approved, MSHA had a responsibility to ensure that the mine operator correctly implemented the plan and that the plan continued to provide adequate protection to miners as conditions in the mine changed. MSHA conducted quarterly Regular Safety and Health Inspections⁴ at Crandall Canyon, but inspectors did not document the work they performed to assess (a) the mine operator’s efforts to instruct miners in implementing the plan or (b) the continued adequacy of the plan. In addition, MSHA neglected to address important information regarding a “bump” that related to the adequacy of the roof control plan during a Fiscal Year (FY) 2007 inspection of the mine. Therefore, MSHA could not demonstrate that it had adequately re-assessed the roof control plan at Crandall Canyon on a periodic basis or that the mine operator had properly trained miners about roof control plans and procedures.

⁴ Section 103(a) Federal Mine Safety and Health Act of 1977, as amended.

MSHA Inspectors Did Not Verify Miners Were Instructed in the Implementation of the Roof Control Plan

Mine operators are required to train miners in general safety procedures and in the specific tasks related to the duties and tasks they are assigned. Federal regulation 30 CFR 75.220(d) requires that the mine operator instruct all affected miners about amendments to a roof control plan's provisions before implementing them. The intent of the regulation is to ensure that miners understand changes in mining procedures and know how to perform new tasks safely. District 9 approved five amendments to the mine operator's plan between November 2006 and June 2007. The MSHA Inspection Handbook requires that, during each quarterly Regular Safety and Health Inspection, the inspector review a sufficient number of training records to determine if required training was provided. The inspector is also expected to discuss the contents of the training with a representative number of workers to evaluate the quality of training.⁵

District 9 Managers stated that inspectors reviewed miners' training records. One inspector explained that he randomly reviewed training records kept at the mine by looking at training dates and new hire dates. He also stated he examined whether annual refresher or new task training was provided and ensured miners signed training records. However, none of the inspectors' notes for the inspections conducted at Crandall Canyon from December 2006 through July 2007 documented that an inspector reviewed training records, talked with miners to determine if they had received sufficient training, or questioned miners to determine if the mine operator had instructed them on changes to the roof control plan. Therefore, MSHA could not demonstrate that it did everything appropriate to ensure that miners, at the time of the inspections, were qualified to perform their assigned jobs.

Inspectors Did Not Properly Conduct and Document Assessments of the Continued Adequacy of the Roof Control Plan

Federal law requires that MSHA review and document the continued adequacy of a mine's approved plan at least every 6 months.⁶ District 9 completed this task more frequently than required by including it in the mandatory quarterly Regular Health and Safety Inspections conducted at the mine. Inspection records during CYs 2006 and 2007 document that inspectors repeatedly judged the roof control plans to be adequate. However, the inspection records do not document the specific work performed to make such determinations or the basis for these conclusions. As a result of these deficiencies, MSHA could not demonstrate that the continued adequacy of the plan was properly evaluated.

For the required 6-month roof control review, MSHA's Coal Mine Inspections Handbook requires that the inspector assess the adequacy of the roof control plan based on

⁵ See MSHA Handbook Series, U. S. Department of Labor Mine Safety and Health Administration, Coal Mine Safety and Health January 2006. Handbook Number: PH06-V-1, page 15.

⁶ Section 302(a) Federal Mine Safety and Health Act of 1977, as amended.

personal observation and information obtained from the mine operator and miners.⁷ The Coal Mine Inspections Handbook requires the 6-month assessment to be documented on a Plan Review Form (MSHA Form 2000-204). The form allows the inspector to check one of two boxes labeled “Adequate” or “Deficiencies in Plan.” Space is provided on the form for narrative information, if needed (see Exhibit 3 for a copy of Form 2000-204).

District 9 Inspectors stated that, to assess the adequacy of plans, they observed miners working, and generally checked numerous conditions, including spacing between bolts in the roof, scaling, and voids or separations between roof segments. Inspectors stated they also compared their observations with the roof control plan to ensure the operator was following it properly. However, there was no documentation of these activities at Crandall Canyon in the inspection files. Typically, the inspectors checked the “Adequate” box on the form but added minimal, if any, narrative. None of the inspectors’ supporting notes contained documentation that the inspector talked with the operator or miners about roof control conditions.

During an inspection conducted between March 13 and March 29, 2007, an inspector neglected to observe, document, and address conditions in an area of the North barrier where a bump had occurred March 11, 2007. The bump forced the operator to pull out of an area where workers were extracting pillars under an MSHA-approved plan. The inspector stated that the mine operator informed him that workers had been removed from the North barrier area due to “rough” conditions, but did not indicate that a bump had occurred. The mine operator further told the inspector that they had marked off this area of the mine with “danger tape” and had initiated plans to permanently seal the area. The inspector did not question why the seal was being installed or its relationship to the retreat mining going on at the time. Because of the plans to seal the area, the inspector decided not to expend inspection time directly observing this area. On March 28, 2007, the inspector signed off on the Plan Review Form that the roof control plan was adequate, but provided no information on the form or in his notes to support that assessment. In addition, his inspection records contain no mention of the information provided by the mine operator concerning the North barrier area. The March 11 bump and the mine operator’s decision to abandon and seal the North barrier area directly related to the adequacy of the roof control plan at that time. However, the inspector concluded the plan remained adequate without personally inspecting this area of the mine.

The inspectors who conducted the quarterly inspections at Crandall Canyon told us that their inspection activities included talking with miners working at the mine at the time of the inspections. However, there is no documentation of the content or results of these conversations. We noted in an internal Genwal Resources, Inc. email dated March 2, 2007 obtained after the tragedy, that the mine operator was apparently mining coal from the floor of the mine, which was contrary to the approved roof control plan.

⁷ MSHA Handbook Series, U.S. Department of Labor, Mine Safety and Health Administration. Coal Mine Safety and Health January 2006. Handbook Number: PH06-V-1, page 11. MSHA updated this Handbook in January 2008.

Although there is no assurance that miners will disclose violations of the plan or other safety concerns to MSHA inspectors, this example demonstrates the need for MSHA to train inspectors on how to effectively interview miners during regular safety and health inspections.

By not diligently collecting information through inspections of all accessible areas of the mine, proactively addressing potential risks identified such as the March 11 “bump,” and maintaining good documentation of the inspection work performed including effectively questioning miners on mining activities and conditions in the mine, MSHA was negligent in concluding that the roof control plan continued to be adequate in protecting miners.

Objective 2 - How Were Decisions Made Regarding Rescue Operations At Crandall Canyon Mine in August 2007?

The Mine Act and 30 CFR 50 contain provisions that require MSHA and the mine operator to take specific actions in the event of mine accidents. In addition, MSHA guidance at the national and district level defines specific roles and responsibilities in responding to mine emergencies. As stated in the Headquarters Handbook,

The local MSHA district and field office coordinate the on site response to a mine emergency. Simultaneously, national coordination and communication responsibilities rest with MSHA headquarters officials.

Further, the Headquarters Handbook states that when an accident results in trapped or missing miners, MSHA’s primary responsibilities include:

- protecting the safety of persons conducting rescue and recovery operations;
- aiding the recovery of trapped or missing miners;
- providing appropriate information to interested parties (e.g., families, media, Congress, etc.);
- conducting a thorough, objective investigation into the cause of the accident; and
- taking appropriate enforcement actions.

MSHA approved the current Emergency Response Plan for Crandall Canyon on June 13, 2007. According to MSHA officials,⁸ MSHA and mine operator employees worked together to develop rescue plans at Crandall Canyon, with MSHA exercising final approval authority over all underground activities. Throughout the rescue effort, specific activities were proposed, discussed, and finalized during recurring meetings and discussions between MSHA and mine officials. Although these meetings were not documented, the resulting approved underground rescue activities were documented through amendments to MSHA’s original withdrawal order and written rescue plans. Decisions related to above ground rescue activities (i.e., drilling bore holes into the mine from the surface) were generally not documented or formally approved by MSHA. After

⁸ Officials and personnel from Murray Energy declined the OIG’s requests for interviews. The OIG does not have the authority to subpoena or otherwise compel testimony from non-DOL employees.

three rescue workers were killed on August 16, 2007, MSHA sought advice from a group of external experts regarding the ability to safely continue underground rescue efforts. Based on their input, MSHA ceased further underground rescue efforts.

All approved rescue activities were accomplished by mine operator personnel under the direct observation of MSHA inspectors. MSHA also monitored all rescue operations through two command centers - one located near the mine site and the other located at MSHA Headquarters in Arlington, Virginia.

While gaining an understanding of the rescue operation decision-making process, an item of potential concern came to our attention -- MSHA's approval to allow television reporters underground during rescue operations.

MSHA and the Mine Operator Held Recurring Meetings to Plan Rescue Operations

Throughout the rescue effort at Crandall Canyon mine, specific activities were proposed, discussed, and finalized during recurring meetings and discussions between MSHA and mine officials. Scheduled meetings were generally conducted twice a day – one in the early morning and one in the early evening. These meetings typically took place in the command center MSHA established near the mine site. The number and identity of participants in these meetings varied, but usually included the District Manager and the mine operator's General Manager. Other MSHA personnel participated in these meetings to varying degrees of frequency. Although MSHA's Assistant Secretary and the Administrator for Coal were on-site, they typically did not participate directly in these meetings. Instead, they were indirectly involved through recurring conversations with the District Manager. In addition to the scheduled meetings, mine and MSHA officials held ad hoc discussions as needed to address changing circumstances.

MSHA Documented Allowable Rescue Activities Through a Withdrawal Order and Written Rescue Plans

When District 9 officials were notified of the reported accident at Crandall Canyon mine, a Field Office Supervisor in Price, Utah directed a Mine Inspector (inspector) to immediately travel to the mine site. Consistent with MSHA policy, the inspector verbally issued a withdrawal order to the mine operator's General Manager prior to leaving for the mine. Issued under Section 103(k) of the Mine Act, the "k order" prohibited the mine operator from conducting any rescue activities without MSHA's approval. After traveling to the mine site, the inspector formalized the verbal order in writing and served it to the mine operator's Safety Director.

Between August 6, 2007, and September 14, 2007, MSHA personnel issued seven amendments to the original "k order."⁹ Each amendment altered the type or extent of

⁹ The withdrawal order was terminated on December 6, 2007.

rescue activities that the mine operator could perform underground. See Exhibit 4 for a summary of each amendment to the “k order.”

Within parameters established by the “k order,” the mine operator is responsible for developing specific rescue plans. MSHA must approve these plans before they can be implemented. According to MSHA officials, the written plans focus on activities that involve a potential risk to personnel. Activities that do not pose a risk to personnel are not reduced to writing or formally approved by MSHA. For example, in an effort to locate the trapped miners, the mine operator drilled several holes from the surface into the inaccessible areas of the mine. The first hole that was drilled was contained and approved by MSHA in a written plan because there was a possible risk of a methane gas explosion caused by the drill entering the mine. MSHA required that all personnel be withdrawn from the mine prior to the drill bit breaching the mine. Because no explosion occurred and because air readings showed no methane gas danger, the drilling of future holes were not reduced to written plans or formally approved by MSHA. MSHA was, however, involved in deciding where all holes would be located and closely monitored the progress and results of each hole through entries in the command center logs.

The District Emergency Plan states that a four member committee reviews all rescue plans submitted by the mine operator. According to the MSHA District Manager, this rescue plan review committee would typically include a representative from MSHA, the mine operator, the State’s mine enforcement agency, and the miners’ union. However, in the case of Crandall Canyon, the State of Utah did not have a mine enforcement agency and Crandall Canyon was a non-union mine. As a result, a group composed of the District Manager and Assistant District Manager, a representative from MSHA’s Technical Support Unit; the Price, Utah, Field Office Supervisor on duty; and the mine operator’s General Manager reviewed the rescue plans.

Between August 8, 2007, and August 15, 2007, the mine operator submitted and MSHA approved 11 separate rescue plans. See Exhibit 5 for a summary of each approved rescue plan.

MSHA Sought Advice from an External Panel of Experts After Three Rescue Workers Were Killed

On the evening of August 16, 2007, a significant bounce occurred in the mine where rescue teams were working. Three rescue workers (including one MSHA Inspector) were killed and six others were injured. After this tragic event, underground rescue efforts were halted, and MSHA and the mine operator mutually agreed to gather a team of external ground control experts (see Exhibit 6 for a list of the team members) to assess conditions and to provide recommendations regarding the possibility of re-establishing underground rescue efforts.

The team of experts concluded that further rescue work inside the mine could not be performed safely. MSHA concurred with this recommendation and prohibited any additional underground rescue efforts.

MSHA Continually Monitored Rescue Activities

Almost immediately after receiving notification of the emergency, MSHA established separate command centers near the mine site and at MSHA headquarters. MSHA personnel staffed the command centers around the clock and obtained and recorded information in log books about what was occurring at the mine. The log books at both command centers captured similar information, including:

- progress updates on the advances underground
- air readings
- progress updates on the drilling of bore holes
- the number of workers underground
- any unusual activity (specifically bumps)
- plan approvals

In addition to the monitoring of activities by the command centers, MSHA inspectors were always present at the site and directly monitored rescue activities. They had the authority to stop any activity or order the withdrawal of all rescue personnel if they observed a violation of the approved rescue plans or provisions of the Mine Act.

Finding 3 - MSHA Lacked Guidance on Non-Rescue Activities

On August 8, 2007, MSHA gave approval for a Cable News Network (CNN) camera crew to enter the mine to photograph conditions and activities where rescue workers were attempting to reach the trapped miners. MSHA also allowed two family members (who were miners, but not part of the rescue team) to travel underground and observe the rescue operation. According to the Assistant Secretary, these decisions were made to provide the family members of the missing miners with an understanding of the difficult underground conditions and the ongoing rescue efforts.

The Assistant Secretary stated that the mine operator had made two separate attempts to take photographs of underground conditions. However, inadequate lighting resulted in poor quality pictures. During a subsequent press briefing on August 8, 2007, the mine co-owner (Robert Murray) asked media members if they could provide equipment capable of taking better quality pictures. Personnel from CNN offered to travel underground and use their equipment to produce video of the conditions and activities. The Assistant Secretary and the Administrator for Coal were present at the press briefing when this idea was presented. The Assistant Secretary told us he gave approval for the media members to travel into the mine. He did not believe the reporters would be exposed to any unnecessary risk and he believed that the resulting pictures would be very beneficial to the families of the missing miners.

Some local MSHA personnel disagreed with the decision. According to notes prepared by a Field Office Supervisor, he disagreed with the decision and was present when another inspector voiced his disagreement directly to the Assistant Secretary. The Assistant Secretary stated to us that he did not recall anyone objecting to his decision. The Field Office Supervisor's notes also described the safety training provided to the camera crew as "fast and not so good." During our audit, MSHA inspectors in District 9 told us that they believed allowing the camera crew into the mine during the rescue activities (a) was unsafe; (b) delayed rescue operations; (c) was a distraction for the rescue workers. They also questioned the benefit to the missing miners' families. The media traveled into the mine under the supervision of MSHA Inspectors. While the camera crew was underground, they traveled within about 55 feet of where coal was being removed as part of the rescue operation.

A subsequent request from the mine operator to allow the CNN camera crew underground for a second time was denied by MSHA. The Assistant Secretary told us that the purpose of the original trip (i.e., to provide pictures to the miners' families) had been met and that there was no need for additional pictures.

We did not determine the appropriateness or the safety risks, if any, associated with the Assistant Secretary's decision. We did determine, however, that MSHA does not have guidelines on when, for what purpose, and under what conditions to allow non-rescue activities and non-rescue personnel into a mine during an active rescue operation. The lack of such guidance increases the risk that all pertinent issues that need to be considered in such a decision may not be appropriately considered, particularly in a crisis situation.

Overall Conclusion

MSHA was negligent in carrying out its responsibility to protect the safety of miners. Specifically, MSHA could not show that it made the right decision in approving the plan or that the process was free from undue influence by the mine operator. MSHA did not have a rigorous, transparent review and approval process for roof control plans consisting of explicit criteria and plan evaluation factors, appropriate documentation, and active oversight and supervision by Headquarters and District 9 management. Further, MSHA did not ensure that subsequent inspections assessed compliance with, and the effectiveness of, approved plans in continuing to protect miners. Finally, requirements related to non-rescue activities need to be clarified.

Recommendations

The conditions identified in our report can be addressed by MSHA within its current statutory authority. We recommend that the Assistant Secretary for Mine Safety and Health ensure that MSHA:

1. Develops a rigorous, standard, and transparent process delineating required tasks and analyses to be completed, and information to be considered, by District Offices in evaluating and approving proposed roof control plans.
2. Establishes policy requiring risk assessments specific to the particular mining operation prior to plan approval (e.g., seismic activity, history of the mine, depth of mine, coal strength, stability factors of pillars, etc.)
3. Establishes explicit criteria and guidance for assessing the quality of, and potential safety risk associated with, proposed plans.
4. Issues policy and guidance on the use of computer models, including appropriateness of input values and use of model results.
5. Issues policy mandating active oversight by District Managers by requiring documentation of how they reached their conclusions that approved plans will provide effective roof control.
6. Requires inspectors to document the work they perform in (a) effectively questioning miners on mining activities and conditions in the mine, and their basis for concluding on (b) the continued adequacy of roof control plans and (c) the completion and adequacy of miner training on such plans.
7. Issues policy establishing the conditions under which non-rescue activities and non-rescue personnel would be allowed on site during active rescue operations;
8. Establishes a Memorandum of Understanding with the Bureau of Land Management to share inspection or other information on mine conditions affecting safety.
9. Conduct a new review, consistent with the recommendations in this report, of all existing roof control plans.

Agency Response and OIG Conclusion

In a written response to our draft report, DOL's Assistant Secretary for Mine Safety and Health concurred with all of our recommendations and identified numerous corrective actions that MSHA has initiated or plans to initiate.

Notwithstanding this concurrence, the response described our use of the word “negligent” as misleading. MSHA’s actions and inactions, taken as a whole, lead us to conclude that MSHA lacked care and attention in fulfilling its responsibilities to protect miners. MSHA could not show how it analyzed roof control plans, the criteria it measured the plans against, the rationale for approving the plans, that the plans were properly implemented, or that the plans continued to protect miners over time. These deficiencies evidence MSHA’s serious and systemic lack of diligence in protecting miners, and we do not believe it is misleading to use the term “negligent.”

The response also expressed concern that our audit report implied that MSHA’s review process had been subject to undue influence. The report neither states nor implies such a conclusion. Rather, our report documents that MSHA could not show how it arrived at its decisions to approve these plans nor that it did all the things necessary to make the appropriate decision regardless of any pressure to expedite the process. As a regulatory agency, MSHA must be able to show that its decisions are not influenced by those it regulates and that they are sound based on rigorous, established and documented processes and criteria.

The Assistant Secretary’s response also identified five instances in which he said the report did not include information, available to the auditors, that he believed contradicted our conclusions. First, the response notes that “by the time Murray Energy requested expedited review of the roof control plan for the North barrier, the plan had already been cleared by MSHA for signature by the District Manager, rendering it highly unlikely that the request could have influenced the approval process.” Although the Roof Control Supervisor had signed off on the North barrier plan the day before a Murray Energy request to expedite the approval, this is not conclusive evidence that MSHA was not influenced by the mine operator. As we stated in our report, the complete lack of a record of MSHA’s review of the Crandall Canyon roof control plan and amendments prohibited us from concluding on the propriety of MSHA’s actions.

Second, the response notes that our report did not recognize the fact that “the local inspector and roof control specialist traveled with the Roof Control Supervisor in an underground inspection of the mine before the plan was approved.” After receiving MSHA’s written response, we clarified that “the local inspector and roof control specialist” refers to one, not two separate persons. We agree that this individual inspected the mine with the Roof Control Supervisor prior to the plan being approved and had the opportunity to provide input. However, he was not the MSHA inspector assigned to conduct the Regular Safety and Health Inspection at Crandall Canyon during any of the preceding four quarters. The greatest benefit of receiving input from “local inspectors” would be the fact that they are familiar with the mine through their quarterly inspections.

Third, regarding our finding that District 9 did not consult with MSHA’s Technical Support Directorate, the response notes that we do not mention that the Roof Control Supervisor who reviewed the plan was a professional engineer with years of experience as Chief of MSHA’s former Technical Support Center in Denver. We agree with the

stated qualifications and experience of the Roof Control Supervisor. We do not agree that this justified him not seeking assistance from the current Technical Support Center in reviewing the proposed plans at Crandall Canyon. In fact, MSHA acknowledges the potential benefit of involving the Technical Support Center in selected plan reviews later in its response. MSHA states it will issue guidance “regarding what type of roof control ... plans must be sent to MSHA’s Technical Support Roof Control Division for peer review and concurrence [emphasis added].” Regardless of an individual’s personal experience and qualifications, there is benefit in subjecting high-risk plans to examination by multiple highly qualified reviewers.

Fourth, the response notes that experts at NIOSH and the University of Utah have stated their agreement with the District Manager that historical information of seismic activity has little predictive value with respect to future activity. However, the documents provided by MSHA to support their assertion do not totally dismiss the value of information obtained from seismic monitoring. In these documents, a University of Utah professor stated that seismic monitoring could provide useful information when integrated with other available information. A NIOSH official stated that there could be value in applying seismic monitoring at mines with a history of bumps, as part of a larger risk management program.

Finally, the response noted that none of MSHA’s criteria for approving a roof control plan included consultation with the Bureau of Land Management. We agree that MSHA’s procedures did not require it to obtain or share information with BLM. However, they should have. As stated in the report, this was a source of relevant information, because of BLM’s own inspections of the mine, which MSHA did not consider.

Our findings and recommendations remain unchanged. See Appendix E for the agency’s complete response to our draft report.



Elliot P. Lewis

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Exhibits

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Exhibit 1

MSHA Coal Districts SOPs Compared to Required MSHA Management Controls

	Required MSHA Management Control	MSHA Coal District										
		1	2	3	4	5	6	7	8	9	10	11
1	Completion of final staff review at DO	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
2	Sets time frame for approving request (days)	Y	N	N	Y	N	Y	Y	N	Y	Y	N
3	Records date received	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4	Records plan's progress through approval procedures	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
5	Shows date approval or denial letter mailed to operator	N	Y	N	Y	N	Y	N	N	N	N	Y
6	Shows distribution of mailing	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
7	Uniform mine file is current	Y	N	N	Y	N	Y	Y	N	Y	N	Y
8	Identifies date for formal review	Y	N	Y	Y	Y	Y	Y	N	N	N	N
9	Check that required information is submitted	N	Y	N	N	N	N	N	N	Y	N	Y
10	Ensure that miners' representatives comments are addressed	Y	Y	N	Y	N	Y	N	N	N	Y	Y
11	Identify and evaluate unusual proposals or requests	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
12	Evaluate plan for provisions contrary to standards or regulations	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
13	Check mine files for information related to plan adequacy	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
14	Check for communication with other plan approval groups, when appropriate	N	Y	N	N	N	Y	N	N	N	Y	Y
15	Technical specialist does on-site review, when necessary	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y
16	Acquire and consider field office input from local inspectors and address recommendations	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
17	Designated MSHA personnel contact operator for additional information	N	N	Y	N	Y	Y	Y	N	N	Y	Y
18	Discuss results of on-site evaluation with operator and identified miners' representatives	N	N	N	N	N	N	N	N	N	Y	N
19	DM receives recommendations to approve or disapprove plan	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
20	Promptly provide approvals or amendments to field office supervisors for inclusion in uniform mine file	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Total Controls Addressed ("Y" answers)	12	15	13	16	13	18	15	9	8	15	17
	Percent SOP comply with Required MSHA Management Control	60%	75%	65%	80%	65%	90%	75%	45%	40%	75%	85%

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Exhibit 2

Chronology of District 9 Crandall Canyon Plan Review and Approval

Date	Event
Spring 2006	According to the District 9 Roof Control Supervisor, Mine officials discussed with him the possibility of pillar mining in Crandall Canyon Main West North and South barriers. District 9 officials viewed this as a high-risk process, so they agreed to review and approve the activity in four phases: North barrier entry development; North barrier pillar extraction; South barrier entry development; and South barrier pillar extraction.
9/8/2006	Prior to formally requesting approval to mine the barriers, the mine operator provided District 9 with two reports prepared by an external engineering firm (one dated July 20, 2006, and the other dated August 9, 2006) that assessed the mine operator’s plan for mining the Main West North and South barriers of Crandall Canyon.
10/2006	According to the Roof Control Supervisor, the District 9 roof control group reviewed the two external engineering reports. During this review a first-year roof control engineer ran the NIOSH computer models the external engineering firm used and obtained different results. The first-year engineer concluded that the engineering firm’s reports supported development of entries in the barriers, but did not adequately support pillar extraction.
11/11/2006	The mine operator submitted a proposed plan amendment to District 9 staff to develop entries in the North barrier.
11/21/2006	District 9 Manager approved the mine operator’s plan to develop the North barrier entry.
11/21/2006	The District 9 Manager sent a letter to the mine operator stating that the plan for pillar extraction, as currently designed, would not be approved. The letter listed inconsistencies in the plan based on the District’s October 2006 technical review of the external engineering firm’s reports.
12/2006	According to the Roof Control Supervisor, after discussion with Crandall Canyon staff, the inconsistencies were resolved in favor of the external engineering firm’s results.
12/20/2006	The mine operator submitted a proposed plan amendment to extract pillars from the North barrier.
1/9/2007	As part of his review of the proposed plan amendment to extract pillars from the North barrier, the District 9 Roof Control Supervisor and the first-year engineer, visited the mine to evaluate ground conditions in the North barrier. The Roof Control Supervisor recommended that the mine operator install a double-breaker row of posts in each cross-cut adjacent to the bleeder entry. He and the mine operator agreed that “top coal” should be left in areas that were not sandstone roof.

(Continued)

Exhibit 2 (continued)

Chronology of District 9 Crandall Canyon Plan Review and Approval

Date	Event
1/10/2007	The mine operator submitted a proposed revision to the previously approved (November 21, 2007) North barrier development plan amendment. The revision would allow the mine operator to leave “roof [top] coal,” where this would improve roof conditions.
1/18/2007	District 9 approved the proposed revision (January 10, 2007) to the North barrier development plan.
1/31/2007	The District 9 Roof Control Supervisor emailed the mine operator to stipulate minimum requirements that would provide acceptable support for the North Main West barrier bleeder entry in the North barrier pillar extraction plan proposed on December 20, 2006. In a memorandum written after the August 6, 2007, incident, the Roof Control Supervisor states he had discussed this amendment with mine personnel during his January 9, 2007, mine visit.
2/2/2007	The District 9 Manager approved the mine operator’s revised December 20, 2006, plan amendment for pillar extraction in the North barrier. The Roof Control Supervisor stated that District 9 and the mine operator had an understanding that if stability problems occurred, pillars would be skipped and miners would move to stable ground to continue pillar extraction.
2/20/2007	The mine operator submitted a proposed plan amendment to District 9 to develop entries in the South barrier.
3/8/2007	The District 9 Manager approved the mine operator’s February 20, 2007, plan amendment to develop the South barrier.
3/12/2007	The Roof Control Specialist stated that he was notified through a voice mail from the mine operator that pillar extraction had been permanently halted in the North barrier due to recurring bounces. According to the Roof Control Supervisor, the mine operator’s message did not indicate damage to the ribs or ventilation stoppings. Based on the description provided, the Roof Control Supervisor concluded there was no reason for District 9 to inspect the area.
5/15/2007	District 9 received another report prepared by the external engineering firm hired by Murray Energy (dated April 18, 2007) which redefined the pillar size for the South barrier as a result of problems encountered while extracting pillars in the North barrier. The report referenced a “ <i>large bump</i> ” that resulted in “ <i>heavy damage to the entries [of the north barrier].</i> ” Further, it stated that “ <i>The [increased] size of pillar is expected to provide a reliable level of protection against problematic bumping for retreat mining under cover reaching 2,200 ft...Skipping pillars should be avoided in the south barrier, particularly under the deepest cover.</i> ”

(Continued)

Exhibit 2 (continued)


Chronology of District 9 Crandall Canyon Plan Review and Approval

Date	Event
5/16/2007	The mine operator submitted a proposed plan amendment to extract pillars in the South barrier.
5/22/2007	The District 9 Roof Control Supervisor stated that as part of his review of the proposed amendment he and a Roof Control Specialist visited the mine to evaluate the ground conditions. The Roof Control Supervisor's post-accident memo of August 14, 2007, provides extensive summary of observations made and discussions held with the mine operators during the site visit. According to the August 14, 2007, memo, the Roof Control Supervisor held discussions with the mine operator regarding leaving adequate pillars around the sump area and bleeder entry. The mine operator agreed not to mine the pillars from cross-cut 139 to cross-cut 142 to protect the bleeder entry and they would skip these pillars during retreat mining.
6/15/2007	The District Manager approved the mine operator's plan to extract pillars in the South barrier. The approved plan required leaving additional pillars near the bleeder entry as required by the Roof Control Supervisor.
8/14/2007	The Roof Control Supervisor wrote a summary of District 9 review and approval of plan amendments which preceded the August 6, 2007, accident.

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Exhibit 3

6-Month Roof Control Plan Review (MSHA Form 2000-204)

Plan Review	U. S. Department of Labor Mine Safety and Health Administration	
1. MSHA Office	2. Mine ID	
3. Mine Name	4. Company Name	
Roof Control		
<input type="checkbox"/> Adequate		
<input type="checkbox"/> Deficiencies in Plan (Briefly Describe)		
Ventilation		
<input type="checkbox"/> Adequate		
<input type="checkbox"/> Deficiencies in Plan (Briefly Describe)		
Inspector Signature	Date	Supervisor Signature Date
MSHA Form 2000-204, Feb. 89 (Revised Jan. 90)		

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Exhibit 4

Summary of 103 (k) Order and Amendments

Order Number	Date	Time (MDT)	Description
7287831 (initial k order)	8/6/2007	4:41 AM	Prohibited the mine operator from conducting any rescue activities without MSHA's approval.
7287831-01	8/6/2007	6:00 AM	Allowed "...necessary personnel to travel underground to make repairs...open the number one seal in the Old Main West entries inby crosscut 118 and to use mine rescue teams to explore within established mine rescue procedures."
7287831-02	8/7/2007	1:50 PM	Allowed the mine operator to "...use a camera underground in accordance with their currently approved photography plan. The use of the camera will be limited to photographs depicting underground conditions for the purpose of informing family members and/or members of the media of the current underground conditions in the mine and the equipment used in the recovery efforts."
7287831-03	8/7/2007	6:20 PM	Permitted "...the necessary personnel to travel underground to make repairs to damaged ventilation devices, clean in and around feeder breaker and advance in the #1 entry."
7287831-04	8/8/2007	10:18 AM	Allowed "...recovery operations to continue in accordance with approved site specific plans."
7287831-05	8/16/2007	11:35 PM	"...prohibit[ed] anyone from traveling inby crosscut #107 Main West. MSHA must be notified and permission granted before performing any other activity in the mine."
7287831-06	9/4/2007	3:55 PM	Defines requirements for performing work inby crosscut 90 of Main West.
7287831-07	9/14/2007	2:45 AM	Changed the type of inspection from E08 (non-injury accident investigation) to an E09 (mine emergency operations) and prohibited any work inby crosscut 50 Main West.
7287831-08	12/6/2007	11:30 AM	Termination of the k order

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Exhibit 5

**Summary of Rescue Plans Approved by MSHA
August 7, 2007 – August 16, 2007**

Date of Plan Approval	Time of Plan Approval	Summary of Contents
Aug 08, 2007	12:02 am (pg 1) 1:05 am (pg 2)	Procedures for removal of loose coal in Entry #1 of South Block of Main West
Aug 10, 2007	No time stated	Restrictions regarding working inby supported areas; rock dusting requirements
Aug 10, 2007	12:10 pm	Procedures and restrictions for exploring Entry #1
Aug 10, 2007	1:10 pm	Plan for drilling bore hole #1 (2.5 inch) and #2 (8.5 inch) [Note 1]
[Note 2]	[Note 3]	Procedures for clearing Entry #1
Aug 12, 2007	12:04 pm	Installation of sample tubing in Main West Seals
Aug 12, 2007	4:10 pm	Procedures for opening seal in Main West
Aug 13, 2007	8:15 pm	Procedures for loading loose material in Entry #1
Aug 14, 2007	8:50 am	Calibration and maintenance of atmospheric monitoring system at the Main West and Main West North barrier seals
Aug 15, 2007	10:00 am	Plan for training miners brought in from other mines to assist in rescue operations
Aug 15, 2007	10:40 am	Permission to use workers certified outside Utah in rescue operations

Note 1: Plans related to drilling subsequent bore holes were not summarized in written plans and approved by MSHA. MSHA did record the location of subsequent bore holes on a mine map maintained in its command centers and progress of drilling activities were recorded in the command center logs.

Note 2: Date of approval signature is not indicated. Document heading contains date of "8 11 07."

Note 3: Time of approval signature is not indicated. Document is marked "Received 6:30 pm."

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Exhibit 6

Ground Control Expert Committee

Name	Organization
Keith Heasley, PhD	Professor, Mining Engineering, West Virginia University (developed LAMODEL while a NIOSH employee)
Hamid Maleki	President, Maleki Technologies, Inc. (engineering consultant with extensive western mining experience)
Chris Mark, PhD	Chief of the Rock Mechanics Section, NIOSH's Bruceston Research Center (developed ARMPS model and authored many papers on retreat mining)
Tony Iannacchione	Mining engineer, NIOSH Bruceston Research Center (extensive experience in pillar stability and mining design)
Rick Olsen	Engineering consultant (experience in mountain bumps and western mining environment)
Morgan Moon	Engineering consultant (extensive underground and mountain bump experience)
Peter Swanson, PhD	Geophysicist, NIOSH Spokane Research Laboratory (conducts research to reduce hazards from rock mass instabilities in underground mining)

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Appendices

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Appendix A

Background

Mine Safety and Health Administration (MSHA)

The Federal Mine Safety and Health Act of 1977, as amended, established MSHA, which is responsible for enforcing Federal laws and regulations and implementing policies intended to protect the safety and health of the nation’s miners.

As a result of a sharp increase in coal mine fatalities in calendar year 2006, Congress enacted the Mine Improvement and New Emergency Response (MINER) Act of 2006. Among its provisions for underground coal mines, the MINER Act requires operators to develop and MSHA to approve emergency response plans for every mine and improvements in rescue team training and response. Key items to be provided for in every mine’s emergency response plan include (a) a redundant means of communication with the surface for persons underground, (b) a means for above ground personnel to determine the current, or immediately pre-accident, location of all underground personnel (consistent with available technology), and (c) emergency supplies of breathable air for individuals trapped underground.

MSHA is responsible for administering the provisions of both the Mine Act and MINER Act, including approving various mine plans (e.g., roof control), performing periodic inspections of each mine, and citing mine operators for safety and health violations. Within MSHA, the Office of Coal Mine Safety and Health (Coal) is responsible for enforcing the Mine Act and the MINER Act at coal mines. Coal administers 11 districts (listed below) and 44 associated field offices with approximately 1,175 staff. Coal has jurisdiction over approximately 2,300 coal mines in 26 states. Eight of its 11 districts are located in the Eastern United States near coal seams located in or near the Appalachian Mountains.

11 MSHA Coal Districts

1	Anthracite coal regions in Pennsylvania
2	Bituminous coal regions in Pennsylvania
3	Maryland, Ohio, Northern West Virginia
4	Southern West Virginia
5	Virginia
6	Eastern Kentucky
7	Central Kentucky, North Carolina, South Carolina, Tennessee
8	Illinois, Indiana, Iowa, Michigan, Minnesota, Northern Missouri, Wisconsin
9	All States west of the Mississippi River, except Minnesota and Northern Missouri
10	Western Kentucky
11	Alabama, Georgia, Florida, Mississippi, Puerto Rico, Virgin Islands

Coal received \$154.6 million for its FY 2008 budget—close to a 30 percent increase over its FY 2007 budget.

Crandall Canyon Mine

The Crandall Canyon Coal Mine is one of 18 coal mines in Utah. It is an underground, bituminous (soft) coal mine, located 16 miles west of Huntington (Emery County), Utah on the eastern edge of the Wasatch Plateau coal field.

Murray Energy, through UtahAmerican Energy (a wholly-owned subsidiary), owns 50 percent of Crandall Canyon mine. Murray Energy acquired the mine when it bought Andalex Resources, Inc., and its four subsidiaries in August 2006. Intermountain Power Agency, a Utah cooperative that generates electrical power for its member municipalities in Utah and California, has owned the other 50 percent of the mine since 1990.

Murray Energy is a privately-held coal mine company, headquartered in Cleveland, Ohio. As of February 19, 2008, MSHA identified the firm's president, Robert E. Murray, as the controller for 52 coal mines in the United States.

Genwal Resources, Inc., a subsidiary of UtahAmerican Energy, Inc., has been the mine operator since 1995. Data from the State of Utah show that production at the mine had dropped from 3.2 million short tons in 2002 to 625,000 short tons in 2007. According to MSHA, employment at the mine dropped from an average of 86 for the first two quarters of 2006 to 58 for the same period in 2007.

For the 12 months during which Murray Energy co-owned the mine prior to the incident, there were 3 accidents reported at the mine, but no fatalities. During this same period, MSHA issued 68 citations to the mine operator for violating various Federal standards. Three of these citations related to roof control issues (roof bolting; marking of unsupported roof; and inadequate support). As of March 6, 2007, MSHA had assessed \$44,125 in fines related to these 68 citations.

Fatal Incident at Crandall Canyon

On Monday, August 6, 2007, at approximately 2:52 a.m., six miners were trapped when "a major coal bump/bounce" occurred in the South barrier of the Main West pillar section. All four entries were rendered impassable approximately 2,000 feet out from the working section. During subsequent underground rescue and recovery efforts, three rescue workers were fatally injured on August 16, 2007. Video images taken through a series of holes drilled into the inaccessible areas of the mine between August 6, 2007, and August 30, 2007 failed to locate the missing miners. MSHA suspended all underground rescue work on August 16, 2007, and it suspended all efforts to locate the six miners on August 31, 2007.

MSHA Approval of Retreat Mining at Crandall Canyon Mine

MSHA's records indicate the first plan for retreat mining at Crandall Canyon was approved on September 27, 1989. Before Murray Energy acquired the Crandall Canyon mine in 2006, all longwall mining was completed and room and pillar mining had been conducted at various locations. Between July 3, 2002, and the August 6, 2007, incident, MSHA District 9 approved a roof control base plan, 5 revisions to the base plan and 11 site-specific amendments.

For Genwal Resources' plan to retreat mine in the Main West barriers, District 9 officials agreed to review and approve the activity in four phases: (a) North barrier entry development, (b) North barrier pillar extraction, (c) South barrier entry development, and (d) South barrier pillar extraction.

For a chronology of MSHA's approval of retreat mining at Crandall Canyon between spring 2006 and August 6, 2007, see Exhibit 2.

Retreat Mining

Retreat mining is a high risk underground mining technique, designed to maximize the amount of coal reserves recovered. It describes a process of removing pillars of coal that had previously been left to support the mine roof. Miners remove pillars as they "retreat" toward the mine entrance, allowing the unsupported roof to collapse behind them. The process is risky due to stresses on the final pillars and the potential for unplanned cave-ins. As of September 1, 2007, the Crandall Canyon mine was one of 211 coal mines with MSHA-approved retreat mining plans.

MSHA data show that Utah coal mines engaged in retreat mining were susceptible to "bumps." Bumps are sudden, violent expulsions of coal from one or more pillars, accompanied by earth tremors. Bumps occur in coal mines where a strong, thick, massive sandstone roof rests directly on the coal with no cushioning layer of shale between. Fatalities and injuries have resulted when these destructive events occur. With more mining operations moving into reserves under deeper overburden or below previously-mined areas, geologists and engineers continue working to identify methods to prevent, and, in the event they do occur, to mitigate the consequences of, bumps in such new circumstances.

From January 2002 to July 2007, MSHA received reports from mine operators of 52 "bumps" that occurred in U.S. coal mines. Of this total, 31 occurred at mines within the State of Utah, two of which occurred at Crandall Canyon (February and August of 2002).

MSHA Roof Control Plan Approval and Oversight Process

Roof control plans identify the methods used in a mine to control the collapse or shifting of the roof, face or ribs in underground coal mines. Each mine operator must develop

and follow a roof control plan that is suitable to the prevailing geological conditions, and the mining system to be used at the mine. This proposed plan, and any subsequent revisions, is submitted in writing, to the MSHA District Manager. Federal regulations at 30 CFR sections 75.220 through 75.223 address the process for review and approval of roof control plans, including assigning this responsibility to the District Manager. Each MSHA District has a SOP that defines how proposed plans are to be reviewed and evaluated.

Computer Models for Assessing Roof Stability

NIOSH, a Federal agency within the Department of Health and Human Services' Centers for Disease Control, offers several computer models to help assess roof stability in coal mines and design safer mining operations. The two main NIOSH models are the Analysis of Retreat Mining Pillar Stability (ARMPS) and LaModel.

ARMPS was developed by NIOSH in 1995 to help prevent pillar failures through better pillar design, thereby enhancing safety for underground mine workers. It has become widely accepted within the mining community. The computer program estimates the loads applied to, and the load bearing capacities of, coal pillars used in retreat mining and calculates a stability factor. The program was verified using numerous pillar retreat case histories collected from across the U.S. According to NIOSH literature, the program is well suited for initial feasibility studies where no previous experience is available and can be calibrated using site specific experience. However, the NIOSH literature also states that the ARMPS stability factor may be less meaningful in cases where the mine depth exceeds 750 feet.

LaModel is software that calculates the stresses and displacements in coal mines. It can be used to investigate and optimize pillar sizes and layout in relation to pillar stress or bump potential.

Mine Rescue and Recovery Operations

The Mine Act and 30 CFR 50 contain provisions that require MSHA and the mine operator to take specific actions in the event of mine accidents. According to MSHA's Mine Emergency Response Procedures Handbook, MSHA's primary responsibilities include: protecting the safety of persons conducting rescue and recovery operations; aiding the recovery of trapped or missing miners; conducting a thorough, objective investigation into the cause of the accident; and taking appropriate enforcement actions.

The mine operator must notify MSHA, by calling a toll free number, within 15 minutes of a reportable accident as defined under 30 CFR 50.2. The MSHA call center informs the appropriate MSHA District Office. The District Office (and appropriate Field offices) coordinates the on-site response. The District Manager or other designated District official completes Form 7000 30, Preliminary Information on a Mine Emergency, and relays information on the emergency to the Office of Coal Mine Safety and Health Administrator.

The Field Office contacts the mine to obtain more information and immediately sends an inspector to assess the situation. The inspector will issue the appropriate order of withdrawal necessary to ensure the health and safety of the miners.

In most serious accident situations, MSHA issues a withdrawal order under provisions of Section 103(k) of the Mine Act (“k order”). The “k order” allows the operator to maintain control of a mine’s assets and operations, and develop and execute rescue or recovery plans that MSHA approves. The District Manager, or senior MSHA official on-site, and a mine operator representative generally sign and date the plan approval.

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Appendix B

Objectives, Scope, Methodology, and Criteria

Objectives

We performed audit work to accomplish two specific objectives:

- Did MSHA's Review, Approval, and Oversight of the Roof Control Plan for Crandall Canyon Mine Provide Reasonable Assurance that Miners Were Protected?
- How Were Decisions Made Regarding Rescue Operations at Crandall Canyon Mine in August 2007?

Scope

For Objective 1, our scope covered the roof control plan amendments submitted while the mine was co-owned and operated by Murray Energy and up to the day before the tragedy (August 1, 2006 through August 5, 2007). Our audit work was not intended to determine (a) the cause of the August 2007 accident, (b) whether the roof control plan was adequate, or (c) whether the mine operator complied with the approved plan.

For Objective 2, our scope covered the period during which active rescue operations occurred at the mine (August 6, 2007, through August 31, 2007). We focused on how decisions were made during the rescue operations, but did not conclude on the adequacy of those decisions.

The OIG served a subpoena on Murray Energy Corporation on August 24, 2007, that requested correspondence, e-mails, and other documents related to Crandall Canyon mine, for the period January 1, 2006, to August 6, 2007. We received extensive documents from the company (some of which were redacted) between September 26, 2007, and March 3, 2008.

We attempted to interview employees of Murray Energy and its subsidiaries, but they declined on the advice of their counsel. Because the OIG does not have the authority to subpoena or otherwise require testimony from non-DOL employees, we were not able to compel their participation.

Methodology

To accomplish Objective 1, we obtained an understanding of MSHA's roof control plan approval and oversight policies and procedures, and of applicable Federal laws and regulations. We interviewed Coal officials at Headquarters, District 9 officials, management and inspectors at District 9's Price, Utah, and Delta, Colorado, Field Offices, and District 4 (Mount Hope, West Virginia) and District 6 (Pikeville, Kentucky) officials.

We reviewed the roof control plan amendments, and related documents, submitted while Crandall Canyon mine was co-owned and operated by Murray Energy. We also reviewed available documents related to MSHA's review and approval of these amendments and documents related to inspections MSHA performed during our audit period.

In an effort to determine whether the review and approval process for Crandall Canyon differed from the process typically used in District 9 or in other District Offices, we judgmentally selected and reviewed roof control plans for two additional mines in District 9 and three mines in Districts 4 and 6 that were engaged in retreat mining. We judgmentally selected Districts 4 and 6 from among Coal's 11 Districts based on the number of underground mines that conducted retreat mining in those districts (59 mines and 41 mines, respectively). For each mine, we reviewed documentation related to the District Office's approval process and 6-month evaluation of the plans to determine if they complied with the written roof control plan SOP and oversight process. At each District Office, we interviewed the District Manager, Assistant District Manager for Technical Services, Roof Control Group employees, including Supervisors and Specialists, and field office supervisors and inspectors.

Additionally, we interviewed selected personnel with the Bureau of Land Management, including the inspector who inspected the Crandall Canyon mine from 2004 through 2007. We also interviewed NIOSH and MSHA's Pittsburgh Safety and Health Technology Center personnel to obtain an understanding of computer software available to assess roof stability in underground coal mines. As explained in the Scope section above, we were unable to interview employees of Murray Energy and its subsidiaries.

We reviewed documents provided to OIG by MSHA and Murray Energy. In addition, we reviewed written responses and related materials provided by the engineering firm that Murray Energy contracted with in response to written questions from MSHA's Crandall Canyon Accident Investigation team.

Some key tasks included:

- Comparing the MSHA-approved Crandall Canyon roof control plan, including the five amendments submitted between August 2006 and May 2007, against regulatory requirements and District 9's "Roof Control Group Standard Operating Procedures for Roof Control Plans."
- Reviewing and summarizing MSHA records related to Regular Safety and Health Inspections conducted at the Crandall Canyon mine during FY 2006 and FY 2007, including completion of the 6-month Roof Control Plan Evaluation (MSHA Form 2000 204).

To accomplish Objective 2, we interviewed MSHA’s Assistant Secretary, the Office of Coal Mine Safety and Health Administrator, and the Accident Investigation Program Manager at MSHA Headquarters in Arlington, Virginia. We also interviewed personnel at MSHA’s District 9 Office in Denver, Colorado, and at the District 9 Price, Utah, and Aztec, New Mexico, Field Offices. We interviewed these officials and reviewed various documents to obtain an understanding of the initial “k order” and revisions, and the rescue decision making process related to the Crandall Canyon incident of August 6, 2007.

During the audit, we made site visits to MSHA Headquarters in Arlington, Virginia; Coal’s District 9 Office in Denver, Colorado, District 9’s Price, Utah, and Delta, Colorado, Field Offices; District 6 Office in Pikeville, Kentucky; and District 4 Office in Mount Hope, West Virginia.

In planning and performing our audit, we considered MSHA’s internal controls that were relevant to our audit objectives by obtaining an understanding of those controls, and assessing control risk for the purposes of achieving our objectives. The objective of our audit was not to provide assurance on the internal controls. Therefore, we did not express an opinion on the internal controls as a whole. Our consideration of MSHA’s internal controls relevant to our audit objectives would not necessarily disclose all matters that might be reportable conditions. Because of the inherent limitations on internal controls, noncompliance may nevertheless occur and not be detected.

We conducted our audit in accordance with generally accepted government auditing standards for performance audits. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a sufficient basis for our findings and conclusions based on our audit objectives.

Criteria

We used the following criteria to perform this audit:

- Federal Mine Safety and Health Act of 1977, as amended
- Mine Improvement and New Emergency Response (MINER) Act of 2006
- General Accountability Office, Standards for Internal Control in the Federal Government, November 1999
- 30 Code of Federal Regulations Part 50, Notification, Investigation, Reports and Records of Accidents, Injuries, Illnesses, Employment, and Coal Production in Mines
- 30 Code of Federal Regulations Part 75, Mandatory Safety Standards – Underground Coal Mines
- MSHA Program Policy Manual, dated October 23, 2003
- MSHA General Coal Mine Inspections Procedures Handbook, dated January 2006

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Appendix C

Acronyms and Abbreviations

ARMPS	Analysis of Retreat Mining Pillar Stability
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
CNN	Cable News Network
Coal	Office of Coal Mine Safety and Health
CY	Calendar Year
FY	Fiscal Year
MDT	Mountain Daylight Time
Mine Act	Federal Mine Safety and Health Act of 1977
MINER Act	Mine Improvement and New Emergency Response Act of 2006
MSHA	Mine Safety and Health Administration
NIOSH	National Institute for Occupational Safety and Health
OIG	Office of Inspector General
Plan	Roof Control Plan and amendments
SOP	Standard Operating Procedure

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Appendix D

Glossary of Mining Terms

Active workings – Any place in a mine where miners are normally required to work or travel, which are ventilated and inspected regularly.

Anthracite Coal - A hard, black lustrous coal containing a high percentage of fixed carbon and a low percentage of volatile matter. Commonly referred to as hard coal, it is mined in the United States, mainly in eastern Pennsylvania.

ATRS – (Automated Temporary Roof Support) – means a mechanical device used to temporarily support the roof while roof bolts are being installed.

Barrier - Solid blocks of coal left between two mines or sections of a mine to prevent accidents due to inrushes of water, gas, or from explosions or a mine fire.

Barrier Pillars – Any large pillar entirely or relatively unbroken by roadways or airways that is left around a property to protect it against water and squeezes from adjacent property, or to protect the latter property in a similar manner.

Bituminous Coal - A middle rank coal (between subbituminous and anthracite) formed by additional pressure and heat on lignite. Usually has a high Btu value and may be referred to as "soft coal."

Bleeder entry - Special air course developed and maintained as part of the mine ventilation system and designed to continuously move air-methane mixtures away from the active workings and into mine-return air courses.

Borehole - Any deep or long drill-hole usually associated with a diamond drill.

Bottom Coal - Coal below the undercut-(To cut below or in the lower part of a coal bed by chipping away the coal with a pick or mining machine. Undercutting is usually done on the level of the floor of the mine); it may or may not be removed.

Bounce – See Bump Below

Breaker Row – timbers set to break the roof off at a prearranged line during retreat mining.

Bump, Bounce (or burst) - A violent dislocation of the mine workings which is attributed to severe stresses in the rock surrounding the workings.

Coal Strength – The stress at which coal ruptures or fails.

Convergence Conditions – Loss of height when a coal seam is extracted on a longwall face, as the roof lowers and the floor lifts. Convergence is an important factor in thin-seam mining.

Cover - The overburden of any deposit.

Crosscut - A passageway driven between the entry and its parallel air course or air courses for ventilation purposes.

Deep (Coal) Cover – Coal seams lying at a depth of 1,800 ft (549 m) or more below the surface.

Default Value – 900 psi for coal strength is used in the NIOSH developed for LA Model computer programs as the “default value” for all mining calculations.

Drift Opening – An underground coal mine opening in which the entry or access is above water level and generally on the slope of a hill, driven horizontally into a coal seam.

Development mining - Work undertaken to open up coal reserves as distinguished from the work of actual coal extraction.

Main Entryway – A term used in the United States for the principal horizontal gallery giving access to an underground mine and used for haulage, ventilation, etc.

Face - The exposed area of a coal bed from which coal is being extracted.

Feeder Breaker - The primary crushers designed to break materials against the deck and chain conveyor system. The crushed product is expected to be “conveyable”, limiting damage to the belt conveyor.

Inby - In the direction of the working face.

Longwall – A long face of coal.

Longwall face – the exposed area of a long face of coal which is being extracted.

Outburst – The name applied to the violent evolution of combustible gases (usually together with large quantities of coal dust) from a working face. The occurrence is violent and may overwhelm the workings and fill the entire district with gaseous mixtures. Roadways advancing into virgin and stressed areas of coal are particularly prone to outbursts in certain seams and faults often intersect in the area.

Outby - Nearer to the shaft, and hence farther from the working face. Toward the mine entrance. The opposite of inby.

Overburden – Layers of soil and rock covering a coal seam.

Pillar – An area of coal left to support the overlying strata in a mine; sometimes left permanently to support surface structures, sometimes systematically removed to regulate subsidence.

Pillar Design – can be done using various computer programs provided by NIOSH-see pillar definition above for additional information.

Pillar Extraction - The recovery or working away of the pillars of coal that were left during the first operation of working in the pillar-and-stall method. Also called pillar mining.

Retreat mining - A system of robbing pillars in which the robbing line, or line through the faces of the pillars being extracted, retreats from the boundary toward the shaft or mine mouth.

Rib - The side of a pillar or the wall of an entry. The solid coal on the side of any underground passage.

Rock Dusting - The dusting of underground areas with powdered limestone to dilute the coal dust in the mine atmosphere and on the mine surfaces, thereby reducing explosion hazards.

Roof - The stratum of rock or other material above a coal seam; the overhead surface of a coal working place. Same as "back" or "top."

Roof Bolts – long steel bolts driven into the roof of underground excavations to support the roof, preventing and limiting the extent of roof falls. The unit consists of the bolt (up to 4 feet long), steel plate, expansion shell, and pal nut. The use of roof bolts eliminates the need for timbering by fastening together, or "laminating," several weaker layers of roof strata to build a "beam."

Roof Control - The scientific study of the behavior of rock undermined by mining operations and the most effective measures of controlling movements and failure. The subject is comprehensive, including the systematic measurement of the movement of strata and the forces and stresses involved. An attempt is made to correlate data with rock types and the type of excavation.

Scaling – Removal of loose rock from the roof or walls. This work is dangerous and a long bar (called a scaling bar) is often used.

Section - A portion of the working area of a mine.

Separation between roof segments – The distance between any two parts of an index plane (e.g., roof, bed or vein) disrupted by a fault.

Seismic Event – Sudden failure due to stresses exceeding the strength of the rock mass or a discontinuity. The resulting emission and radiation of kinetic energy in the form of ground vibrations causes a noticeable 'shock' or tremor.

Sump Area - The bottom of a shaft, or any other place in a mine, that is used as a collecting point for drainage water.

Top Coal – coal at or near the top of the working face.

Ventilation Stopping - Permanent stoppings are utilized to control and direct the ventilation air flow through underground coal mines to dilute and render harmless methane, entrained coal dust, and other contaminants at the working face and other areas of the mine. The Ventilation controls section (§ 75.333) of Title 30 Code of Federal Regulations (30CFR) requires that permanent stoppings be built and maintained between intake and return air courses beginning at the third connecting crosscut outby the working face, and separate other air courses and direct air as specified.

Voids - A general term for pore spaces or other reopenings in rock. In addition to pore spaces, the term includes vesicles, solution cavities, or any openings either primary or secondary.

Withdrawal Order – In most serious accident situations, MSHA issues a withdrawal order under provisions of Section 103(k) of the Mine Act ("k order"). The k order allows the operator to maintain control of a mine's assets and operations, and develop and execute rescue or recovery plans that MSHA approves. Only items considered to be critical with specific degrees of risk should be incorporated. The District Manager or senior MSHA official on-site and a mine operator representative generally sign and date the plan approval.

Agency Response to Draft Report

U.S. Department of Labor

Mine Safety and Health Administration
1100 Wilson Boulevard
Arlington, Virginia 22209-3939



MAR 26 2009

MEMORANDUM FOR ELLIOT P. LEWIS

Assistant Inspector General
for Audit

FROM:

RICHARD E. STICKLER
Acting Assistant Secretary for
Mine Safety and Health

SUBJECT:

Response to Draft Report
No. 05-08-003-06-001
"MSHA Could Not Show It Made the Right Decision in
Approving the Roof Control Plan at Crandall Canyon Mine"

Thank you for the opportunity to review and comment on your Draft Audit Report, *MSHA Could Not Show It Made the Right Decision in Approving the Roof Control Plan at Crandall Canyon Mine*. The report "was not designed to and does not make any ... determinations" regarding the cause of the tragedy at Crandall Canyon, "including what role, if any, the roof control plan might have played." (Report pg. 2). Rather, the report examines the Mine Safety and Health Administration's (MSHA) process for approving roof control plans and makes several useful recommendations for improving this process.

Because MSHA's Accident Investigation is still ongoing, I will not comment in detail on the report's factual conclusions at this time. However, MSHA appreciates and concurs with the report's recommendations -- several of which MSHA was in the process of implementing at the time it received your report. Please find attached a response detailing how MSHA will respond to each recommendation, thereby further enhancing the safety of our nation's miners.

MSHA can - and will - make changes to its standard operating procedures to improve its effectiveness, but it is misleading to the public to characterize the Agency's performance as "negligent" based on the evidentiary record cited in the report.

I am also concerned about the report's implication, unsupported by evidence, that MSHA may have been subject to "undue influence." We were glad to read that the OIG could not conclude "whether the mine operator had received preferential treatment in these decisions."

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However, despite this statement, the report then improperly places on the agency the nearly impossible burden to prove a negative, charging that “MSHA could not show that ... the process was free from undue influence by the mine operator.” (Report pg. 1) Indeed, while the report fairly concludes that there was inadequate documentation of the Crandall Canyon roof control plan approval process, the lack of documentation does not by itself prove that MSHA was unduly influenced. The only items the report cites as potential indications of undue influence are a Murray Energy memorandum showing that they requested that MSHA expedite its review of the roof control plan for the North Barrier, and Murray Energy e-mails indicating that they needed an expedited review of the roof control plan for the South Barrier. Not only are these communications not evidence of undue influence, but the report does not recognize several important countervailing facts MSHA provided to OIG auditors.

For example, the report fails to note that the District Manager told OIG auditors that, when justified, he prioritized the sequence of plan reviews, rather than allowing unnecessary delays by the agency to force mines to shut down and put miners out of work. The report also does not note that by the time Murray Energy requested expedited review of the roof control plan for the North Barrier, the plan had already been cleared by MSHA for signature by the District Manager, rendering it highly unlikely that Murray Energy’s request could have influenced the approval process.

In the end, the report specifically acknowledges that the OIG was unable to conclude whether MSHA gave preferential treatment to the mine operator in MSHA’s plan review process. Thus, the overall heading could more appropriately have stated that “there is no evidence that the mine operator unduly influenced MSHA’s plan approval process.” (Report pg. 17)

I am also concerned about the report’s conclusion that MSHA was “negligent” in carrying out its responsibility to protect the safety of miners. The report points to several shortcomings in MSHA’s documentation of its roof control approval process – shortcomings the agency has committed to address – and in certain cases identifies missed opportunities to proactively enhance safety protections, but the report does not provide evidence that MSHA negligently breached its duty to protect miners through its administration of the Mine Act.

For example, although the report finds that there were four sources of potentially relevant information the agency failed to consider in the roof control plan approval process at Crandall Canyon, it overlooks several important facts that were made known to your auditors:

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- (1) The report faults MSHA for failing to solicit “input from mine inspectors” before approving the roof control plan – yet the report does not recognize the fact that the local inspector and roof control specialist traveled with the Roof Control Supervisor in an underground inspection of the mine before the plan was approved;
- (2) The report faults MSHA for failing to seek “assistance from MSHA’s Technical Support Directorate” – yet the report does not mention that the Roof Control Specialist who reviewed the plan was a professional engineer with years of experience as Chief of MSHA’s former Technical Support Center in Denver;
- (3) The report faults MSHA for failing to consider the “history of seismic activity” at Crandall Canyon – yet the report does not recognize the fact that experts at NIOSH and the University of Utah have stated their agreement with the District Manager that historical information of seismic activity has little predictive value with respect to future activity;
- (4) The report faults MSHA for failing to consider “Bureau of Land Management inspection results” - yet the report makes no mention of the fact that none of MSHA’s criteria for approving a roof control plan included consultation with the Bureau of Land Management.

As mentioned above, there is still an ongoing MSHA accident investigation, as well as an independent internal review of the August 6 and 16, 2007 accidents at the Crandall Canyon Mine. In the meantime we will continue to aggressively implement important improvements that we had identified prior to your report, along with the OIG’s additional recommendations. It is my sincere hope that your work, and that of the accident and independent review teams, will enable us to continue to improve the health and safety of our nation’s miners.

If you have any questions, please contact Ken Bullock at 202-693-9778.

Thank you for your consideration.

Attachment

**MSHA RESPONSE TO INSPECTOR GENERAL’S RECOMMENDATIONS
ON CRANDALL CANYON MINE**

The following are the corrective measures that the Mine Safety and Health Administration (MSHA) will implement to address the recommendations contained in the Office of Inspector General’s (OIG) Report.

OIG Recommendation No. 1: Develop a rigorous, standard, and transparent process delineating required tasks and analyses to be completed, and information to be considered, by District Offices in evaluating and approving proposed roof control plans.

MSHA Response: MSHA concurs with this recommendation, and MSHA will initiate five corrective actions. First, MSHA will develop a standard, detailed, and comprehensive national checklist for all roof control plan approvals. To establish uniformity and consistency, all districts will utilize the checklist when reviewing roof control plans. Since systems of mining, mining methods, and mine conditions vary regionally and even within districts, some of the checklist items may not be applicable in all cases. However, checklist items found not to be applicable during the MSHA review process can be marked N/A.

Next, the national roof control plan approval process will be standardized to ensure consistent reviews. The process will include facets such as the plan approval process in general, a roof control plan checklist, a general safety precautions checklist, a retreat mining checklist, and a mobile roof support checklist.

Third, a memorandum of instruction from the Administrator for Coal Mine Safety and Health (CMS&H) will be prepared and sent to all district managers indicating that mine operators will be required to submit all input data and/or information, used by them or consultants, to determine that a roof control plan submittal is adequate.

Fourth, to assure technical quality and integrity of the plans, MSHA will issue guidance regarding what type of roof control or ground support plans must be sent to MSHA’s Technical Support Roof Control Division for peer review and concurrence.

Finally, MSHA will finalize and issue a Program Information Bulletin (PIB) on retreat mining software, which was already under development prior to OIG’s report. The PIB will provide guidance on the proper use of the National Institute for Occupational Safety and Health’s (NIOSH) Analysis of Retreat Mining Pillar Stability (ARMPS) program and alert the industry of the availability of the latest

version of the program. Although ARMPS is just one modeling program that can be used for mine design, it is the most widely used, relatively easy to use and can give a “first approximation” of pillar stability. ARMPS minimum pillar stability factors are provided in the PIB.

MSHA expects to implement all of these corrective actions within 60 days of the issuance of the OIG report.

OIG Recommendation No.2: Establish a policy requiring risk assessments specific to the particular mining operation prior to plan approval (e.g., seismic activity, history of the mine, depth of mine, coal strength, stability factors of pillars, etc.).

MSHA Response: MSHA concurs with the goal of this recommendation, but believes the OIG’s examples of risk factors may be incomplete or not applicable in every situation. MSHA will prepare a letter from the Administrator for CMS&H to mine operators requesting detailed and comprehensive information to include: review and submittal of technical and engineering data, listing of potential or known hazards, and other factors requested by the district manager for non-typical roof control plans or amendments. Mine operators will be required to address how the proposed plan(s) will address the identified and potential mining hazards when providing the submittal information to MSHA.

As indicated in the response to Recommendation No. 1, MSHA is developing a PIB to provide guidance on the proper use of NIOSH’s Analysis of Retreat Mining Pillar Stability (ARMPS) program and to alert the industry of the availability of the latest version of the program. Although ARMPS is just one modeling program that can be used for mine design, it is the most widely used, and can give a “first approximation” of pillar stability. ARMPS minimum pillar stability factors are provided in the PIB.

MSHA expects to implement the above corrective actions within 60 days of the issuance of the OIG report.

A second PIB addressing general guidelines for the use of numerical modeling will also be developed. This PIB will provide guidance on items such as the type of information that should be provided in any submittal to MSHA that is used in support of a roof plan approval.

MSHA expects to implement the above corrective action within 120 days of the issuance of the OIG report. Additional time is needed for this corrective action because of the complexity of the numerical modeling needed to develop this PIB.

In addition, West Virginia University (WVU) has an ongoing project to develop guidelines for the use of the LAMODEL computer program. Once those guidelines have been established, a PIB specifically addressing the use of LAMODEL will be issued within 60 days.

OIG Recommendation No. 3: Establish explicit criteria and guidance for assessing the quality of, and potential safety risk associated with, proposed plans.

MSHA Response: MSHA concurs with this recommendation and has already been working on providing more explicit criteria and guidance.

MSHA Technical Support's Roof Control Division, in collaboration with NIOSH, published a pillar recovery risk factor checklist in a December 2005 technical paper. This checklist includes key risk factors such as production pillar design, barrier pillar design, final pillar stump design, mobile roof supports, supplemental roof support, geologic hazards, equipment operator locations, intersection spans, multiple seam interaction, depth of cover, age of mine workings, and type of coal haulage system. MSHA will use this checklist to develop the criteria for identifying potential problems in specific retreat mining plans.

MSHA expects to implement the above corrective action within 180 days of the issuance of the OIG report. Additional time is needed because of the complexity of developing the criteria and guidance and it is anticipated that some of the findings and recommendations of the Crandall Canyon accident investigation report will be incorporated into the criteria and guidance. Also, since the original pillar recovery checklist was jointly developed with NIOSH, their input and concurrence will also need to be sought.

MSHA will also send a letter from the Administrator for CMS&H to coal mine operators requesting detailed and comprehensive information to include: review and submittal of technical and engineering data, potential hazards and other factors requested by the district manager for non typical roof control plans or amendments. This memorandum will be responsive to both OIG Recommendation Nos. 2 and 3.

MSHA expects to implement the above corrective action within 60 days of the issuance of the OIG report.

OIG Recommendation No. 4: Issue policy and guidance on the use of computer models, including appropriateness of input values and use of model results.

MSHA Response: MSHA concurs with this recommendation. MSHA provided training for 60 of its employees in November and December 2007 on NIOSH and *Rocscience Phase²* software was purchased and installed in both CMS&H and Metal Nonmetal districts, as well as in MSHA headquarters, and the Triadelphia and Pittsburgh Office of Technical Support centers. The *Rocscience Examine^{3d}* software was purchased and installed in the Triadelphia and Pittsburgh Office of Technical Support centers. The NIOSH Analysis of Retreat Mining Pillar Stability (ARMPS) and their Analysis of Longwall Pillar Stability (ALPS) were also made available for use by the districts, from the NIOSH website. NIOSH and WVU also provided training for all attendees on ARMPS, ALPS, and LAMODEL.

MSHA Technical Support is developing and will issue agency policy and guidance for the use of computer models such as Analysis of Retreat Mining Pillar Stability (ARMPS) and LAMODEL. The guidance will stress and emphasize the importance and appropriateness of modeling, input values, and use of model results to enhance roof and ground control plans, thereby providing a higher level of safety and predictive significance.

MSHA expects to implement these corrective actions for policy guidance on the use of ARMPS within 60 days of the issuance of the OIG report. Policy guidance on the use of LAMODEL will be issued by MSHA within 60 days after WVU's LAMODEL guidelines have been established.

OIG Recommendation No. 5: Issue policy mandating active oversight by District Managers by requiring documentation of how they reached their conclusions that approved plans will provide effective roof control.

MSHA Response: MSHA concurs with this recommendation. The Administrator for CMS&H will prepare a memorandum to the district managers requiring documentation be kept in the roof control review files explaining the rationale behind the approval of plans. The documentation will include a completed checklist showing a full plan review with signatures and comments of those participating in the reviews.

MSHA expects to implement this corrective action within 60 days of the issuance of the OIG report.

OIG Recommendation No. 6: Require inspectors to document the work they perform in (a) effectively questioning miners on mining activities and conditions in the mine, and their basis for concluding on (b) the continued adequacy of roof control plans and (c) the completion and adequacy of miner training on such plans.

MSHA Response: MSHA concurs with this recommendation and already has policies requiring such documentation. MSHA inspectors are required to document inspection activities through the MSHA Inspection Tracking System (ITS), and as required by the *General Coal Mine Inspection & Inspection Tracking System Handbook*. Inspectors record areas of the mine inspected on a checklist as well as mining activities and mine conditions. When violations are identified, inspectors further record information in their notes, detailing the activities, conditions, or practices giving rise to violations. Samples of inspector tests for the quality of mine atmospheres and air quantity readings are also recorded. All CMS&H enforcement personnel are trained on usage of the ITS and note-taking.

The adequacy of roof control plans, including their continued suitability and applicability to in-mine conditions and mining methods is specifically addressed by MSHA's use of Form 2000-204, where inspectors record their evaluations of the roof control plans and identify current conditions that would warrant attention or action by MSHA relative to plan efficacy. MSHA believes proper use of Form 2000-204 assures the adequacy of plan review and efficacy.

The completion and adequacy of miner training for plans is addressed on Page 44, Item 10 of the *General Coal Mine Inspection & Inspection Tracking System Handbook*. Item 10, "Mining/Work Cycle," reads, "The inspector shall observe the complete mining cycle on each active producing working section. The physical condition of the working section (roof and rib conditions, cleanup/rock dusting, ventilation controls, approved plan compliance, etc.) shall be carefully evaluated during these inspection activities." It should be noted that observation of the work cycle includes reviewing the applicable mining plans for suitability and compliance.

Requirements for documentation from the *General Coal Mine Inspection & Inspection Tracking System Handbook* state, in part:

Documentation Required: *Inspector observation of the complete mining/work cycle shall be documented in the hard-copy inspection notes to show the mechanized mining unit number (MMU), the method of mining (continuous mining advance, continuous mining retreat, conventional mining advance, blasting from the solid advance, etc.) the date observation of the mining/work cycle was started, and the date this procedure was fully completed for that MMU.*

A short statement such as “No Violations Observed” or “NVO” shall be included when no hazards or violations are observed. Additionally, observation of complete mining cycle shall be documented in the Inspection Tracking System MMU Log to show the MMU number, the date started and the date fully completed. No other documentation is required unless a violation is observed.

To reinforce these requirements and address OIG recommendations, the Administrator for CMS&H will issue a memorandum to the district managers and enforcement personnel reiterating the importance of discussing with and questioning miners on mining activities and conditions in the mine, the basis for plan protections, the continued adequacy of roof control plans, and the completion and adequacy of miner training on such plans. The memorandum will reiterate that roof control plans are to be reviewed on a six month basis and that the necessary documentation must accompany such evaluations. The memorandum will further require that retreat mining sections must be visited at least monthly by a roof control specialist. Finally, the memorandum will instruct districts to request assistance from MSHA’s Educational Field Services (EFS) to evaluate training on retreat mining plans.

MSHA expects to issue this memorandum to address the OIG recommendation within 60 days of the issuance of the OIG report.

OIG Recommendation No. 7: Issue policy establishing the conditions under which non-rescue activities and non-rescue personnel would be allowed on site during active rescue operations.

MSHA Response: MSHA concurs with this recommendation. The Administrator for CMS&H will issue a memorandum to all district managers regarding rescue and non-rescue personnel. In accordance with the memorandum, district managers will ensure that only appropriate parties are granted access to the mine site and surface areas. The memorandum will address affected rescue personnel, non-rescue personnel, and non-rescue activities on mine sites during mine emergency and rescue operations, as well as security during mine emergency operations, cooperation with local emergency services, and access to surface and underground areas of the mine. The instructions of the memorandum will be designed to ensure safe, timely, and effective rescue and recovery operations.

MSHA expects to implement this corrective action within 60 days of the issuance of the OIG report.

OIG Recommendation No.8: Establish a Memorandum of Understanding with the Bureau of Land Management to share inspection or other information on mine conditions affecting safety.

MSHA Response: MSHA concurs with this recommendation and has been working with the Bureau of Land Management (BLM) on sharing information since last fall. The parties are currently developing a formal Memorandum of Understanding (MOU).

Following the tragedy at Crandall Canyon, MSHA became fully aware of the potential value in obtaining information from BLM inspectors as to serious safety hazards they may have observed in the course of inspections in underground coal mines.

The Department of Labor (DOL) and the Department of Interior opened a dialogue on the topic of information sharing between the two agencies in October 2007. The Acting Assistant Secretary for Mine Safety and Health has met with the Assistant Secretary for Land and Minerals Management at the Department of Interior and discussed a potential agreement between the two agencies that would allow MSHA to obtain BLM inspection data and other information on mine conditions affecting safety. A draft MOU document has been developed and discussions to finalize the agreement are ongoing and should conclude shortly.

Additionally, in Denver, Colorado, MSHA and BLM personnel familiar with Western mining conditions held an extensive meeting in which they explored the practicalities of potential information sharing. Continued dialogue and exchange of mine condition information with the MSHA District 9 Office in Denver and the local BLM office will be an important aspect for assurance of MSHA's full knowledge of mine conditions in the Western regions.

MSHA expects to finalize the MOU within 60 days of the issuance of the OIG report.

OIG Recommendation No. 9: Conduct a new review, consistent with the recommendations in this report, of all existing roof control plans.

MSHA Response: MSHA concurs with this recommendation. MSHA currently reviews roof control plans twice annually for each underground coal mine, and as stated in the above response to OIG Recommendation No. 1, is developing a standard, detailed, and comprehensive national checklist for all roof control plan

approvals. To establish uniformity and consistency, all districts will be required to utilize the new checklist when reviewing roof control plans.

The collective bargaining agreement between MSHA and the National Council of Field Labor Locals (NCFL), which is the recognized bargaining unit for MSHA's mine inspectors, requires the consent of the NCFL prior to MSHA's implementation of new forms like the checklist. After agreement is reached with the NCFL, CMS&H will immediately require that the approved checklist be used by inspectors during the very next review of roof control plans for each mine.

MSHA expects to implement the checklist and hopes to have the concurrence of the NCFL within 60 days of the issuance of the OIG report.

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