Commonwealth of Pennsylvania
Department of Environmental Protection
Bureau of Deep Mine Safety

Quecreek Mine Inundation
July 24, 2002

Status Report / Action Plan

Enclosed is a synopsis outlining the central issues that arose during the aftermath of the Quecreek Mine inundation and rescue. Each issue is coupled with a description of the Department of Environmental Protection's planned action and, where appropriate, an estimation of implementation costs.

Date: July 22, 2003

In the year since the Quecreek Mine inundation and rescue, the Commonwealth has initiated and completed three investigative inquires into the events surrounding the accident. The *Commission on Abandoned Mine Voids and Mine Safety* (Commission), which was established by Executive Order, conducted public hearings and took testimony from the mining industry, academia, state and federal mine safety agencies, and mine workers regarding current procedures and best available technologies for detecting abandoned mine voids. The Commission's charter was to provide recommendations to improve mining practices and mine safety for underground mines operating adjacent to abandoned mine voids. Its final report, issued November 15, 2002, contained 48 recommendations covering wide-ranging issues including: remote detection of mine voids, mine worker training, design and layout of mines, state and federal regulatory procedures, inspection of underground mines, and mine rescue and response procedures.

More recently, the Department of Environmental Protection's (DEP) Bureau of Deep Mine Safety completed its investigation of the Quecreek incident. Deep Mine Safety's report of findings, released July 22, 2003, documents the causes of the accident, presents timelines of the accident and rescue, concludes whether any state laws were violated, and provides 25 recommendations for implementing changes to underground mine inspection and permitting practices based on the lessons learned at Quecreek.

These two investigations provided over 70 specific recommendations for improvement. These recommendations have been categorized into seven broad issues and summarized on the attached tables. Each issue is coupled with a listing of related DEP initiatives. These initiatives represent a combination of current and new or expanded procedures designed to address each issue. Many of the initiatives flow directly from recommendations enumerated in the aforementioned investigative reports. When possible, the estimated cost associated with the initiatives has been included.

DEP will also benefit from the findings contained in a recent report authored by the Commonwealth's Office of Inspector General (OIG). Following Quecreek, the OIG conducted an inquiry into the internal workings of DEP's underground mine permit review process. The OIG's report, released July 22, 2003, contains numerous constructive, and sometimes critical, findings relating to procedures and policies that were in-place at the time of the accident. DEP embraces the findings of the OIG and views the release of the findings as an opportunity to eliminate any confusion which may have impacted the efficiency of DEP's mine map review process.

Historical changes in the interpretation and the implementation of Section 236 caused confusion regarding its application to adjacent abandoned mines. A clear and unambiguous interpretation will be developed, with public input, to establish whether Section 236, *52 P.S. Section 701-236*, applies to all active and abandoned underground mines, or only applies to active underground mines. Additionally, DEP has modified chain-of-command duties to require that the Director of Deep Mine Safety and the Deputy Secretary for Mineral Resources Management play more direct roles in day-to-day mine safety decision-making.

Taken together, these initiatives represent a comprehensive action plan formulated to drive the changes needed to ensure that the Quecreek accident is not repeated and that Pennsylvania remains the leader in mine safety.

1. Modernize mine safety laws.	
Issue	**Actions (Planned and/or Taken)**
Pennsylvania's mine safety laws are antiquated and unnecessarily scattered among separate statutes. The laws require updating to provide optimal protection for mine workers by keeping pace with emerging technologies, allow the promulgation of regulations to facilitate programmatic upgrades, and ensure that mine operators are primarily responsible for mine-site compliance.	DEP is currently working with the legislature to draft legislation that will: o Amend Pennsylvania's mine safety statutes to allow DEP to: promulgate regulations that allow programmatic upgrades to keep pace with technology; consolidate mine safety requirements for anthracite and bituminous mines into a single statute; and shift responsibility for compliance to the mine operator. o Establish an ongoing budget item to fund the costs of emergency medical personnel providing services at mine emergencies. (Cost: Estimated cost $50,000-$75,000 per year to maintain readiness; $100,000-$200,000 per emergency) o Allow DEP to take enforcement action against mine operators for violations of mine safety standards. o Use violation histories in granting new or revised deep mine permits. o Ensure that final certified surveyed maps of underground mines abandoned by bankrupt entities are prepared and filed with DEP. o Allow DEP to assess monetary penalties for violations of the Act. o Grant DEP statewide authority to copy all mine maps.

2. Revise mine permitting and inspection procedures.	
Issue	**Actions (Planned and/or Taken)**
In light of the Quecreek Mine inundation, more rigorous and coordinated permit review and mine inspection procedures are needed to ensure underground mine permits contain appropriate information regarding the location and extent of abandoned mine voids.	A draft Technical Guidance Document, which establishes the method to be used when assembling, presenting and evaluating information regarding abandoned mines, has been developed for public comment. The guidance document: o Details interaction and communication procedures within DEP and between DEP and the mine operator to ensure verification and validation of the mine maps o Charges the Bureau of Deep Mine Safety (BDMS) with the responsibility of reviewing all safety aspects of a permit for a new mine or the expansion of an existing mine. If credible evidence of adjacent abandoned mine workings is not provided, then BDMS will specify both the appropriate barrier distance and the operational measures needed to maintain the barrier. (Cost: 2 FTEs per year (Mining Engineer 2) for $150,000) o Includes the federal Mine Safety and Health Administration (MSHA) as a notified agency during the permit application process. o Establishes procedures for reducing mine barriers, including solicitation of comments from the mining industry, the United Mine Workers of America, and all other stakeholders. o Establishes mine map survey standards. o Establishes guidelines for assessing credibility of location evidence including requiring mine permit applicants to provide the source of information used to locate old mines. o Establishes inspection procedures to verify the final depth of penetration of each mine section. o Addresses visual examinations, drilling processes and the application of geophysical methods, where practical, to verify the existence of abandoned mine voids, particularly where the credibility of the maps is in question. o Establishes Mine Inspector responsibilities regarding determinations as to the location of active mine workings. o Connects submittal and approval of final mine map to the mine site's bond release. o Seeks input on whether Section 236 should apply to all active and abandoned underground mines, or should only apply to active underground mines. BDMS has issued policy directives to its staff addressing the transfer of all documents to the appropriate BDMS District Office at the closure of a mine and upon the mine inspector's separation of service.

3. Elevate perception of potential hazards.	
Issue	**Actions (Planned and/or Taken)**
The recognition of hazard potential and the systematic communication of information related to hazard potential are essential steps that can lead to mine design improvements, thereby offering increased protection for mine workers.	The following inspection and training initiatives are currently in-place or are being developed: o Conduct training to address site-specific situations that occur during the operational life of the mine, such as the presence of low, flood-prone areas along escape ways that may hamper mine evacuation in inundation emergencies. o Develop and implement a protocol for hazard-specific inspections of mines advancing towards abandoned underground mine workings, including; a) procedures when mining near abandoned mine voids, b) ensuring that mine inspectors understand the limits of mine maps, and c) verifying and documenting that approved plans for locating old works are implemented properly. o Address training (mine examiners and inspectors) specific to changes in water conditions in the mine, including flow, color, and odor of water, and roof and floor conditions during an advance towards abandoned mine workings. o Encourage open and regular communication between DEP, MSHA, mine management and labor. o Develop and implement a training module for dealing with mine inundation with mandatory application in "high risk" mines. (Cost: .5 FTE at $30,000 per year) o Develop a continuing education module for mining professionals, mine managers, and mine inspectors. (Cost: .5 FTE at $30,000 per year) o Incorporate the lessons learned from the Quecreek Mine accident in training protocol for BDMS staff and mine workers. o Ensure that mine maps posted at the mine site for use by inspectors, miners, and others contain a legend and other features needed to fully understand the map.

4. Conduct and support mine safety research and promote the use of innovative technologies.	
Issue	**Actions (Planned and/or Taken)**
Mine safety and mine void detection research must be conducted, promoted and adequately funded to ensure that Pennsylvania's miners and its mine industry benefit from the latest innovations in mine design and the most modern developments in operational safety.	DEP will partner with federal mine safety research agencies to: o Conduct a study to evaluate the utility of mitigation measures to address situations that occur during the operational life of the mine that may hamper mine evacuation in inundation emergencies. (Cost: Estimate $50,000-$100,000) o Develop communication systems to withstand variable conditions within the mine, including those realized during mine flooding. o Research and develop various geophysical methods and techniques for mining-specific applications to enable these techniques to be applied separately or in conjunction with drilling, to assist in locating and delineating mine voids. (Cost: Possible funding from $10 million in MSHA funding) o Conduct geophysical tests under approved protocols to assess applicability of various geophysical tools for mine void detection. (Cost: Possible funding from $10 million in MSHA funding) o Develop alternatives to the 20-foot test hole procedures required under section 224(b) to protect miners conducting drilling. (Cost: Undetermined. Research in robotics ongoing at various institutions) DEP will be conducting in-house research regarding utilization of water chemistry as a diagnostic tool for alerting mine operators of nearby flooded workings. DEP is also researching possible sources of funds for verification and validation of abandoned mine maps.

5. Create a systematic, state-wide approach for locating, collecting, archiving and preserving mine maps	
Issue	**Actions (Planned and/or Taken)**
Historical and existing processes for collecting, storing, archiving, cataloging, and preserving mine maps suffer from shortcomings including: lack of inventories, inaccessibility, lack of a centralization, and inadequate and/or disjointed digitizing and georeferencing initiatives.	DEP will: o Find, identify and catalog the "Final Maps" submitted to the Department since 1911. o Develop databases from production information of mines, which has been collected and recorded since the 1870s. o Correlate production data with mine maps in the repositories to provide a more complete picture of the coverage of the collections. o Undertake a public advertising campaign to solicit the assistance of the public to locate and copy maps of abandoned mines throughout the state. DEP and the Pennsylvania Historical and Museum Commission (PHMC) are partnering to: * o Implement a preservation program including: archival and photographic storage, electronic recording of original mine maps and georeferencing of electronic maps. o Establish one central map repository database of mine maps and develop procedures to inventory, digitize, catalog, and preserve known existing paper mine maps and coal production reports. The Department is working with the PHMC to determine the costs associated with a centralized mine map repository. The costs of finding, cataloging, and digitizing mine maps have been estimated to be $3,500,000 per 10,000 maps processed. (* Mine map workshops have been scheduled for Greensburg and Pottsville in August and September respectively.)

6. Assist mining industry in meeting new requirements.	
Issue	**Actions Planned and/or Taken**
It is recognized that the ability of small mine operators to fund the additional research needed for compilation of verification and validation information is limited	o DEP will be exploring possible assistance from various sources, including the Federal Abandoned Mine Land fund, and will examine setting up a program to assist small mine operators in funding mine map validation and verification research that will be required to support an application for underground mine activities. (Costs: undetermined at this time)

7. Use Quecreek rescue as a building block for future mine emergency rescue/response procedures.	
Issue	**Actions (Planned and/or Taken)**
Apply the lessons learned at the successful Quecreek Mine rescue to future mine emergencies.	The following actions are being implemented by BDMS to make sure that the lessons learned at Quecreek are fully incorporated into DEP's mine safety training and response/rescue protocols: o Stress the value of "Command Center" training and make the "emergency communication triangle" training module widely available o Adopt the Incident Management System (IMS) as Pennsylvania's statewide standard for mine emergency response and work with MSHA to integrate the "Command Center" system into IMS. o Adopt standards of family communication, care and support initiated by the airline industry and American Red Cross, as Pennsylvania's standards for mine emergencies. o Conduct tabletop and functional exercises of mine emergency responses using IMS as the structure, and evaluate these exercises to improve plans and responses. o Provide training to key individuals outside the mining community on mine emergency response and rescue techniques. Conversely, train key individuals in the mining industry in the procedures of other agencies that may become engaged during a mine emergency. o Maintain the emergency response contact list of personnel and supplies developed following Quecreek and utilize it as a resource for all future mine emergencies. o Actively work to remedy the shortage of mine rescue teams, personnel and equipment in the Commonwealth. (Cost to replace 48 outdated Self Contained Breathing Apparatus units @ $450,000 with annual maintenance costs of $25,000.) o Training procedures for BDMS staff and mine workers will incorporate the lessons learned from the Quecreek No. 1 Mine accident.