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MSHA/OSRV

From: Geoff Wade [gwade@esri.com]
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To: zzMSHA-Standards - Comments to Fed Reg Group
Subject: RIN 1219-AB44 MSHA Underground Mine Rescue Equipment and Technology

Mr. Robert Stone
Acting Director
Office of Standards, Regulations and Variances
1100 Wilson Blvd., Room 2350
Arlington, VA 22209-3939

Ref: **Underground Mine Rescue Equipment and Technology - Request for Information, RIN 1219-AB44, 30 CFR Part 49**

Dear Mr. Stone

Further to the posted Request for Comment (RIN 1219-AB44) regarding new developments and promising technologies in the area of Underground Mine Rescue Equipment and Technology; ESRI respectfully suggests that many of the issues introduced in the RFI, and discussed subsequently at the Public Meeting (March 13th) and in submitted comments (http://www.msha.gov/currentcomments.asp) are inherently 'spatial or geographic' in character.

Geographic Information Systems (GIS) is a well established technology that allows for the integration of spatial 'map layers' and digital processing upon them. Many large mining companies have been using the technology for several years, to improve spatial decision making, reduce operational deficiencies, and improve communication across their corporations.

In respect of the issued RFI on Underground Mine Rescue Safety we believe GIS could significantly positively contribute in a number of ways, such as:

- GIS could be made part of a Common Operating Picture (COP) at a regional coordination center, as it has been in many other industries.
- Logistics of rescue operations mobilization, equipment needs, crew and operations plans, and onsite briefings could be enhanced.
- Registration of consistent quality digital mine plans for use by emergency responders would add significantly to operational efficiency.
- Mine models created from the digital map data would help support integrated situation handling and streamline communications exchange.
- Preparedness measures eg citing of safety chambers and breathing apparatus could be optimized.
- Communications network planning to/from mine workers underground can be researched, planned, maintained and communicated.
- Tracking of miners and equipment in real time within the mine model at an operations center by trained rescue personnel is possible.
- Robotics surveillance and the navigation of autonomous vehicles is becoming possible against a detailed mine plan.

The RFI requested comment in regard to the specific issues identified, we respectfully submit the following observations and recommendations then for the possible uses of Geographic Information Systems (GIS)

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technology:

A Rapid Deployment Systems: Whatever rapid deployment systems are identified by your study to be of use, it would appear likely that the larger pieces of specialist equipment, such as specialized pumps, drill rigs and the trained personnel to operate them would be regionally deployed within striking distance of a possible incident and under the control of a coordination center. GIS technology is specifically designed to optimize the logistics considerations of such positional staging, in its ability to run iterative model scenarios for the mobilization of all required field crews and their equipment. GIS has been used in such a capacity in many such situations eg 9/11, SE Asia Tsunami, Hurricanes, USFS wildfire response, etc.

B/C. Breathing Apparatus: The staging of breathing apparatus (including SCSR) in caches, possibly co-located with a safety chamber within a mine complex is also, to a degree, a spatial problem. Where to locate the cache (and/or safety chamber) could in part be determined by the geographic layout of the mine, travel time considerations, optimized and redundant routing, etc. A digital copy of the mine plan loaded into a GIS could help determine optimal cache and safety zone locations based on various model scenarios.

D. Rescue Chambers: It appears, from the RFI, that MSHA is already thinking of the positioning and characteristics of safety chambers partly as a spatial issue. GIS could help answer some of your posed questions on their location and sizing, based on individual mine plan configuration, travel time and staging options, possible rescue scenarios, etc.

E. Communications: GIS is in itself not a communications technology (in the manner of a radio), although a simple map remains the most extensively used foundation stone for developing a 'common operating picture' (COP) in both everyday and emergency situations in a multitude of industries. A map is able to convey a mass of complex spatial information in a simple and straightforward manner that we are accustomed to consuming, and has thus remained the 'system of choice' for streamlining communications between the 'situation room' and 'first responders' on the ground.

Modern GIS technologies now allow mine plans to be captured digitally from paper or CAD drawings, in whatever their original coordinate systems, and brought up-to the required geographic quality standard for making them the vital backdrop for emergency situations response. Extensive work has been done in recent national emergency situations that have leveraged GIS functionality, from coordinating personnel and logistics supply to the rescue site, caching of rescue supplies, detailed rescue mobilization, live tracking of rescue personnel using active RFID sensors and other technologies, etc.

We suggest that the availability of a digital mine map maintained by the mine operator to a defined standard, could contribute significantly to improving communications both in everyday and emergency situations.

F/G. Robotics/Thermal Imagers: Readouts from robotics sensors could be positioned with accuracy on a digital mine map or within a 3D model, given the continued working or a communications system as has been discussed extensively in this forum. The registration of these rich data sources with a map can help convey live information to situations personnel in context when they are dealing with complex multi-threaded information feeds. The map itself can is also be used to form the blueprint memory for navigation robots sent into harmful environments.

H/I. Developing Mine Rescue Equipment and Teams: There has been much reference to the possible use of active RFID tags in underground situations. Such systems are operational of course as many responders have testified, their output in terms of a location is commonly registered to a digital mine map/model, for everyday operational knowledge, improved logistics management, and a host of safety considerations. In emergency situations the availability of up-to date mine maps, including the last known position of all available equipment, caches, safety chambers, miners, vents, electrical systems, etc. would be an invaluable aid to the responding teams.

J. Government Role: We believe that the availability of an up-to date mine map, maintained by the operator to a high auditable standard, and shared with some coordinating authority for regional rescue operations coordination, could significantly assist in the reduction of accidents and efficient response should the worst happen. Establishing a standard for such maps, developing a reporting procedure, record keeping and coordination/communications procedure for such plans to the mobile rescue teams should be a joint effort by the community of operators and appropriate regulatory authorities. The use of such technology could be built into the training of rescue personnel by leveraging existing policies and practices of many Federal and State authorities with similar mandates such as FEMA, USFS and Coast Guard.

Disclosure of Interest Statement – About ESRI.
Since 1969, ESRI has been giving customers around the world the power to think and plan geographically. The market leader in GIS, ESRI software is used in more than 300,000 organizations worldwide, including each of the 200 largest cities in the United States, most national governments, more than two-thirds of Fortune 500 companies, and more than 5,000 colleges and universities. ESRI applications are running in many of the worlds leading mining companies, for all manner of applications and are progressively being integrated with other important information systems, for more information please see www.esri.com.

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