Standing Up the U.S. Department of Energy’s Defense-Related Uranium Mines Program

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8.1 LM Uranium Mine Programs
Presentation Overview

• Establishment of the DRUM Program
• Program Accomplishments-to-Date
• Standing up the DRUM Program
  ▪ Collection of Historical Data
  ▪ DRUM Program Documents
  ▪ Establishing Risk Standards
  ▪ Developing the DRUM Database
  ▪ Challenges of Ramping Up
• Lessons Learned

Geologist locating an adit at a small mine on federal public land in the Yellow Cat District, Utah
History of the DOE DRUM Program: 
Report to Congress

- DOE prepared an August 2014 Report for Congress on 4,225 DRUM (mines) that produced uranium ore for defense-related purposes of the United States
  - Most of the mines are abandoned.
- The Report is based on U.S. Atomic Energy Commission (AEC) records, and required consultation with other federal agencies, affected states and tribes, and the interested public.
- Numerous data gaps were identified regarding the condition of the mines.
- The majority of mines were found to be on U.S. Bureau of Land Management (BLM) and U.S.D.A. Forest Service administered land.
- Mines present physical hazards that are the greatest, most immediate dangers.
  - Chronic exposure to radiological and chemical constituents from legacy mine waste is also of concern.
Establishment of the DRUM Program

- DOE’s Office of Legacy Management (LM) initiated the DRUM Program in fall 2016, building on Report to Congress findings.
- The Program’s goal is to verify and validate (V&V) the condition of 2,500 mines on federal public land by 2022.
- V&V will result in identifying whether the mines pose physical hazards as well as potential radiological and chemical risks, and to what extent.
- LM will also assess:
  - the federal government’s potential environmental liability;
  - costs to address high-risk physical hazards; and
  - the Program’s return on investment to the American taxpayer.

Merry Widow Mine, Eagle Basin, Colorado
Establishment of the DRUM Program: State and Federal Partnerships

- LM formed partnerships and executed agreements with BLM and Forest Service to inventory and sample mines.
  - Approximately 2500 mines are on federal public land and pose risks to recreationalists.
- LM also formed partnerships and executed agreements with state abandoned mine land programs.
- Partnerships are advantageous because they leverage resources and expertise.
  - BLM and Forest Service facilitate site access and advise on land issues.
  - States have years of mine inventory expertise to contribute; some states also have authority to access state and private land for inventory activities.
  - LM contributes its radiological expertise.

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Program Accomplishments To Date

As of July 22, 2018:

- V&V activities for 904 mines in Colorado, New Mexico, and Utah are complete.
- Risk scoring assessments are complete for 113 mines and provide rankings of physical hazards, and potential chemical and radiological risks.
  - The majority of mines present physical hazards (e.g., open adits).
  - Few mines rank medium or high for chemical and radiological risks.
- The federal government has reduced its potential environmental liability by approximately $150 million through preliminary risk screening efforts.
  - Screening results generally don’t exceed established chemical and radiological risk screening levels.

<table>
<thead>
<tr>
<th>Number of Mines</th>
<th>V&amp;V Activities Completed</th>
<th>V&amp;V Activities Remaining</th>
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<tbody>
<tr>
<td>904</td>
<td>0</td>
<td>1,596</td>
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Standing Up the DRUM Program:
Collection of Historical Data

- AEC sources include allocation and certification bonus case maps and files from the National Archives and Records Administration.
  - Over 3,700 maps were scanned for the DRUM Program.
- Other historical data sources
  - W. Chenoweth
    - Well-known uranium geologist whose collection includes reports and first-hand knowledge of mines in Arizona and New Mexico
  - S. Hollingsworth
    - Former lead geologist for Umetco; numerous maps of claims
  - Museums of Western Colorado (AEC data)
  - National Uranium Resource Evaluation
  - Defense Minerals Exploration Administration
  - USGS Bulletins, geologic maps, and professional papers

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Standing up the DRUM Program:
DRUM Program Documents

DOE developed five Program Documents to guide V&V efforts.

- The **Program Management Plan** describes how DOE LM and its contractor will execute the program.

- The **V&V Work Plan** provides structure and procedures for V&V activities reconciliation efforts that include:
  - reconciliation to determine mine location;
  - field inventory of mine features;
  - gamma surveys;
  - environmental sampling; and
  - risk scoring assessments to determine physical hazards, and potential chemical and radiological risks posed by a mine.
Standing up the DRUM Program: DRUM Program Documents (continued)

- The **Health and Safety Plan Analysis** identifies hazards and procedures for site workers performing field activities.
- The **Quality Assurance Program Plan** presents steps to ensure that data collected are of correct type and quality.
  - Reinforces management’s commitment to perform and deliver high quality services.
- The **Data Management Plan** describes data generation and use, management of the DRUM Database.
  - Data generated from field activities; quality assurance involved at each step.

Mine waste pile at Markey Mine, Red Canyon, Utah
Standing up the DRUM Program:
Establishing Risk Standards

• DOE and BLM agreed to a two-week exposure over a 26-year timeframe risk scenario for radiological and chemical screening levels.
  - Screening levels only apply to mines on federal public land.

• Gamma radiation screening levels were developed by DOE and are set for screening based on different exposure standards (none, low, medium, high); chemical screening levels developed by BLM.

Hard Rock Mine: Gamma Survey
Standing up the DRUM Program: Developing the DRUM Database

- Report to Congress database was developed from an Microsoft Excel spreadsheet; included fields such as ownership, production level, and status.
- DOE determined an upgraded database for the Program was needed to document V&V results.
- Requirements included:
  - a “permanent” IT platform so data can be archived after the Program concludes;
  - canned and ad-hoc data query and reporting capabilities;
  - the ability to eliminate multiple spreadsheets used for storing data; and
  - an ArcGIS platform for storing data collected by GPS-enabled devices.
- First database upgrade included improvements to the existing interface, database, and reporting functionality.
- Second database upgrade will add additional data fields and reporting, making it a useful tool for all project personnel.
Standing up the DRUM Program: Challenges of Ramping Up

- DOE staff grew from 1 to 4 FTE in 1 year.
- Contractor staff grew from 4 to 42 FTEs in 3 years.
- Contractor was required to hire 32 new contractor positions to accommodate work load. Personnel included:
  - radiological control technicians;
  - ecologists;
  - geologists;
  - technical report writers;
  - document management;
  - abandoned mine experts; and
  - other support staff.
Lessons Learned:

General

• Reporting without upgraded DRUM Database
  ▪ Tracking data by spreadsheet led to errors

• Quality versus production
  ▪ Program rolled out rapidly; three field crews hired in one year
    ○ Primary attention placed on production and safety
    ○ Less focus on training and quality assurance led to nonconformity with some work plan requirements

• Corrective Actions
  ▪ Collected additional information at select sites that were sampled during the 2017 field season
  ▪ Conducted extensive training on field techniques during the beginning of the 2018 field season
  ▪ Increased management and quality assurance assessments to ensure quality and consistency will be achieved moving forward
Lessons Learned:
General (continued)

• Constantly monitor lessons learned from other sites and programs
  ▪ Bulletin made LM sites aware of suspect counterfeit bolts
    ○ Safety inspection of trailers and tie-downs used to hold all-terrain vehicles discovered eight suspect bolts holding tie-downs
  ▪ Information was disseminated regarding a recall on lithium batteries used in tough pads
    ○ Pulled four tough pads out of service and replaced batteries

• Conducted additional training of field personnel
  ▪ Provided advanced wilderness first aid training
  ▪ Provided mine safety training along with tour of underground mine teaching facility (Edgar Mine operated by Colorado School of Mines)
Lessons Learned:
Instrumentation

• First gamma unit did not have ability to observe data at the mine
  ▪ New units purchased, allowing transects to be observed in the field
  ▪ Units also allow for download of data onto an aerial image to ensure coverage was achieved

• Initially utilized X-ray fluorescence meter to measure waste rock samples, with goal of reducing number of analytical samples
  • Too difficult to set up a correlation for wide range of metals
  • Useful as a screening tool or to target one or two metals
Lessons Learned:
Instrumentation (continued)

• Radon daughter measurements
  ▪ Measured radon levels at site and near mine openings
  ▪ Many factors influenced readings
    o Opening venting in or out
    o “Fresh radon” doesn’t result in exposure levels reported
  ▪ Generally field teams don’t work near openings where highest levels occur; additionally, field teams don’t enter mines

• Hazardous gas measurements
  ▪ Four-gas meter used to look for low levels of oxygen, carbon monoxide, and hydrogen sulfide
  ▪ Don’t go underground or into confined spaces; no need for monitoring

• High-volume air sampler (required portable generator) measurements for long-lived radionuclides
  ▪ Collected enough data early on and determined not needed
Questions?

DRUM Site Tour, DOE, Navarro, and DRUM Program Partners
Southwest Colorado

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