U.S. DEPARTMENT OF ENERGY | Legacy Management

Program Update

July–September 2014

Welcome to the July–September 2014 issue of the U.S. Department of Energy Office of Legacy Management Quarterly Program Update. *This publication is designed to provide a status of activities within LM. Please direct all comments and inquiries to lm@hq.doe.gov.*

Goal 5

2014 LM All-Hands Training

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) 2014 All-Hands Training was held the week of July 28, 2014, in Albuquerque, New Mexico. The week included presentations from LM staff and managers, a trip to the National Museum of Nuclear Science & History, teamwork and personal development training, as well as site visits within the Grants Mining District.

Tuesday's events began with DOE Deputy Under Secretary David Klaus briefing LM employees on the future of DOE and his vision for the Office of the Under Secretary for Management and Performance. In the afternoon, participants visited the National Museum of Nuclear Science & History where they learned about the complex past of the "Atomic Age" that ultimately led to LM's modern-day mission.

Deputy Under Secretary David Klaus expresses appreciation to Laguna Pueblo Acting Governor for the tribe's participation in LM's All-Hands Training.

On Wednesday, the group traveled to the Grants Mining District to see LM's Bluewater Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II disposal site, and the Jackpile-Paguate Uranium Mine, located 40 miles west of Albuquerque on Laguna Pueblo. Tribal leaders warmly welcomed LM staff to the mine, sharing information about tribal customs and governance and discussing the history and legacy of the mine. Jackpile-Paguate was once the world's largest open-pit uranium mine.

LM Director David Geiser and Deputy Under Secretary David Klaus at the tribal offices for Laguna Pueblo.

The training sessions concluded on Thursday with instruction provided by Leadership Smarts. LM staff were taught about group dynamics through the use of

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Inside this Update:

Goal 5

LM to Meet Energy Metering Goals Through Enhanced Data Collection at Groundwater Treatment Systems

The federal government, including the U.S. Department of Energy (DOE) Office of Legacy Management (LM), has been challenged by Executive and DOE orders to reach two goals related to energy usage and metering. The first goal states that LM should reduce energy use intensity (EUI) by 30 percent by fiscal year (FY) 2020, as compared to the FY 2003 baseline. The metering goal was for LM to have 90 percent of its energy use individually metered by FY 2013, a goal that LM will now be able to meet by expanded metering of groundwater treatment systems at its sites.

EUI Goal – EUI is the energy use divided by building square footage. When the 2003 baseline was set, multiple sites that now fall under LM responsibility—such as the Rocky Flats, Colorado, Site and Fernald Preserve in Harrison, Ohio—had multiple buildings, which accounted for LM maintaining a large building square footage. The majority of these buildings have since been demolished, resulting in a drastic reduction of LM's energy usage since 2003. However, because LM has reduced its building square footage even more, its EUI shows an increase, rather than decrease, since 2003. Certain energy uses can be excluded from the EUI calculation. Among those is energy used by mission-driven processes that are individually metered and reported on an annual basis.

The Fernald Preserve is located on the site of a former uranium processing facility that produced high-purity uranium metal products as an important step in America's nuclear weapons production cycle. After the facility's production operations ceased in 1989, the site underwent a $4.4 billion environmental cleanup, resulting in a site that has been restored to pre-settlement conditions, using native plants and grasses.

The only remaining remediation activity at the site is groundwater extraction and treatment through a system that is used to reduce the level of uranium in the groundwater. Although remediation activities are considered mission-driven processes, LM has been reporting the energy use because the extraction wells were not individually metered. As of July 2014, the lack of metering has been remedied.

Large capacity wells are used to extract 8 million gallons of water each day. The pumps used in these wells consumed 3,899,472 kilowatt-hours (kWh) of electricity in FY 2013, causing the preserve site to account for more than 88 percent of the total energy usage within LM. Approximately 90 percent of that usage was consumed by the extraction well pumps.

The new well-field control system at Fernald Preserve has reduced energy usage at the site, helping LM meet Executive and DOE energy use goals. Wireless functions within the system allow system monitoring for increasing efficiencies.

Groundwater remediation efforts at Fernald Preserve account for more than 80 percent of LM's energy usage. Recently installed electric metering capabilities at each extraction-well house helped LM hit its metering goals. The system's extraction wells and pumps receive routine maintenance by a small staff of contractor employees.

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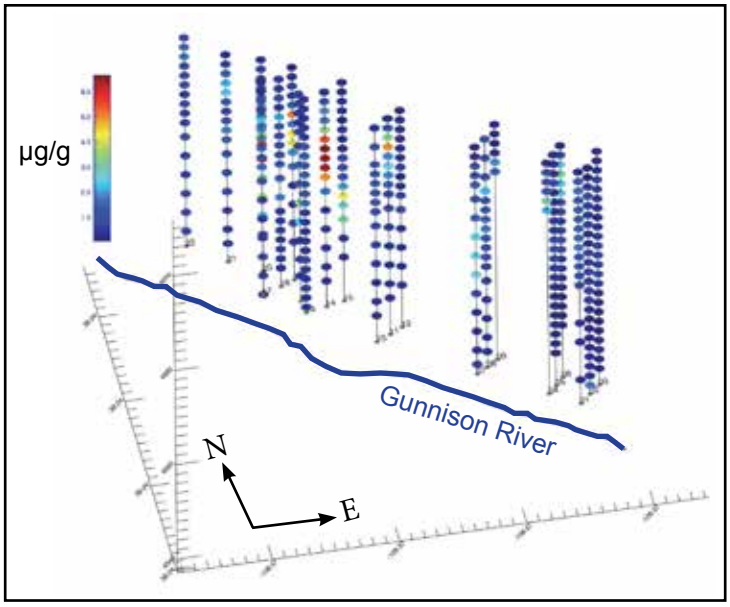
Goal 1

Anatomy of a Groundwater Uranium Plume

Groundwater containing legacy contaminants (pollutants that remain after their sources have been controlled) moves through aquifers in response to the hydraulic gradient. As the groundwater moves, contaminants accumulate on solids (e.g., soil, alluvium, and rock). Clean groundwater entering the aquifer upgradient of the site is contaminated by "bleed back" from the solids phases in the soil or rock. Accurate cleanup times are difficult to predict because of this contaminant desorption effect.

Groundwater is often monitored at contaminated sites, but solids phases typically are not. To understand groundwater plume migration, scientists need to understand both the chemistry of the groundwater and the solids matrix and the connection between them. An analogy can be made to human physiology: to understand a disease, a doctor needs to also understand how pathogens are transported through the bloodstream and how they interact with different parts of the body. Understanding the interaction between the water phase and the solids phases in an aquifer is important to estimating plume migration rates and cleanup times.

The U.S. Department of Energy Office of Legacy Management has a testing center at the Grand Junction site in Colorado, used to investigate the connection between contaminated groundwater and solids phases in the aquifer. A uranium plume was formed by water seepage from a legacy uranium test mill. Twenty-two spots were drilled on a 4-acre section of the uranium plume for direct access to the solids. All drillings passed through the alluvium and entered the bedrock beneath. Drilling cores were split into 366 samples, each representing 1 foot of rock layers.



This 3-D representation shows a high degree of spatial variation in the distribution of "weakly held" uranium at a GJO test facility. The red and orange data points in the center portion of some of the borings indicate a zone of high concentration of uranium.

Core samples collected at the drill site are labeled with description information, placed in bags, and transported to a laboratory.

A variety of tests were conducted. Uranium was drawn out of each sample using several different liquid extractants to help determine how tightly the uranium was bound to the sediment. Because uranium interacts differently with different minerals, it is useful to determine ties between elements and specific mineral phases. Mapping these associations helps scientists understand the potential for uptake and release of uranium. Petrography is used to establish the physical makeup and mineralogic properties of a sample. Fission tracks are used to associate the distribution of uranium with these properties. Column tests were used to characterize uranium release from the sediment samples in flowing water.

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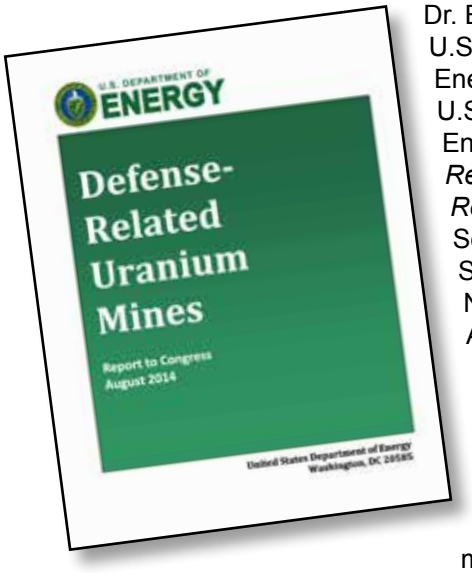
Goal 4

DOE Submits Its *Defense-Related Uranium Mines Report to Congress*



Dr. Ernest Moniz, the U.S. Secretary of Energy, submitted the U.S. Department of Energy (DOE) *Defense-Related Uranium Mines Report to Congress* on September 2, 2014. Section 3151 of the National Defense Authorization Act for Fiscal Year 2013 mandated that DOE, "... undertake a review of, and prepare a report on, abandoned uranium mines in the United States that provided uranium ore for atomic energy defense activities of the United States." Submittal of the report to Congress, included the Senate and House Committees on Armed Services, the Senate Committee on Energy and Natural Resources, the House Committee on Energy and Commerce, and the House Committee on Natural Resources. The report is available on the DOE Office of Legacy Management (LM) website at http://energy.gov/lm/downloads/defense-related-uranium-mines-report-congress-august-2014.

A Collaborative Approach

To develop a comprehensive list of defense-related uranium mines and their conditions, LM used uranium purchasing records from the Atomic Energy Commission (AEC) and supplemented them with mine data offered by the Bureau of Land Management, the Forest Service, the National Park Service, the Geological Survey, the Bureau of Reclamation, and the Environmental Protection Agency. Contributing information also came from other sources, including state abandoned mine lands agencies and the Navajo Nation.

Mine-related information was shared with LM by supporting agencies through one-on-one discussions with subject matter experts, interagency meetings and teleconferences, and electronic correspondence. LM also reached out to state agencies at conferences held by the Interstate Mining Compact Commission and the National Association of Abandoned Mine Lands Programs. Public and private sector input was received during information exchange forums, such as the Uranium Contamination Stakeholder Workshop—held to address uranium contamination issues on the Navajo Nation—as well as by email, webinar, and the LM website.

Report Highlights

AEC records offer the most reliable and comprehensive data on mines that provided uranium ore for defense-related purposes. The agency's production tables list 4,140 mining records. As a result of reviewing other agency records, LM found that 85 additional mines may have provided ore for defense-related purposes. A total of 4,225 mines are thought to have provided uranium ore to AEC from 1947 to 1970,

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Contributing Federal, State, and Tribal Agencies
Alaska Department of Natural Resources
Arizona Geological Survey
Colorado Department of Natural Resources, Division of Reclamation, Mining and Safety
Navajo Abandoned Mine Lands (AML)/Uranium Mill Tailings Remedial Action Department, AML Program
Nevada Commission on Mineral Resources, Division of Minerals
New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division
North Dakota Public Service Commission, AML Division
Oregon Department of Energy
Railroad Commission of Texas, Surface Mining and Reclamation Division
South Dakota Department of Natural Resources
Utah Department of Natural Resources, Division of Oil, Gas and Mining
U.S. Department of the Interior
U.S. Environmental Protection Agency
U.S. Forest Service
Wyoming Department of Environmental Quality, AML Division

Goal 2
Analysis of LM Stakeholder Interaction and External Communications

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) makes every effort to communicate with its stakeholders through public and small group meetings, conferences, briefings, news releases, telephone, email, informational materials, and the LM website. To assess the effectiveness of communication with stakeholders across the nation, an analysis of stakeholder interaction is performed yearly by LM. The tools used for this evaluation include statistical software to track Internet usage, the LM National Stakeholder Database, an overview of stakeholder activities at LM's larger sites of responsibility, and a list of LM communication products.

LM website usage was analyzed over a 12-month period from May 1, 2013, through April 30, 2014. During that time, there were 729,483 visitors to the website. The average number of visitors per day was 1,999; the average time spent per visit was 6 minutes and 23 seconds; and the average number of page views per visit was 4.29. Graph 1 shows the top ten LM webpages accessed during the 1-year period that was analyzed, and Graph 2 shows the ten most downloaded files from the LM website.

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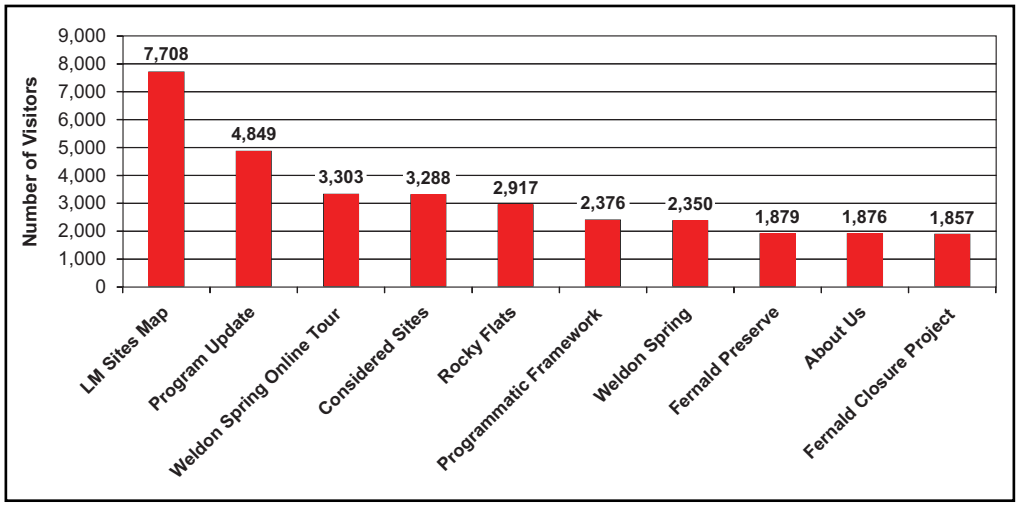
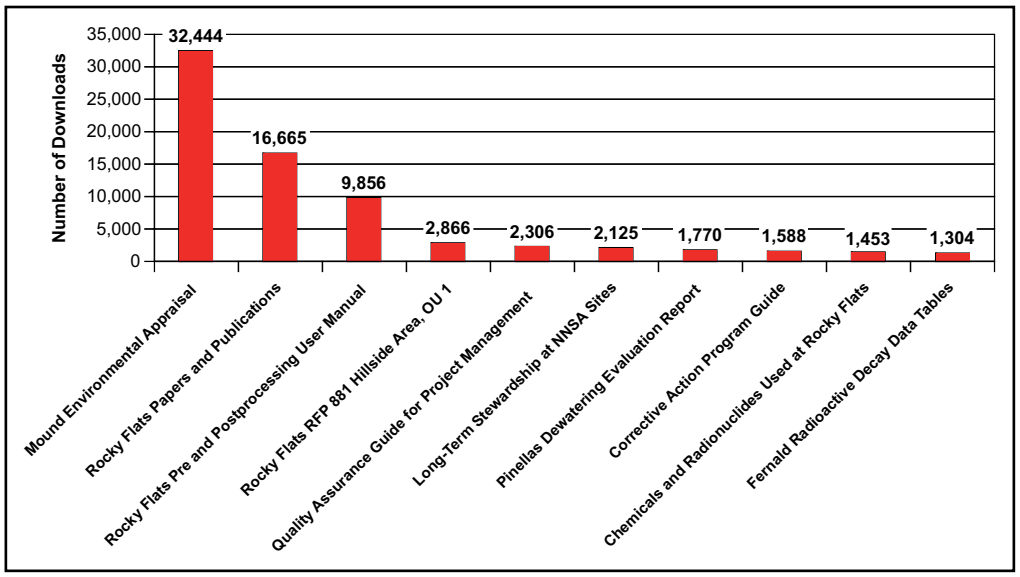


Graph 1. Top ten LM webpages accessed (May 1, 2013, through April 30, 2014).



Graph 2. Ten most downloaded files (May 1, 2013, through April 30, 2014).

Goal 1

Scientists Assess Damage Caused by Earthquake near Amchitka

Contractor scientists for the U.S. Department of Energy Office of Legacy Management (LM) traveled to the Amchitka, Alaska, Site in late August to assess the damage caused by a recent earthquake. The 7.9 magnitude event occurred approximately 20 miles north of the island on June 23, 2014. Amchitka Island, near the western end of the Aleutian Islands, is approximately 1,300 miles southwest of Anchorage, Alaska.

The scientists were joined by personnel from the U.S. Fish and Wildlife Service (FWS) and the U.S. Geological Survey (USGS). Two USGS scientists traveled to Amchitka to upgrade the seismic monitoring equipment and to monitor existing geodetic survey stations across the island.

Three underground nuclear tests were conducted on Amchitka Island between 1965 and 1971. The FWS

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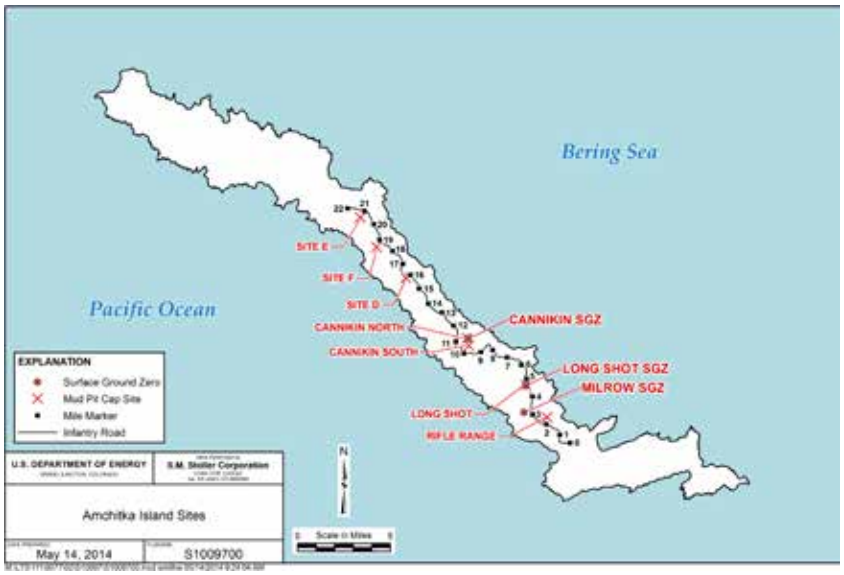
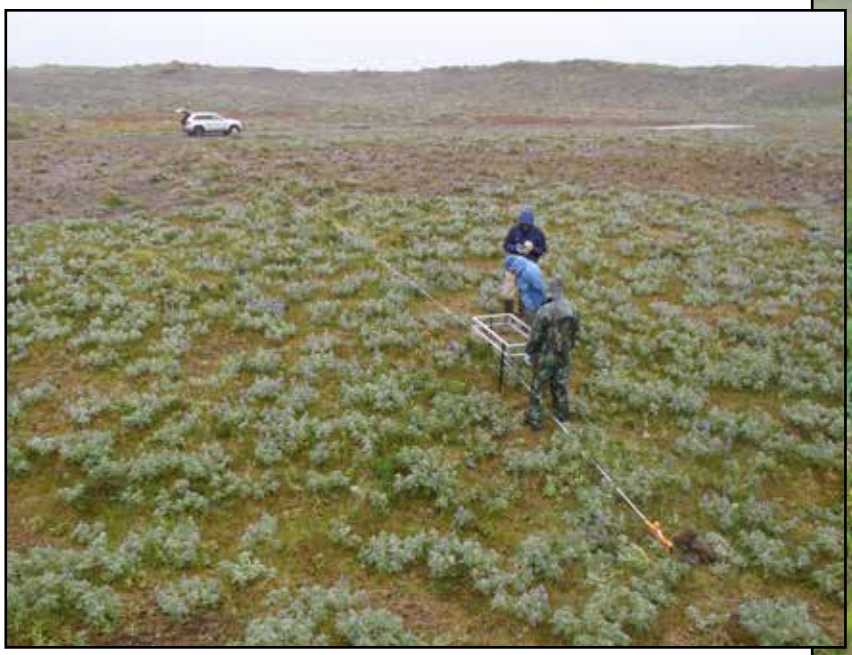


Amchitka mud pit cap sites.



Before 2014 earthquake—the Rifle Range Site (June 2011).

After 2014 earthquake—a crack in an access road at the Rifle Range Site is identified (August 2014).

Goal 1

DOE Weldon Spring Site Seeks Shelter

On the evening of May 31, 2013, a category F3 tornado touched down, leaving a path of damage more than 32 miles long and 250 yards wide at its peak. The funnel twisted its way through several Missouri communities, including the U.S. Department of Energy Office of Legacy Management (LM) Weldon Spring site in southern St. Charles County. According to a National Weather Service damage survey, the tornado stayed on the ground for approximately 35 minutes.

Severe damage was sustained by the Weldon Spring Interpretive Center, laboratory, and office trailer. However, because the storm event occurred after the site had closed for the day, no employees or visitors were injured. After site damage was assessed, federal and contractor staff became concerned about what actions could be taken if a similar event occurred during the site's operational hours. Considering the best interest of the general public and the safety of onsite staff, LM evaluated several different options for installing a storm shelter at the site.

Project discussions included analyzing the optimal size and type of shelter needed, based on the site's current usage and eventual location of the shelter, and whether the shelter should be placed above or below ground.

A competitive procurement for a shelter design that would meet Federal Emergency Management Agency standards was accepted by Survive-A-Storm, a company based in Thomasville, Georgia, with several offices throughout the Midwest.

LM and its contractor organization worked closely to select a subcontractor to construct the above-ground, 10 foot by 56 foot, stand-alone shelter. The shelter is made of prefabricated steel, capable of withstanding winds up to 250 miles per hour. The shelter was placed adjacent to the Interpretive Center and installation was successfully completed in June 2014.

Shelter being placed on a concrete slab.

Providing optimal protection from severe weather events required that the base of the structure be welded and bolted to the concrete slab beneath it. The reinforcement ensures that the structure will protect up to 112 occupants from severe weather effects.

Inside the 4,480 cu. ft. storm shelter.

LM strives to provide the best possible safety options to sites like Weldon Spring that are widely utilized by the general public. Currently, LM is in the process of writing a formal policy and procedure to be followed in the event the shelter needs to be used. ❖

Goal 4

Reindustrialization Workshop Held at Mound Site

The U.S. Department of Energy (DOE) has partnered with local communities to determine the best reuse of land, assets, and facilities, and the Mound-site community is no exception. In May, DOE's Office of Legacy Management (LM) and the Mound Development Corporation (MDC) co-hosted a reindustrialization workshop at the Mound site in Miamisburg, Ohio. In line with DOE's Asset Revitalization Initiative, this workshop highlighted the beneficial reuse of the agency's unique and diverse mix of assets, which include not just land, but also facilities, infrastructure, equipment, technologies, natural resources, and a highly skilled workforce.

Seth Kirshenberg of Energy Communities Alliance suggested that the Mound site was a valid model for DOE land reuse, while presenting at the reindustrialization workshop.

The workshop highlighted DOE's collaboration with community reuse organizations—like MDC and the Hanford Tri-City Development Council in Washington State—to redevelop their respective sites. It also touched on MDC's future marketing strategy for rebranding the Mound site. Joining the co-hosts, were personnel from DOE Headquarters and the agency's Offices of Management and Environmental Management. The City of Miamisburg, Montgomery County, Mound site tenants, and national and local stakeholder groups were also represented at the workshop.

Carl F. Adrian, President/ CEO of Tri-City Development Council and Colleen French, DOE Richland Operations Office Government Programs Manager, presented a case study of the Hanford site at the reindustrialization workshop, emphasizing the importance of working closely with stakeholders.

Participants explored the challenges of reindustrializing former DOE sites, through presentations and discussions. Topics included government property transfer rules, revitalization and reuse initiatives, property divisions that allow multiple potential reuses, establishment of different cleanup levels based on end-use scenarios, lessons learned from Mound reindustrialization

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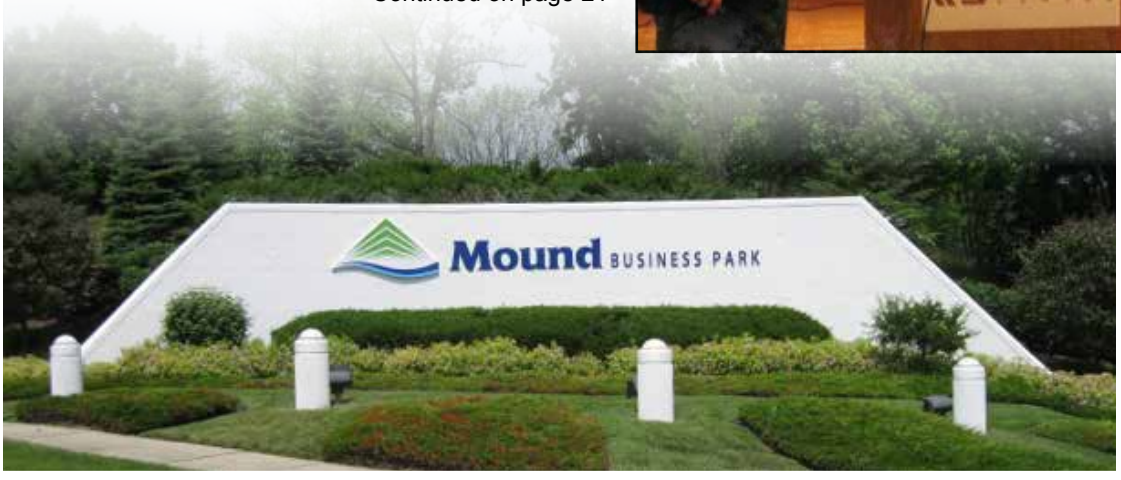

MDC unveiled its new site name at the reindustrialization workshop. MDC will now be marketing the former DOE site as the Mound Business Park, which presents a more inclusive redevelopment effort that welcomes a larger variety of businesses.

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Scientists Assess Damage Caused by Earthquake near Amchitka

scientist assisted the LM contractors on their inspection of seven test-associated areas on the island where drill cuttings contaminated with diesel fuel are contained in earthen disposal cells. These areas are known as the mud pit cap sites.

Of the seven mud pit caps inspected, two showed no signs of damage, two had minor cracks along the edge of the mud pit caps, and three had moderate damage. Moderate damage occurred on one of the mud pit caps where the soil cover had slumped away from its side, exposing the geomembrane fabric that covers the drilling mud. Another cap with moderate damage had a prominent crack along its uphill side, and the land surface down-slope of the cap had slumped away. The mud pit cap was still intact; however, native soils up-slope and down-slope of the site have either cracked or slumped.

"Although there was shaking-induced ground failure at the surface, primarily in areas with soft, wet sediments and fill, [we] don't suspect any damage occurred in the test cavities," said Mark Kautsky, LM site manager. "The test cavities are in dense rock, several thousand meters below the surface and the earthquake occurred at a depth of 70 miles below the surface, so it is unlikely there was any damage to the underground test cavities; however, we will continue monitoring the region very closely."

LM is currently assessing the best way to repair the damage that occurred to the mud pit caps and is scheduled to conduct biological monitoring of the Amchitka site in 2016. ❖

Before 2014 earthquake—the Long Shot Site (June 2011).

After 2014 earthquake—a crack along the northeast side of cap at the Long Shot Site is documented (August 2014).

Goal 1

Chariot Remediation Work Completed on Schedule

Remediation work at the Chariot, Alaska, Site was completed on schedule this summer. The U.S. Department of Energy (DOE) Office of Legacy Management (LM) teamed with the U.S. Army Corps of Engineers (USACE) to conduct remediation and abandonment of five test holes at the site. Four test holes designated Able, Baker, Charlie, and Dog were installed by the Atomic Energy Commission (AEC), in the early 1960s to evaluate subsurface site conditions as part of Project Chariot. The fifth test hole, X1, was likely an emplacement hole for a chemical explosives test that was never performed. Refrigerated diesel was used to improve borehole stability when the test holes were drilled. Consequently, soil around the test holes contained residual diesel that needed to be removed.

The Chariot site is located in the Ogotoruk Valley in the Cape Thompson region of northwest Alaska. As part of the Plowshare Program that was created in 1957 by AEC to study peaceful uses for atomic energy, Project Chariot began in 1958 when a science team chose Cape Thompson as a potential site to excavate a harbor using a series of nuclear explosions. Between 1959 and 1962, AEC—with assistance from other state and federal agencies—conducted more than 40 pretest bioenvironmental studies of the Cape Thompson area. Plowshare Program work at the Project Chariot site was canceled because of strong public opposition. No nuclear devices were brought to the Chariot site, and no nuclear tests were conducted.

Preparation for this summer's remediation project began a few years ago when residents from Point Hope, Alaska, contacted the LM site manager for Chariot, Mark Kautsky, to discuss remediating the test holes. The village of Point Hope is located about 35 miles northwest of the Chariot site. Since then, Kautsky has led several meetings with residents and leaders from Point Hope and the surrounding communities of Kivalina and Barrow. One of the public meetings was held this past March in Point Hope (corresponding article can be read in the January–March 2014 *Program Update* at http://energy.gov/sites/prod/files/2014/04/f14/FINAL2014_Q1_0.pdf).

"A key part of the work process is informing the local villages about our actions and listening to their concerns," said Kautsky. "It's important to make sure that the community understands that we take their concerns seriously."

LM teamed with USACE, who subcontracted remediation work to Tanik Construction and camp set-up work to Fairbanks Environmental Services; both Alaskan-owned companies. LM's prime contractor, S.M. Stoller Corporation, provided project oversight and public communications support.

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Camp Chariot, a temporary campsite that housed about 10 workers during the 2014 remediation.

Location of the Chariot, Alaska, Site.

Goal 1

Groundwater Cleanup Operational Changes Are Being Implemented at Fernald Preserve

Uranium contamination in the Great Miami Aquifer—at the Fernald Preserve, Ohio, Site—is being removed from the groundwater through a pump-and-treatment operation, which until this year, involved the operation of 23 extraction wells. Figure 1 shows the footprint of the uranium plume and the 23 extraction wells. Concurrence and support from the U.S. Environmental Protection Agency (EPA), Ohio EPA, and site stakeholders allowed the implementation of operational changes that are predicted to increase the effectiveness of the ongoing operation and shorten cleanup times for a portion of the aquifer.

Groundwater remediation is proceeding successfully, as reported each year in the Fernald Preserve Site Environmental Report (SER). At the end of 2013, 11,784 pounds of uranium had been removed from the aquifer. The *Record of Decision for Operable Unit 5* states that the U.S. Department of Energy (DOE) has committed to continuing pumping operations until it can be demonstrated, with reasonable certainty, that the final remediation level of 30 micrograms of uranium per liter of water (µg/L) has been attained at all affected areas of the aquifer. The final remediation level is based on EPA National Primary Drinking Water Regulations.

The progress of groundwater remediation is reported each year in the SER. Operation metrics indicate that, although still working, the remedy is becoming slightly less effective each year. Data trend indicates that the effectiveness will continue to reduce as the remedy progresses. This type of decline is common for pump-and-treatment operations. However, rather than simply continuing to operate and accepting the current trend as the norm for the technology being used, the DOE Office of Legacy Management is choosing to re-examine the operation in order to find an innovative approach for improving the remedy effectiveness, shortening its time span, and reducing costs.

In addition to decreasing effectiveness, sampling indicated that a portion of the aquifer had higher uranium concentrations than originally characterized for the area in 2005, when the final cleanup design was modeled. In order to obtain a more accurate model-predicted cleanup time, the groundwater model needed to be updated with new uranium plume data.

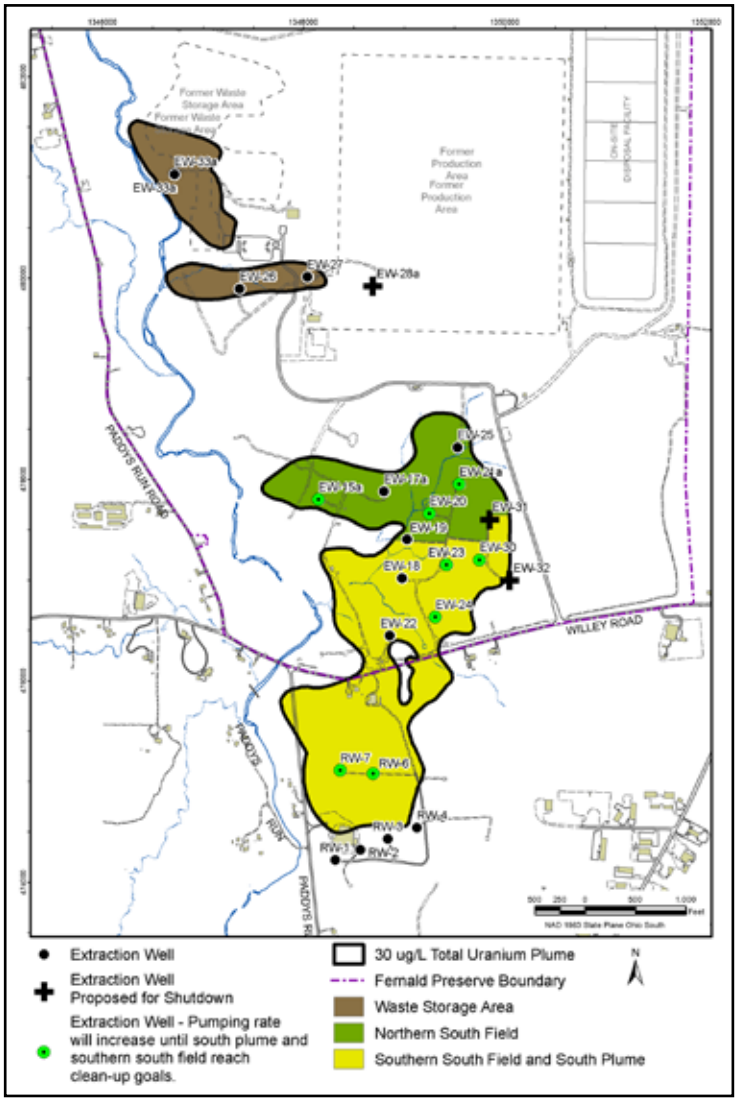

Figure 1. Waste Storage Area (WSA) phase II design well locations and 2011 maximum uranium plume footprint.

Modeling results (using updated uranium plume data) predicted longer cleanup times if no operational changes were made. The area groundwater model was used to simulate several operational changes, including adding new extraction wells, varying the pumping rates of existing

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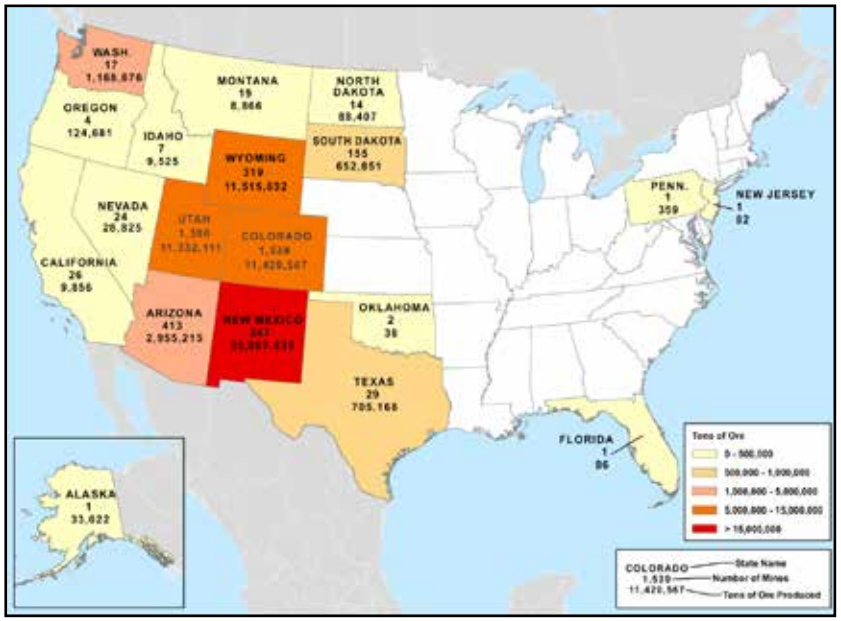
DOE Submits Its *Defense-Related Uranium Mines Report to Congress*

with more than 90 percent of those mines in Colorado (1,539), Utah (1,380), Wyoming (319), and New Mexico (247). Of the 75.9 million tons of ore produced, more than 35 million came from New Mexico mines, followed by mines in Colorado and Utah. Nearly half of the mines are on federal lands managed by the Bureau of Land Management, and approximately 11 percent are on tribal lands.



Number of mines and total uranium-ore production (in tons) by state.

Most defense-related uranium mining was conducted under the General Mining Law of 1872, which did not require that mines undergo reclamation or remediation. Of the 4,225 mines identified in the report, only 15 percent were confirmed to have had some form of reclamation or remediation completed. For all receptors evaluated, radon proved the main contributor to radiological risk. Data suggests that mine reclamation helps mitigate radon and gamma emissions, and sealing adits and shafts (mine openings) can significantly reduce potential radiological exposure. However, the primary objective of actions such as sealing mine openings, historically, has been to eliminate physical hazards at abandoned mines. Until recently, the relative difficulty of measuring radon, compared to measuring gamma radiation, may have resulted in underestimating the radiological risks at some mines. Mine remediation is still needed in areas where residences might be built on, or in close proximity to, mine contamination.

Cleanup of Skyline Mine, Monument Valley, Utah. Photo courtesy of U.S. EPA Region 9: www.epaosc.org/SkylineAUM.

These and many other findings about defense-related uranium mines may be found in four technical topic reports documenting DOE's review of abandoned uranium mines. The topic reports provide more detail on subjects such as the location of mines, their reclamation and remediation status, the potential cost of reclaiming and remediating different categories of mines, and the ways that different federal, state, and tribal agencies are prioritizing mines for cleanup; these can be downloaded from LM's website at http://www.lm.doe.gov/default.aspx?id=10668.

DOE consulted with the Department of the Interior and the Environmental Protection Agency on this report. Without the contributions from these agencies, as well as those from other federal agencies, affected states and tribes, and the interested public, the report could not have been successfully completed. Information on individual mines will continue to be added to DOE's data collection as it becomes available.

For more information about the report, please visit the LM website at http://www.lm.doe.gov/aum/. ❖

Goal 2

NextGen GIS and the Environmental Database

Next Generation (NextGen) Geospatial Information System (GIS) and U.S. Department of Energy (DOE) Cold War legacy sites environmental records—spanning nearly 40 years—in the Environmental Database, are managed by the DOE Office of Legacy Management (LM). As key LM assets, these records must be managed and maintained efficiently and effectively. There are over 16 different applications that support the databases containing environmental and geospatial information. Current applications, respective systems, and processes require significant upgrades to effectively operate in the future.

A multi-disciplined LM team collaborated to develop functional requirements and design a NextGen GIS solution. NextGen GIS (also referred to as GEMS 2) replaced the legacy Geospatial Environmental Mapping System (GEMS) and its associated databases. The upgraded system has better map functionality, expanded layers, support, upgrades, speed, ease of use, expandability, Internet-based external users, and cross-agency commonality for map sharing, development, and collaboration. Its processes help ensure that LM environmental data are properly preserved and protected while also allowing open and transparent operation between LM and system users; state and federal regulators; local, regional, and national stakeholders; and the public. NextGen GIS can be accessed through the LM website at http://energy.gov/lm under Mapping and Monitoring (GEMS), or directly via http://gems.lm.doe.gov.

LM has customized its NextGen GIS application to draw validated information from a database of 4.7 million analytical results and 232,000 water-level measurements for 58 long-term surveillance and maintenance (LTS&M) sites. Data were collected from transferred sites over a period of 40 years, and used to capture and store historical environmental information such as analytical chemistry data, groundwater depths and elevations, well logs, well construction data, geo-referenced boundaries, site physical features, and sampling locations from LTS&M sites. Stakeholders, regulators, and project personnel can use this web-based application and data to display information in several forms, such as interactive tabular reports, graphs, geospatial displays, or with the data labeled or highlighted in map views.

The new system is user-friendly with support for the responsive design (for smaller laptop screens and tablets); versatile for analysis of environmental data, including export to .csv file format (Excel compatible); self-analyzing, access to supporting site logs and inspection photos; and has the ability to overlay external mapping features onto LM-focused site maps. A more advanced version of GEMS was also deployed, providing additional functionality to internal federal staff.

LM released the initial NextGen GIS, version 2.0, in early January 2014; with additional versions 2.1 and 2.3 released in April and August 2014. Future versions of the system will integrate land use (e.g., parcel ownership, mineral rights, covenants), institutional controls (e.g., land restrictions and access agreements), and real and personal property layers.

External customers for NextGen GIS include local, regional, and national stakeholders; regulators; and other government agencies. Public stakeholder groups will be able to view and analyze historic and current site environmental data. In addition to the web application, users can also consume the many LM site mapping services via Esri Representational State Transfer (REST) technology into their own GIS application, similar to how GEMS allows users to overlay U.S. Bureau of Land Management—Public Land Survey System and U.S. Geological Survey (USGS) Data—National Hydrography Dataset onto the GEMS map.

Throughout the process, LM has built relationships with other government organizations by sharing requirements, design, and system architecture through conferences and one-on-one demonstrations. LM plans to continue using this platform to share environment data and analysis for efficient collaboration of LTS&M information, and to continue interfacing with other government agencies and organizations such as the U.S Environmental Protection Agency, National Oceanic and Atmospheric Administration, and USGS.

Current activities are underway to integrate the NextGen GIS with a new environmental support services, commercial off-the-shelf—or COTS—product named Environmental Quality Information System (EQuIS), developed by Earthsoft, LLC. LM staff conducted a comprehensive requirements-capturing, build-verses-buy, and pilot study leading up to the decision to procure and implement the EQuIS product.

Continued on page 17

Goal 5

Fernald Preserve Receives Safety Award

The Greater Hamilton Safety Council (GHSC) bestowed its *100 Percent Award* for calendar year 2013 on the Fernald Preserve, Ohio, Site. The award is given to companies that are members of GHSC who have had no lost-time injuries or illnesses during the calendar year. Approximately 50 employees of S.M. Stoller Corporation (contractor to the U.S. Department of Energy Office of Legacy Management [LM]) work at the Fernald Preserve. They were recognized at GHSC's 71st annual safety awards banquet—held May 22, 2014—for their outstanding safety efforts. The Fernald site has been involved with GHSC since the 1990s.

Stoller employees at the Fernald Preserve have been granted six awards since 2006, when the site transitioned to LM. Remediation at the site was conducted in accordance with regulations set by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The site requires operation and maintenance of remedial action systems, environmental monitoring, routine inspection and maintenance, and stakeholder support.

Major activities accomplished during 2013 without a lost-time injury or illness included operating and maintaining the aquifer restoration well field, which extracted over 2.3 billion gallons of water and removed 470 pounds of uranium from the aquifer; completing well-field control system upgrades; collecting and analyzing soil and water samples; completing ecological monitoring; clearing of invasive plants; mowing and baling the grass at the onsite disposal facility; and constructing a wildlife observation blind.

LM contractor employees at the Fernald Preserve, from left to right: Larry Oeffner, Health and Safety specialist; Roger Grant, industrial hygienist; Jim Siler, Health and Safety manager, Karen Voisard, Voluntary Protection Program lead; Glenn Griffiths, program manager; and Bill Hertel, Fernald/Mound site manager.

In 2013, the Fernald Preserve Visitors Center received over 10,000 visitors, including guests from the State and Tribal Government Working Group and Japan's Fukushima Daiichi power plant.

GHSC has provided continuous service to businesses, organizations, and the community since it was established in 1942. Over 200 companies in the Hamilton, Ohio, area are current members of GHSC, which is renowned as a local, state, and national safety-award winner. The organization provides annual safety expos, seminars, and lectures, which meet federal- and state-mandated continuing education requirements. ❖

LM is continually seeking opportunities to protect natural resources and the future. One simple step we can take toward improving environmental consciousness is to distribute the *Program Update* newsletter by email instead of sending a printed copy.

Please send your email address and your first and last names to lm@hq.doe.gov so that we can update our database.

Thank you for your assistance.

Continued from page 1

2014 LM All-Hands Training

the RACI (Responsible, Accountable, Consulted, Informed) model and the StrengthsFinder technique for discovering and maximizing individual strengths. Overall, the 2014 LM All-Hands Training was a great success, bringing together LM staff from across the country and offering many learning and development opportunities. ❖

LM staff gather outside of the National Museum of Nuclear Science & History.

LM staff members tour the National Museum of Nuclear Science & History.

An LM scientist discusses geologic and groundwater complexities associated with the Bluewater site.

Tribal leaders share the origins of the Laguna Pueblo flag.

Continued from page 2

LM to Meet Energy Metering Goals Through Enhanced Data Collection at Groundwater Treatment Systems

The control system for the groundwater remediation system, put into operation in 1997, had become obsolete and replacement parts, such as control boards, were difficult to obtain. In 2013, a decision was made to install a new well-field control system. Installation of the new system was completed and it was put into operation this summer. From this point forward, energy used by wells at the Fernald Preserve can be excluded from the EUI calculation. Since the well pumps are metered and used for remediation, LM can discontinue reporting their energy use and meet its 30 percent EUI reduction goal in FY 2015.

Metering Goal – LM's second energy goal was to individually meter 90 percent of its energy use by FY 2013. Not having meters on the Fernald Preserve wells kept LM from reaching this goal. However, since all of the necessary equipment has been installed at the site, LM can report that nearly 99 percent of LM's energy use is now metered.

Additional benefits of using the new metering system are simplified data collection and reporting. The new system control units feature a wireless data–download system. As operators make their weekly rounds, the past week's data are downloaded via a hand-held data collection unit. This data will eventually be reported in the DOE Sustainability Dashboard, which is used to complete the annual Site Sustainability Plan for LM.

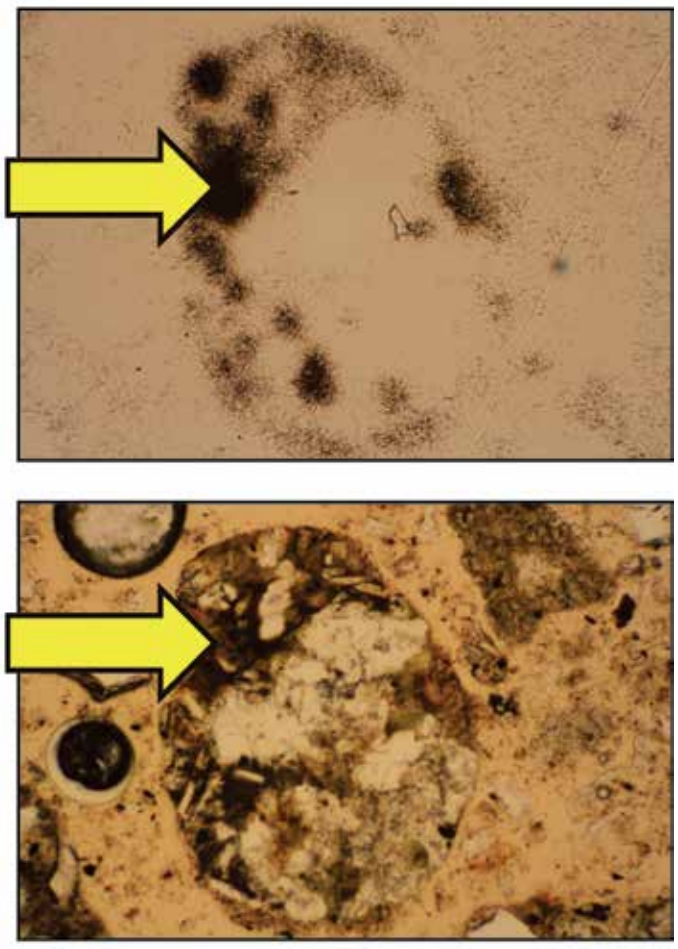
The new extraction-well control system promises to provide many advantages over the old system—including better analysis and troubleshooting tools through the availability of each well system's data—and will help LM meet crucial energy goals. ❖

Continued from page 3

Anatomy of a Groundwater Uranium Plume

Information from these studies is still being analyzed. Early findings include:

- Uranium desorption—in part—is rate limited, as determined by varying groundwater flow rates.
- Much of the uranium is associated with the fine-grained soil combination that binds and coats sedimentary grains. This matrix has a reddish-orange color that suggests the presence of iron oxides. ❖



In this fission-track map (top) and its associated photomicrograph (bottom), the arrows point to an area of oxidized matrix material with a high density of fission tracks. The high-density fission tracks indicate high uranium concentrations. The correlation of track density to petrographic analysis suggests that uranium is sorbed to iron-oxide-rich matrix material. This information can be used in groundwater models.

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NextGen GIS and the Environmental Database

Implementation is underway with a phased migration of LM sites into the system. The first migration is expected to be completed by March 2015. The final data migration should be completed by July 2015. EQuIS will replace the 16 existing, individual systems and manual processes currently being used by LM, with an all new, integrated process and toolset for more efficient and effective support of LM's LTS&M mission. ❖

Figure 1. LM home page.

Figure 2. Main screen of GEMS 2.

Figure 3. Site-specific pop-up data.

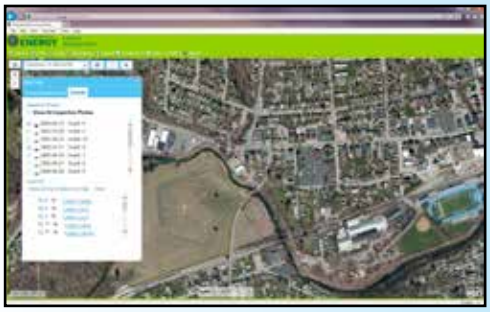

Figure 4. Access to site photos and logs.

Figure 5. Easy access to standard reports and supporting data.

Figure 6. Support for multiple base maps.

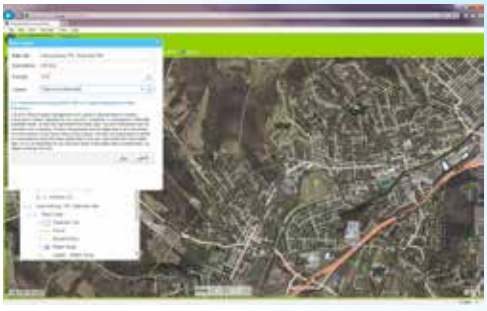

Figure 7. Ability to export map to .pdf or .png.

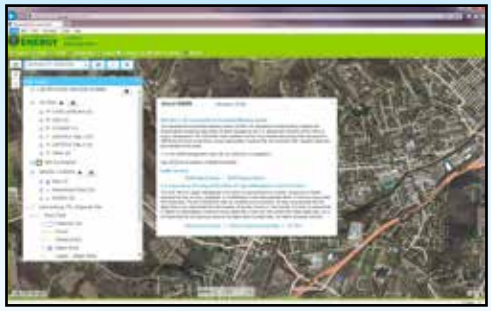

Figure 8. Help screen with links to GEMS 2 mapping and reporting services.

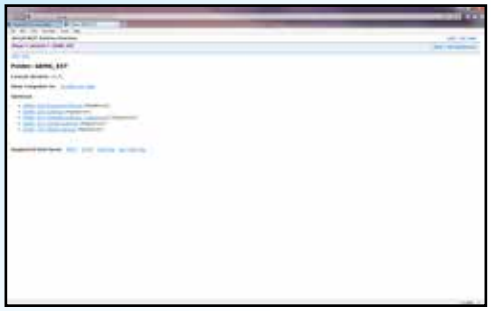

Figure 9. Screen showing GEMS 2 mapping services.

Goal 1

Environmental Justice Activities

Teaching Radiation, Energy, and Technology Workshop Held in Aiken, South Carolina

The U.S. Department of Energy Environmental Justice Program participated in a Teaching Radiation, Energy, and Technology (TREAT) workshop sponsored by Savannah State University and the Savannah River Site (SRS) July 23 through 25, 2014, at the University of South Carolina, in Aiken. The goal of the TREAT Workshop is to educate kindergarten through 12th grade mathematics and science teachers, and local community leaders who reside near the SRS facility. Subject matter included radiation, sources of radiation, radioactive waste management, the effects of radiation on environmental health, and the impact of environmental radiation exposure on humans. Additional topics included community education outreach programs,

Teachers, students, community, and agency participants at TREAT.

an overview of nuclear technology on regional and global levels, overview of the U.S. Environmental Protection Agency, South Carolina Department of Health and Environmental Control overview, environmental monitoring operations, and fundamentals of grantsmanship. The workshop is designed to educate teachers so they can take the radiation education message to their students and ultimately to the community. ❖

TREAT Workshop painting exercise using visual arts and imagery to communicate the benefits associated with nuclear energy.

44th Congressional Black Caucus Annual Legislative Conference, Environmental Justice Braintrust

The Congressional Black Caucus (CBC) held its 44th Annual Legislative Conference in Washington, DC, September 24 through 27, 2014. Congressman James Clyburn (D-South Carolina) served as chair of the CBC Environmental Justice (EJ) Braintrust during the conference.

This year's Braintrust focused on the timely topic of climate change and its effect on communities, particularly those with minority and low-income populations. The panelists assessed current changes and those that may occur in the future. Conference panelists discussed enhancing the unique relationships between human health, EJ, economic development, and improving the quality of life in challenged communities nationwide.

The U.S. Department of Energy Office of Legacy Management and Dr. Jonathan Pershing, Principal Deputy Director of the new Office of Energy Policy and Systems Analysis, and Deputy Assistant Secretary for Climate Change Policy and Technology in the Office of International Affairs, participated in the session. ❖

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Environmental Justice Activities

Pipeline Development Program

The Pipeline Development Program, sponsored by the U.S. Department of Energy (DOE) and the Medical University of South Carolina, is in its fifth year. The program is designed to expose lower-income and minority middle and high school students in rural South Carolina, to science, technology, engineering, and mathematics (STEM) disciplines, and to encourage them to pursue careers in those areas.

Approximately 1,700 students will participate in the program this year, representing Cane Bay Middle School, Cross Middle School and High School, St. Stephen Middle School, and Timberland High School.

During the course of the school year involved schools are provided the necessary resources to allow students to participate in STEM educational activities at locations such as:

- The Aquarium
- Boeing
- Charleston Water Treatment Plant
- The Columbia Zoo
- Patriots Point Naval & Maritime Museum
- Space and Naval Warfare Systems Command

Other initiatives of the program are to:

- Provide information and education opportunities that enhance skills and knowledge in STEM disciplines to counselors, teachers, and students.
- Assist teachers in providing STEM literacy for students.
- Provide opportunities for students and teachers to participate in workshops and exhibitions to further STEM awareness.
- Identify professionals in the mathematics, science, engineering, and medical professions as potential speakers to discuss careers in the STEM areas with the students. ❖

Cane Bay Middle School students at Space and Naval Warfare Systems Command.

Cross Middle School students at the Aquarium.

Goal 5

LM Summer Interns

Erind Disha – Hailing from Stamford, Connecticut, Erind Disha interned with the U.S. Department of Energy Office of Legacy Management (LM) Benefits Continuity Team. Erind's main project was to build and populate a master database of historical data on pensions and post-retirement benefits. He also led the team in researching the cost impact of the Affordable Care Act on legacy health plans.

Erind attends Bard College in Annandale-on-Hudson, New York, where he is studying finance, economics, and mathematics. After graduation, he plans on attending graduate school and eventually returning to his native Albania to become a public servant as an elected official. We are grateful for Erind's contributions to LM and wish him the best. ❖

Kia Hall – Kia interned with the LM Human Resources (HR) Team during the 2014 summer. Kia worked closely with the HR team toward the creation of a new recruitment database. She also helped to create several HR and workforce charts that were used during briefings with the U.S. Secretary of Energy and at the 2014 LM All-Hands Training.

During her internship, Kia updated and maintained a diversity-data spreadsheet of LM's historical personnel data, and worked with the Planning, Budget, and Acquisition Team on several budget assignments.

Kia attends Morgan State University in Baltimore, Maryland, where she is studying finance. LM is grateful for her contributions and wishes her the best. ❖

Goal 5

LM Welcomes New Employees

Darina Palacio – Darina joined the U.S. Department of Energy Office of Legacy Management (LM) on July 14, 2014, as a general engineer working out of our Westminster, Colorado, office and is part of Environment Team 2. Darina was selected from the Presidential Management Fellows Program that identifies outstanding graduate students and matches them with federal career opportunities. Prior to joining LM, Darina worked part time with the environmental law firm, Earthjustice, as a water-quality researcher during graduate school. She also interned with the U.S. Geological Survey (USGS).

Darina has held leadership positions in several organizations including the National Society of Black Engineers and the American Society of Civil Engineers. She has won numerous fellowships and awards. Most noteworthy were the 2012 American Water Resources Association William V. Storch Award, and a Florida Education Fund McKnight Dissertation Fellowship.

As a graduate of California State University, Darina received her bachelor's degree in civil engineering. She earned her master's degree and PhD at University of Florida. She is from the beautiful country of Belize. ❖

Terry Petrosky – Terry joined LM on August 25 as a physical scientist working out of our Grand Junction, Colorado, office and is part of Environment Team 1. Prior to joining LM, Terry worked as a laboratory manager and a chemical oceanographer research assistant, then as a USGS employee.

As part of the National Water Quality Assessment (NAWQA) program, Terry participated in numerous water-quality studies for groundwater and surface water. He has instructed training courses on groundwater and surface water sample collection.

Terry is a graduate of Florida State University where he received a bachelor degree in chemistry and minored in mathematics and physics. ❖

Joshua Linard – Joshua joined LM as a physical scientist at our Grand Junction, Colorado, office on August 25, and is part of Environment Team 1. Prior to joining LM, Joshua worked for USGS where he worked on the NAWQA Agricultural Chemical Team. His work on the team included developing and applying semi-distributed, physically based watershed models, to simulate the transport of agricultural chemicals in different environments across the U.S.

Joshua is a graduate of the University of Idaho where he received both his bachelor's and master's degrees in environmental science. He recently developed and applied multiple linear regression models to estimate mean-annual salt and selenium yields in the Upper Colorado River Basin. ❖

Save the Date

October 10–22, 2014	**Community Leaders Institute**	Tennessee State University Nashville, TN
November 5–8, 2014	**Eighth Annual National Conference on Health Disparities**	Long Beach, CA
November 14–15, 2014	**Community Leaders Institute**	Jackson, MI
November 18	**Interagency Working Group Senior Leadership Meeting** *Hosts: U.S. Environmental Protection Agency, and White House Council on Environmental Quality*	U.S. Environmental Protection Agency Headquarters, Washington, DC

Continued from page 8

Reindustrialization Workshop Held at Mound Site

efforts, and other sites' redevelopment efforts. Special emphasis was placed on the importance of local government and community involvement in a site's decision-making process.

Tours on day two of the workshop gave attendees a mobile glimpse of available Mound Business Park buildings and property, and the chance to walk through an underground building that is one of the most challenging assets for MDC to market. Participants also toured the Mound Science & Energy Museum located on the LM property, and watched presentations by museum volunteers (former site employees) on the historical research and manufacturing achievements that occurred during the site's 50-year-production mission. ❖

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Groundwater Cleanup Operational Changes Are Being Implemented at Fernald Preserve

extraction wells, or both. New modeling results indicated that the best approach required no additional extraction wells, only operational changes to the existing wells.

Operational changes implemented so far in 2014 involve shutting down three extraction wells that no longer benefit the ongoing cleanup, and reallocating the pumping budget from the three shutdown wells to existing wells in the southern South Field and South Plume. Figure 2 shows the three extraction wells that were shut down (EW-28a, EW-31, and EW-32). The groundwater model predicts that with these operational changes the southern South Field and South Plume will clean up faster than previously predicted (2 years faster for the plume area south of Willey Road, and 8 years faster for the plume area north of Willey Road).

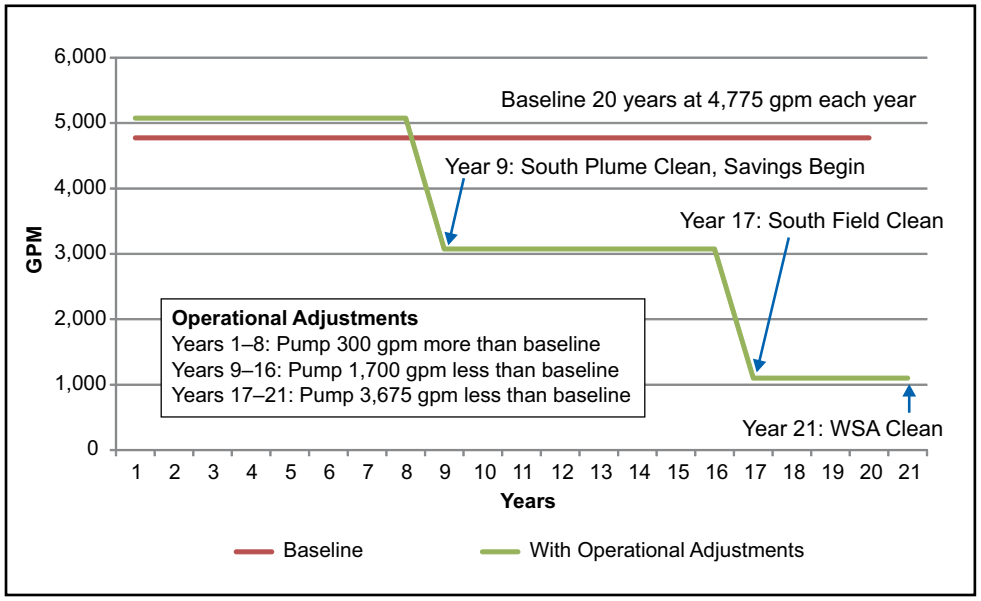

Figure 2. System pumping rates by year.

To achieve accelerated cleanup of the plume areas, the target pumping rate for the groundwater remediation system is being increased by 300 gallons per minute (gpm) for 8 years to provide an operational boost in the target area (see Figure 2). Once remediation goals are achieved, pumping can be reduced for the two remaining plume areas on DOE property, the northern South Field and Waste Storage areas (see Figure 1). Figure 2 shows that during years 9 through 16 the pumping rate will be reduced by 1,700 gallons per minute (gpm), and during years 17 through 21 the pumping rate will be reduced by 3,675 gpm. Operational costs are slightly higher the first 8 years due to increased pumping, but the upfront costs will be offset later by predicted savings due to decreased pumping, resulting in an overall predicted savings of approximately $6.0 million (see Figure 3). ❖

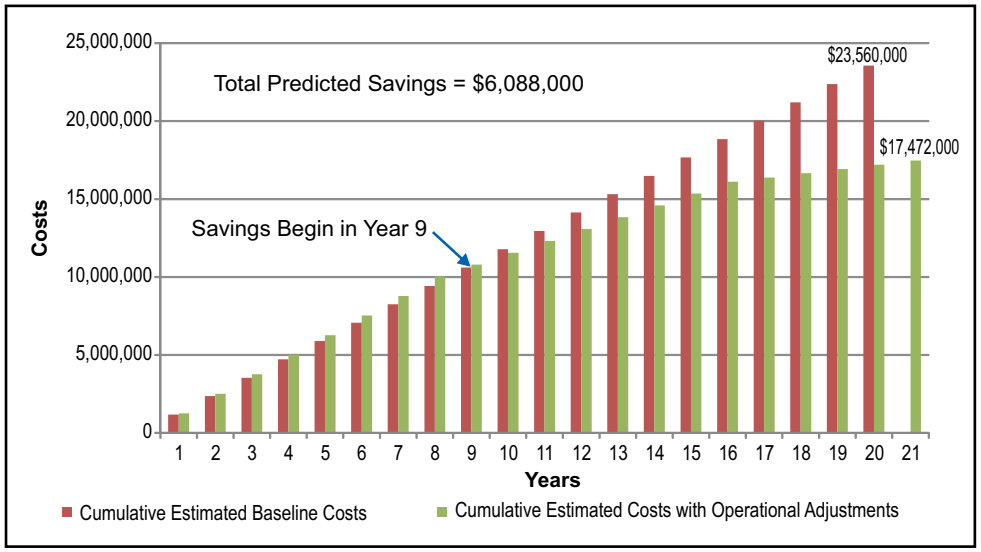

Figure 3. Cumulative estimated costs.

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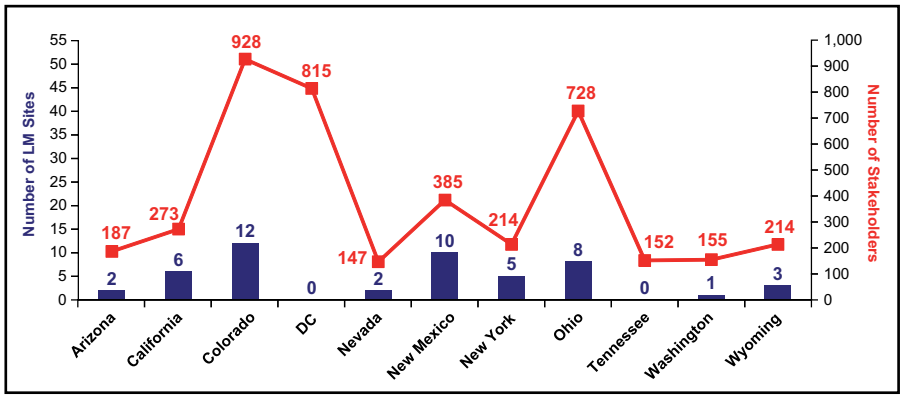
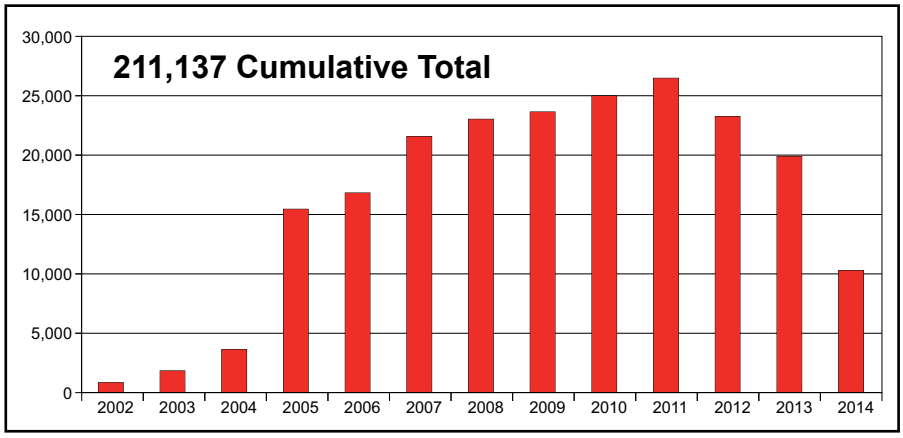
Analysis of LM Stakeholder Interaction and External Communications



Graph 3. Number of stakeholders in top ten states versus number of LM sites in each state.



Graph 4. Weldon Spring Interpretive Center visitors by year. The decrease in visitors in 2013 can be attributed to closure of the Interpretive Center June 1 through 14, 2013, as a result of storm damage and the government shutdown that occurred October 1 through 17, 2013.

LM uses a stakeholder database to track people who are interested in information about LM activities. Most LM stakeholders reside in Colorado; the Washington, DC, area; and Ohio. Graph 3 shows that most stakeholders are from areas surrounding LM sites. Although there are no LM sites in Washington, DC, the number of stakeholders in that area includes elected federal officials and employees of federal agencies (including DOE) who maintain offices there.

The analysis of stakeholder interaction also includes information about stakeholder activity at LM's largest sites: Fernald and Mound, Ohio; Rocky Flats, Colorado; and Weldon Spring, Missouri. The Weldon Spring site in St. Charles County has an interpretive center with amenities and educational opportunities for the community. Graph 4 shows the number of visitors to the Weldon Spring Interpretive Center for each year since it opened in 2002. In 2013, interpretive center tours and education presentations given by staff members were attended by 19,850 members of the community.

The complete analysis report provides more information about stakeholder interaction nationally. The *Analysis of LM Stakeholder Interaction and External Communications* report is available on the LM website at http://energy.gov/lm/downloads/analysis-lm-stakeholder-interaction-and-external-communications. ❖

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Chariot Remediation Work Completed on Schedule

About 10 workers lived at a temporary work camp from late July until early September while they removed diesel-contaminated soil and well casings from the five test-hole sites. The test-hole areas were excavated to the permafrost level. Workers were able to completely remove the casing at test hole X1; other well casings were abandoned by removing any liquids, cutting and removing existing thermistor cables, and cutting the casings off at the permafrost level. Soil samples were taken during the excavations to ensure that the cleanup goals were achieved at each location. The Alaska Department of Environmental Conservation (ADEC) was consulted throughout the project to confirm that all of the contaminated soil was removed and the soil remaining at the test-hole sites was at or below clean-soil levels regulated by the State of Alaska. About 780 tons of contaminated material were encased in 646 super-sacks, which were then placed in 41 Conex boxes, and transported by barge to a permitted disposal facility in Oregon. DOE received closure documentation from the State of Alaska for all of the test-hole sites.

"We're pleased that the work was achieved safely and on time," said Dr. April Gil, LM Environmental Team Lead.

During the remediation, LM federal and contractor staff arranged and conducted a tour of the site for community representatives from Point Hope and a separate tour for members of the Alaska media. Tour participants were able to see various stages of the remediation and have discussions about the work with Kautsky and Gil, a representative from ADEC, and contractors working on the site.

"Being open and transparent with local community members is as important to us as the work itself," said Kautsky. "That's why we invited the media and local community members to the site to witness the remediation work. We hope [our communication efforts] will help build trust [between LM and] the locals." ❖

Super-sacks are weighed before being placed in Conex containers. The Conex containers were removed by barge to a permitted offsite disposal location.

LM Chariot site manager, Mark Kautsky (center), discusses the contamination removal process with community members from Point Hope, Alaska.

LM Chariot site manager, Mark Kautsky (center), answers questions from the media near the Able test hole at the Chariot, Alaska, site.

Anticipated Legacy Management Sites Through Fiscal Year (FY) 2020

Legacy Management Goals and Objectives

Goal 1. Protect human health and the environment

Objectives

1. Comply with environmental laws and regulations.
2. Reduce health risks and long-term surveillance and maintenance (LTS&M) costs.
3. Partner with other Federal programs to make environmental remedies better and last longer.
4. Oversee DOE implementation of Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*.

Goal 2. Preserve, protect, and share records and information

Objectives

1. Meet public expectations for outreach activities.
2. Protect records and make them accessible.
3. Protect and ensure access to information.

Goal 3. Meet commitments to the contractor work force

Objectives

1. Safeguard contractor pension plans.
2. Fund contractor health and life insurance.

Goal 4. Optimize the use of land and assets

Objectives

1. Optimize public use of Federal lands and properties.
2. Transfer excess government property.
3. Improve domestic uranium mining and milling operations.

Goal 5. Sustain management excellence

Objectives

1. Renew LM's designation as a high performing organization (HPO).
2. Implement LM's *Human Capital Management Plan*.
3. Operate in a sustainable manner and reduce LM's carbon footprint.

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