WYOMING

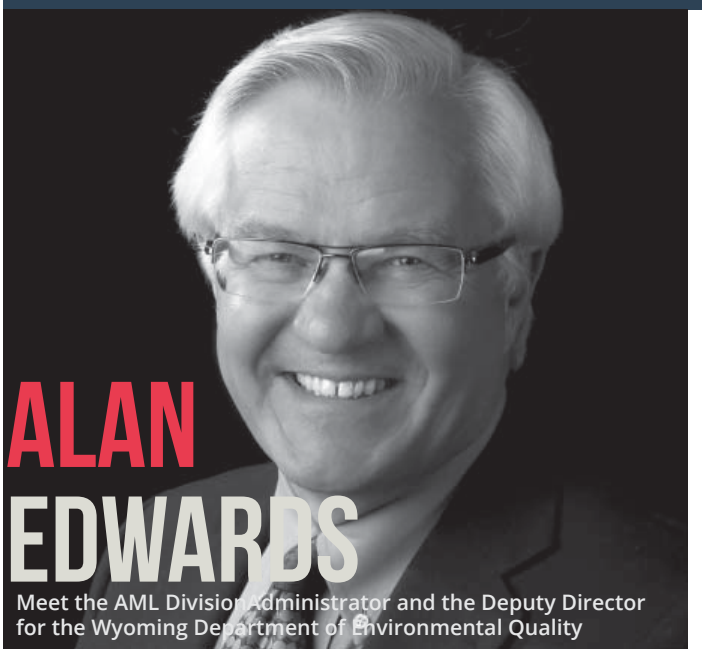
2016

Abandoned

MINE LANDS

Contents

Meet our Abandoned Mine Land Administrator



In May 2010 I had the opportunity to return to Wyoming after an extended absence to assume the positon as the Administrator of the Abandoned Mine Lands Program (AML). It did not take long to realize how fortunate it was for me to return. My career has afforded me the opportunity to work in several different and challenging areas. It is without a doubt, though, that this has been the most rewarding challenge both personally and professionally. This position provides me the opportunity to work in a strong professional agency – the Department of Environmental Quality. My role as the AML administrator gives me the opportunity to work with a strong, highly experienced team that is fully committed and dedicated to the work of the program. An extra benefit has been the ability to work with my peers in other AML programs who are as equally committed and qualified.

In truth, what is not to like about working for AML? We have the opportunity to address and correct the safety hazards posed by the remnants of the historic coal mining in the country. We also have the ability to address the environmental challenges that many of those abandoned mines represent. The public health and safety is a concern for all of us so the ability to be able to positively make an impact is extremely rewarding. AML programs provide the opportunity to provide work for reclamation contractors who in turn have the ability to provide meaningful employment to those who work on these projects. The reclamation projects provide a positive economic boost to the communities where the work is performed by the construction monies that flow through their communities, their citizens who have the opportunity to work on the projects and the benefits of a safer community. We have the opportunity to interact with the full universe of stakeholders and community leaders as we develop our projects. These are principles and values that are held by the Wyoming AML and all AML programs across the country.

This magazine is intended to provide a snapshot of the various types of projects we do in Wyoming and our accomplishments. The Wyoming AML program was officially approved by the Office of Surface Mining and Reclamation enforcement in 1983. A summary of some of the accomplishments of the program since inception are noted here. They are significant and reflect the dedicated efforts of AML staff over the years. In addition to the items noted, we are particularly proud of the improvements that have been made for wildlife habitat. Historical mining practices in many cases eliminated, or dramatically altered, the vegetation and habitat of our valued public lands. Our work has helped mitigate those historic impacts. We are proud also of our work to help re-establish habitat for sage grouse.

The accomplishments of the program are significant. But Wyoming, like all AML programs, is still not done. Every year new problems are noted or develop, some of which are very serious. This is a result of a variety of factors. The technology for finding and identifying additional areas has improved dramatically. As time passes and the historic underground mines age, time has a way of impacting those historic mines. Changes in weather, weakening of support structures and other conditions often result in collapse of the mine workings resulting in serious problems. Wyoming has a very recent example of one such case. In early September 2016 we were contacted by a commercial property owner in a Wyoming community. He said he was experiencing unusual settlement in the parking lot of the commercial property. AML investigated first by drilling an exploratory hole to help determine if it was a result of old mine workings or some other condition. Once again we were very surprised. The exploration found that there was a four (4) foot roof or cover over a void. The air void was two (2) feet over the water surface. Further exploration determined that the water was mud that extended to a depth of at least 23 feet. A downhole camera was lowered into the hole and established that the structure was approximately ten (10) foot square. It appears that we have found a previously undocumented mine shaft for a nearby abandoned mine. Additional work is underway to determine the actual depth of the feature. In this particular case, the surface subsidence was located just inside the entrance to the parking lot meaning that traffic entering and exiting the parking lot were driving over an unstable roof structure that was not known to anyone. It is very fortunate that this had not resulted in a serious accident.

We are pleased by what we have accomplished to date. Even so, we realize we are a long way from being done with AML reclamation. As with all states, our inventory continues to grow with the discovery of every new problem that is identified. We are okay with that challenge and are fully prepared to meet it.

Again, at the risk of repeating myself, what is not to like about working for the Abandoned Mine Lands program. I, for one, cannot think of one.

The Abandoned Mine Lands Division

Working to fix the problems from the past and ensuring they dont continue into the future

RECLAMATION

MITIGATION

WILDLIFE

COMMUNITY

The Wyoming Abandoned Mine Land Division (AML) is responsible for reclaiming and remediating lands disturbed by historic mining activities prior to the passage of the Surface Mining Control and Reclamation Act (SMCRA) in 1977. Reclamation includes, but is not limited to, reclaiming open pits, closing open mine shafts and adits, remediating mine subsidence features, abating mine fire impacts, and restoring wildlife habitat and rangeland values, and restoring watersheds impacted by the historic mining. Important elements of the reclamation activities are the re-vegetation of those disturbed sites and creation of stable landforms, which will return the land to the previous land use and re-establish appropriate habitat for wildlife. AML also focuses on mitigating the impacts from historic underground coal mining in communities in the state.

AML administers the Mine Subsidence Insurance Program to help protect property owners from economic loss resulting from underground mine subsidence damage. The Mine Subsidence Insurance Program offers policies to homeowners and businesses in communities impacted by historic underground coal mining for insurance to repair damage that may result from mine related subsidence. The insurance is an option available to homeowners and businesses for a reasonable fee. This program operates strictly as an insurance program.

Since the initiation of AML reclamation activities in Wyoming in 1983, reclamation activities have included restoration of approximately 27,886 acres of degraded and unproductive abandoned mine land to beneficial use as wildlife habitat and rangeland. Additionally 2,296 mine openings have been closed, and over 610,000 linear feet (approximately the distance from Cheyenne to Denver) of dangerous highwalls have been remediated. Since its inception, AML has restored approximately 127 miles of impaired streams and 1,985 acres of impaired streamlands. In FY 15 alone, AML reclaimed approximately 1,664 acres of unproductive abandoned mine lands, closed 16 mine openings, reduced 1,426 linear feet of dangerous highwalls, restored 124.8 acres of impaired streamlands and remediated 68.5 acres of lands affected by coal mine fires. Of the FY 15 reclamation completed, 66.3 acres within Sage Grouse Core area was restored for wildlife use. (Source OSM's eAMLIS as updated, 2016.)

AML has worked closely with other state

agencies such as the Wyoming Game & Fish Department (WGFD) and the State Historic Preservation Office (SHPO) and with federal agencies such as the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) to preserve important resources, and establish appropriate seed mixes for sensitive wildlife species, such as sage grouse.

In recent years, AML has implemented a geomorphic design into the reclamation of areas with surface disturbance. This process seeks to emulate the surrounding undisturbed landforms and create areas that will capture snow, control erosion, and result in more successful revegetation of those sites. AML continues to evaluate its earlier Natural Regrade™ project designs and to improve the implementation and adaptation of the software to local native conditions at the reclamation sites. This iterative process has allowed AML to further refine and modify site specific designs to achieve significant success on the ground, especially when used in conjunction with customized seeding mixtures developed to capitalize on the varied terrain produced by this technique.

AML has continued to mitigate the impacts of historic underground coal mining in communities across the state. This ongoing problem increases in scope, especially as unsupported and unmaintained underground mine workings continue to age. Slumping, cracking, and ground collapse increase over time, and are exacerbated by wet spring weather, as has occurred during the spring of 2016. In the space of a few weeks, eighteen new subsidence problems were reported to AML in the vicinity of Rock Springs, Kemmerer, Hanna, Sheridan, Reliance, Superior, and Glenrock. Some of these features were in and immediately adjacent to roadways, utilities, and residences. Mitigation of underground mine subsidence is done primarily through injecting cement grout into the shallow voids to construct support for the ground surface under the affected properties. This injection of void-fill grout, under controlled low pressures, avoids additional damage to structures and infrastructure while reducing the potential for future mine subsidence damage. Historically, grouting activities have been conducted in communities such as Buffalo, Glenrock, Rock Springs, Superior, Reliance, and Kemmerer. Because of the ongoing mine subsidence problems in so many communities, as well as in certain areas where infrastructure has been affected, AML has proactively undertaken a statewide investigation to evaluate subsidence potential in known areas of undermining. These predictive studies will guide subsidence mitigation project planning to prioritize the highest risk areas for damaging subsidence to preempt economic impacts. To date, it is estimated that about 18,393 holes have been drilled to inject approximately 480,754 cubic yards of grout for underground mine mitigation. During the last Wyoming fiscal year, three drilling and grouting contracts drilled 708 holes and delivered 46,455 cubic yards of grout to mitigate subsidence under structures and infrastructure in several locations in Sweetwater County.

GROUTING PROJECTS

Professional Geologist overseeing grout injection work on the Belt Route around Rock Springs, Wyoming

+PROTECTING THE PUBLIC

Witihin Sweetwater County over 18,000 holes have been drilled and 480,000 cubic yards of grout have been placed.

AML exploratory drilling and grouting program has been very successful in locating, mapping, drilling, and grouting abandoned mines within the state. Grouting of mined out areas is used to stabilize the surface from subsidence events. The AML program has grouted mine voids from as shallow as 15' to depths exceeding 200'. AML grouting program is used for protection of residential and commercial structures, utility corridors and local, state and federal infrastructure such as roads, bridges and utlities.

Currently, Wyoming DEQ AML has three consultants and three contractors working on mine mitigation through drilling and grouting operations.

Tools we use:

- **Mine maps and old timer's accounts of mine locations and conditions.**
- **E-logging of bore holes to verify strata conditions and rubble zones.**
- **Downhole cameras to provide a visual documentation of current conditions and right justify mine maps. Camera use has been very effective in showing haulage routes and room conditions as it relates to intact timbers, mine floor and roof conditions, void sizes, rubble conditions, and grout flow within the voids during injection operations.**

GROUTING OPERATIONS

Grouting operations of a county road and pipeline corridor by Rock Springs, WY

Grouting operations of a county road with access to Superior, Wyoming.

DRILLING AND GROUTING

Operations on a conty road with access to Superior, Wyoming

Reclamation

Project just as it started in June 2015

CUMBERLAND NO. 2 & BRILLIANT 8 MINE PROJECT

Seeding

Seeding operations at the end of the project in 2015

PROJECT INFORMATION

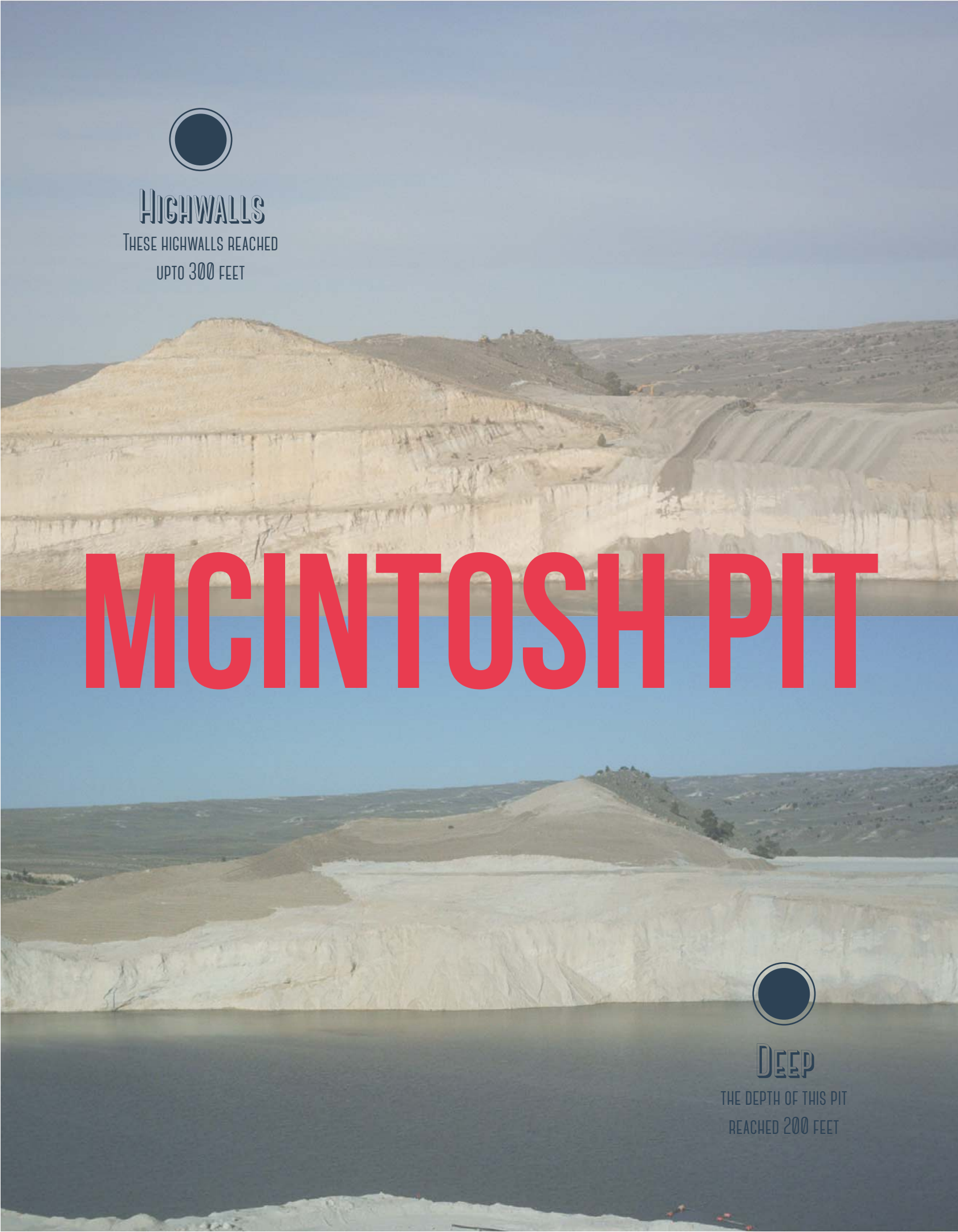
AML Project 17G-Cumberland No. 2 & Brilliant 8 Mine Fire is located in Lincoln County, near Kemmerer, Wyoming. High Country Construction, Inc., of Lander, Wyoming completed the fire abatement project at a total construction cost of $1,310,544.64. Spectrum Engineering, of Billings Montana, designed the project and provided project engineering, construction inspection, and contract administration services during construction. The project was completed on November 9, 2015.

Hot areas of actively burning coal, and hot ash beds stretched along the entire half-mile long fire face, presenting the risk of sparking brushfires, and presenting the hazard of open coal fires in an area of constant public recreational use. The locale is a patchwork of Bureau of Land Management public land and private land that is generally treated as public land with no access restrictions. The hot spots were hundreds of degrees Fahrenheit and hidden under innocuous looking ash deposits. The primary objective of the proposed work was to control the coal seam fire that was burning sporadically inside the underground mine workings and along the outcrop of the Kemmerer coal bed. This work was accomplished by excavation of relatively shallow portions of the fire, combined with constructing a soil cap over the remainder of the fire-impacted area. The cap is intended to restrict airflow to the underground coal mine fire and to repair mine subsidence and fire damaged areas. Drainage patterns were modified to redirect runoff water around the cap area and encapsulation sites. The secondary objective of the project was to clean up the ground surface and reduce the risk of coal slack fires by removing surface coal waste deposits from the hillside. A railroad siding blocking a natural drainage was also removed.

This project reclaimed approximately 58 acres of fire damaged and coal waste covered land back to a condition where it can be used as rangeland for livestock and wildlife. This site is within a Sage Grouse Core Area unit, therefore, this reclamation site, once the revegetation is well established, will close a portion of the fragmented sage grouse habitat in the area.

Statistics from this Project:

- 19,164 cubic yards of coal slack removed from the surface and encapsulated by burial.
- 2,263 cubic yards of burning coal excavated and quenched, then encapsulated.
- 45,500 cubic yards of fire-involved carbonaceous materials excavated, neutralized, and encapsulated.
- 58 acres of hazardous and unproductive land returned to beneficial use, including Sage Grouse Core Area restoration.



MCINTOSH PIT

Highwalls

These highwalls reached upto 300 feet

Deep

The depth of this pit reached 200 feet

PROJECT INFORMATION

AML Project 16-O, the McIntosh Pit, is located in the Crooks Gap Uranium Mining District in Fremont County, Wyoming, approximately 10 miles south of Jeffery City. The McIntosh pit lies within the Sheep Mountain Uranium Project. The pit is a 35 acre groundwater impoundment surrounded by highwalls that reach 300'. The depth of the pit exceeds 200'.

Goals of the project:

- Eliminate physical hazards of 7000' of highwalls
- Eliminate dangerous impoundment
- Remediate 12 MCY mine spoils. Some spoils with elevated radionuclides and heavy metals
- Restore 250 acres of intensely disturbed lands to geomorphically stable land-forms
- Enhance habitat value of McIntosh Reservoir #2, public access fishing pond
- Maintain landowner's water rights
- The project is broken into 7 Phases over 7 years at an estimated cost of $26.2M.

LIONKOL PROJECT

PROJECT INFORMATION

The Lionkol Project is located within a historic coal mining district which was extensively mined underground from the early 1900's through the 1940's, then followed by open pit mining which continued into the early 1970's. The project was completed in four phases over a six year period, with the final phase completed in the fall of 2013. Overall the project reclaimed intensely disturbed mine lands including four open pit complexes, associated mine spoils, and numerous underground mine portals, shafts, and subsidence features. In addition, miles of degraded mainstream drainages were restored.

The following is a summary of the total work completed under 17H for the Lionkol Project.

- Reduction of 4,700 linear feet of dangerous highwall
- Reclamation of 20 open portals
- Reclamation of 22.4 acres of clogged stream lands
- Reclamation of 1.7 miles of clogged stream
- Use of approximately 2,092,063 cubic yards of mine spoils as backfill material
- Regrading of 127 acres of mine spoils utilizing Natural Regrade TM designed surfaces
- Construction of 5 Surface Water Impoundments and associated rock structures
- Construction of 5 Grade Control Structures
- Construction of 2 Riprap Drop Structures
- Construction of a storm water attenuation impoundment
- Construction of 2 waste water storage ponds
- Revegetation of 345.3 Acres
- Planting of 9,600 saltbrush plants to aid revegetation.
- Re-aligned, re-graded, and resurfaced Cell Tower Access Road

DAY LOMA PROJECT

Before

Day Loma pit in 2009

pre-reclamation

After

Day Loma pit in 2016

end of Phase 6

Seeding

First year growth in Day Loma

Phase 5 Reclamation

Gas Hills Uranium Mining District

DAY LOMA PROJECT

PROJECT INFORMATION

- Nine (9) phases total, currently in Phase 7
- Total estimated project area: 644 acres
- Total estimated project cost: $21,114,221
- Total project excavation volume: 11,000,000 cubic yards
- Utilizes geomorphic reclamation for all phases.
- All reclamation phases seeded with a pit seeder.
- Reclaimed the severely impaired Coyote Creek Drainage channel, a 2,000-acre drainage basin. Spoils pinching the impaired channel were nearly vertical and 130 feet tall.

WYOMING DEPARTMENT OF

ENVIRONMENTAL QUALITY