



Tipple of Weaver Coal Mine at Gallup New Mexico, ca 1910.

Abandoned & Inactive Coal Mines of the Gallup Coal Field McKinley County, New Mexico

Final Report for Office of Surface Mining Reclamation and Enforcement
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by

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Introduction

This report on the abandoned coal mines in the Gallup coal field of west-central New Mexico brings together all the known mine and coal geology maps, coal reports, and coal mine photographs in this area. The Gallup field has been a significant coal producing area since the early 1880s. Underground mining began at this time with the construction of the railroad through the area and continued until the 1950s. The earliest coal mine in the Gallup area was the Gallup (Gibson) Mine in 1882 (Noe, 1997). Beginning in the 1960s, large scale surface mining began and continues to the present. As of 2008 over 218 million short tons of coal have been produced from the Gallup area and remaining estimated resources are over 840 million st. The Gallup area has some of the best quality coal in the San Juan basin in New Mexico and although the major strip mine in the area, McKinley mine is in a shutdown phase after 47 years of production, this area still has significant coal and potential for coal development.

Today many of these old underground mines are within the Gallup city limits and underlie areas where there has been surface development of housing tracts, schools, and shopping centers. Subsidence has been a problem in this area since the 1980s.

The city of Gallup, the McKinley County seat, has a thriving population of 20,000 people and serves as a trading area for more than six times that number. As a result of past and future urban growth above these underground coal mines numerous environmental and public safety issues are now facing the city including subsidence issues, environmental concerns from underground coal mine fires, and determining the exact location of abandoned mines and mine lands in and surrounding the city. To address the specific safety and environmental concerns detailed knowledge of the underground mine workings and location of mine openings, shafts, and adits are needed by regulatory agencies, the city of Gallup, developers and concerned citizens.

The compilation presented in this DVD allows access to the raw data through an Access Database and for the georeferenced mine maps in an ARCGis Project. PDF's of all the mine maps, mine reports, and jpeg images are accessible both within the database and ARC project and directly from folders on the DVD.

Coal Mine Database

(CoalMines.mdb)

The Coal Mine database presents coal data from the 129 known mines in the Gallup coal field. Data includes:

- Location data
- PDF (OCR'd) Reports from the Abandoned Mine Land Survey in 1980
- PDF's of the Mine Map where available
- Geologic information (Host rock, host formation, rock type)
- Mine Development & Production data
- Production from Territorial Mine Inspector or State Mine Inspector Reports
- Photographs with accompanying captions.
- References

Methodology

The database for this project is a subset of the CoalMines database for inactive mines housed at the New Mexico Bureau of Geology (NMBG). The basis for most of the data in the database is from the work done for the Abandoned Mine Lands Survey (AML) conducted in the late 1970s by geologists at the New Mexico Bureau of Geology and Mineral Resources (then the New Mexico Bureau of Mines and Mineral Resources). During this survey locations were field checked, openings photographed, and located on topographic maps. The histories of the mines were compiled by Howard Nickelson who had worked for the Conservation Division of the US Geological Survey in Carlsbad, New Mexico (see preface in Nickelson, 1988).

Locations for the mine records in the database are primarily from Nickelson, 1988; these locations are given in the PLSS (Township, Range, and Section) with distances from North line and East line of the section at the beginning of each mine description. Although the AML survey located the mines on topographic maps, the published data in Nickelson was used as the final source when there was a discrepancy in location. With this information, these points were located on topographic maps and then latitude and longitude were determined by hand. This was done several years ago on a set of topographic maps that include a sketch of the mine workings from a mine map, when available. For this study the locations were rechecked and latitude and longitude determined by projecting the data points into AllTopo and adjusting the locations when needed.

Mine locations and names of the mines, production information, ownership, were checked against data in the MILS data set (Causey, J. D., 1998). The MILS dataset was brought into Arcmap and the points were compared with the points projected from the location data in the CoalMines database. In some cases the MILS dataset used the center of a section for the location, when no more accurate location was available. The Nickelson (1988) location was used when there was a discrepancy. The NMBG Coal Data Library houses printouts from the MILS which includes references for their mine data. Discrepancies between MILS and data entered into the CoalMines database were checked by going back to the original source of the data, such as Sears (1925) or mine inspector reports.

The Territorial (1882-1911) and State Mine Inspector (1912-1962) were checked for mine names, owners, mine development and production data. The production data included in the CoalMines database is from these mine inspector reports. Geologic and other information about these inactive mines was gleaned from Sears (1925) report on the Gallup field and from Shaler's (1907) earlier work in the area. Sears (1925) Plate 1 shows many of the areas mine locations as well as the coal beds being mined at the time. This information is included in geologic information.

The AML survey produced individual mine reports (Nickelson, 1979) with field photographs, historical information, and problems that needed reclamation. These have been scanned and a link to open individual pdfs for the associate mine is available through the CoalMines database. Information about mine fires or subsidence shown on the Environmental tab of the CoalMines database form were found in Nickelson, 1979, Nickelson, 1988, the mine inspector reports and Sears, 1925.

The Geologic Information Center (GIC) houses the old coal mine maps and these have been scanned and catalogued in the NM Map database, managed by Maureen Wilks.

The most complete map available for a mine was used in this project for georeferencing. Each map was brought into ArcMap and referenced by points on the quadrangle base maps. Further description of how these maps were georeferenced is in the map layers explanation. Within the CoalMines database if a record has a mine map a pdf can be called up through a control button on the CoalMines form.

Within the CoalMines database there is an audit trail to track changes for each record. In the upper right hand corner there is a control button to view the changes for each record. The audit trail lets the user see what changes have been made. In the query objects the DeletedRecords_from_AuditTable query allows the user to see records that have been deleted and generally a reason has been entered in the Comment field to indicate the reason for deletion.

ARC Project

(GallupMines.mxd, GallupMines_rdr.pmf)

ArcMap project coordinate system is NAD1927 UTM Zone12N, Transverse Mercator. NAD 1927 was chosen because the quadrangle maps for this area were created in this projection.

Description of layers in ArcMap and ArcReader projects.

The ArcMap project coordinate system is NAD1927 UTM Zone 12N, Transverse Mercator. NAD 1927 was chosen because the quadrangle maps for this area were created in this projection. Each layer is described below. This data is also found in the properties of each layer within ArcMap with credits.

Gallup Mines:

Locations of abandoned and non-active coal mines in the Gallup area. Locations derived from Nickelson, 1988. Associated data in the table is from Nickelson, 1988 and various other references found in the CoalMines Access database. The file used to create these data points resides in the CoalMines database - GallupMines_GIS and is an abbreviated set of the data fields associated with each coal mine record. Coal mines that have associated mine maps have hyperlinks.

Surface coal mine permit areas:

Surface coal mine permit areas in the Gallup field. Shape file is from the EMNRD, Mining and Minerals Division in Santa Fe, NM.

Coal Geology:

Layer shows outcrop and 200 ft overburden lines from Beaumont, 1998, NMBGMR Resource map 19. Georeferenced map and cropped to Gallup coal area. Purple is Dilco Coal Member of the Crevasse Canyon Formation - Kccd. Green is Cleary Coal Member of the Menefee Formation and Gibson Coal Member of the Crevasse Canyon Formation, undivided.

Mine Maps:

Mine maps for the Gallup coal field. Maps were scanned as tiff images, and then indexed to have the fewest number of colors and reduce the size of the tiff file. To georeference the tiff, the appropriate mine was selected from the Gallup mines layer and zoomed to the selection. The map was fit to the display area and points on the map that could be matched with the underlying quadrangle, such as section corners, centers, and quarters along section boundaries were matched in the georeferencing tool. The map was then rectified. Using the rectified image, the map was clipped setting maximum and minimum extents to eliminate no data areas. After clipping, the colormap (indexing) was reapplied and the display was set to have 15% transparency.

AML Maps:

These layers are quadrangles with locations from the Abandoned Mine Land study done in the late 1970s- early 1980s. One set has numbered mine locations; the second is an overlay with problem areas identified by the study. Maps were scanned as Tiffs, palletized and georeferenced. The georeferenced maps were clipped.

USGS Bull. 767, Plate 1:

Plate 1 from USGS Bulletin 767, by J.D. Sears, 1925. Geology and Coal Resources of the Gallup-Zuni basin, New Mexico. Map is georeferenced; however there are discrepancies that could not be resolved because of the odd shapes of many of the sections in this area. Map has many mine locations and coal bed outcrops.

Gamerco Ownership:

Map from Gamerco report showing ownership in the Gallup area. Tiff was georeferenced using quadrangles to match up sections. A PDF of this map resides in the Ownership folder (\minequads\Ownership\Gamerco_Map.pdf). Reference for report:

A portfolio of assets owned by Gamerco Associates, Ltd., Prepared for Charles High, Managing Partner, Gamerco Associates, Ltd. 300 West Hill, Gallup, New Mexico 87301

Surface Ownership:

Surface ownership for Gallup coal area clipped from BLM (2008) coverage. Download from New Mexico Resource Geographic Information System Program -RGIS:

<http://rgisbeta.unm.edu/browsedata>

Mineral Ownership- US Government

Clipped shape file of mineral ownership from BLM shape file Download from New Mexico Resource Geographic Information System Program -RGIS:

<http://rgisbeta.unm.edu/browsedata>

Quadrangles:

These quadrangles have sketches of mine workings as well as locations from Nickelson, 1988 (NMBG Bulletin 111). The mine workings were sketched on the maps looking at the mine maps and using Nickelson's locations (From north line, from east line). Maps were scanned as tiff images. The tiff images were then palletized to have the minimum number of colors and reduce the size of the tiff. Maps were georeferenced using 16

points - the corners and 2.5 minute tick marks generated from an excel macro developed for our State Map project. Using the georeferencing tool these maps are georeferenced, and then clipped with a polygon that is in Nad27 utm zone12.

DVD Directory

Directories are set up for ArcMap and follow structure used in the layers within the project.

AML Maps: Abandoned Mine Land Survey maps

Bull767

Coal Permits: Surface coal permits shape files

Data

- PDF's (AML Reports)
- Photos
- CoalMines.mdb
- GallupMines_noMaps.xls
- ListofMines.doc
- MILS_2.dbf
- MineRef.pdf (References for this project)

Info

MineMaps: Mine map files used in ArcMap and pdfs used in CoalMines database

Ownership: Surface, Mineral Ownership shape files and Gamerco ownership georeferenced image

Quads: Georeferenced Quadrangles used as base maps in ArcMap

RM_19: Coal Resource Map 19 georeferenced image

ArcReader_WebLink.doc

GallupMineMaps.mxd (ArcMap Project)

GallupMineMaps_rdr.pmf (Arc Reader Project)

OFR530_Report.pdf

References

Causey, J. D., 1998, MAS/MILS Arc/Info point coverage for the western U.S., excluding Hawaii, U.S. Geological Survey Open-File Report 98-512,

Nickelson, H. B., 1988, One hundred years of coal mining in the San Juan Basin, New Mexico, New Mexico Bureau Mines Mineral Resources, Bulletin, v. 111, pp. 1-226.

Noe, Sally, 1997, Our Gallup, New Mexico, U.S.A. Story, The Donning Company Publishers, pp. 1-192

Sears, J. D., 1925 Geology and coal resources of the Gallup-Zuni Basin, New Mexico, U.S. Geological Survey, Bulletin, v. 767, pp. 1-53.