Site Location:
The Lewis Mine Fire is located on private property north east of the Marshall Drive – Cherryvale Road intersection in unincorporated Boulder County.
Site Description:
The Lewis Coal Mine was a small production coal mine that operated between 1914 and 1946 \(^1\). The Davidson Ditch, a water supply ditch built in the late 1800s, crosses the Lewis Site \(^2\).
Site Description:
Surface subsidence resulting from the shallow mine workings began almost immediately after mining at the Lewis Coal Mine was complete.
Site Description:
Surface subsidence remains readily visible today as north-south trending linear depressions.
Geologic Setting:
• The Lewis Site is located in the lower portion of the Cretaceous Laramie Formation.
Geologic Setting:

- The lower portion of the Laramie Formation consists of sandstones interlayered with clays, shales and coal seams.
- Coal Seams in the area generally range from 2 feet to 14 feet in thickness\(^4,5\).
- The Site is bounded by the Peerless fault on the East and the Fox Fault on the west\(^4\).
Geologic Setting:
The No. 3 coal seam which ranges from 3 feet to 14 feet thick was the most extensively mined seam in the Marshall area\(^{2,3}\).
Mine Fire & Subsidence:

- The initial cause of the Lewis Mine Fire is unknown but likely resulted from spontaneous combustion.
- Observations from long time local residents indicate that the Lewis Mine Fire has been burning for more than 50 years.
- Subsidence related to the mine fire and shallow mine workings continues.

Lewis Mine Fire Mitigation
Mine Fire & Subsidence:
In 1987 due to the mine related subsidence a 600 foot section of the Ditch was lined with concrete.

Lewis Mine Fire Mitigation
Mine Fire & Subsidence:
The Lewis Mine Fire continues to burn at a low intensity adjacent to the south edge of and possibly underneath a portion of the concrete lined section of the Davidson Ditch\(^2\).

Lewis Mine Fire Mitigation
Mine Fire & Subsidence:

- Ground subsidence continues threatening the integrity of the Davidson Ditch.
- When installed in 1987 the ground surface on the south side of the Davidson Ditch matched the elevation on the north side.
Subsurface Investigation:
In the winter of 2023 Colorado DRMS initiated a subsurface investigation to further delineate the nature and extent of the Lewis Mine Fire.
Subsurface Investigation:

- Twenty seven (27) borings were completed surrounding the area of active surface venting \(^2\).
- Temperature probes were installed in 21 of the boings.
- The remaining 6 boings were completed as groundwater monitoring points.

Adapted from Lewis Mine Underground Coal Fire Report of Investigations, 2023

Lewis Mine Fire Mitigation
Subsurface Investigation:

- Results from the subsurface investigation indicate the uppermost coal bed is approximately 10 to 20 feet below ground surface\(^2\).
- Heat is localized to an area 2,500 ft\(^2\) in size centered around the active surface vents\(^2\).
- The maximum subsurface temperature measured was 144\(^\circ\) F.
- Surface and subsurface observations are consistent with a low intensity, smoldering coal fire.

Adapted from Lewis Underground Coal Fire Report of Investigations, 2023
Mitigation:

- Colorado DRMS will mitigate the Lewis Mine Fire by excavating the burning coal and blending this material with the cold overburden.
- Additionally the subsidence under the Davidson Ditch to the west will also be addressed.
Mitigation:

• A 300 foot section of the Davidson Ditch will be removed.
• The area will be excavated to just below the Lewis Mine workings, approximately 25 feet to 30 feet below ground surface.
Mitigation:

• Any material exceeding 100°F will be blended with cold overburden (rock & soil) at a ratio of 5 parts cold material to 1 part hot material.

• This process breaks up any hot or smoldering material and disperses it within the cold soil and rock.
Mitigation:

- The blended material will then be monitored until the temperature is less than 100°F.
- Once cooled, the blended material will be backfilled into the excavation.
Mitigation:

- **BLENDDING AND EXCAVATION OF MATERIAL EXCEEDING 100°F WILL NOT BE PERMITTED IN EXTREMELY WINDY CONDITIONS.**

- Blending and excavation activities will be halted if a Red Flag Warning is issued for the area of the Lewis Site by the United States National Weather Service.

Lewis Mine Fire Mitigation
Mitigation:

• In the event that blending operations are halted for high winds any material exceeding 100° F shall be immediately covered with a minimum of two feet (2 ft) of cold overburden.
Mitigation:

- The excavated area beneath the Davidson Ditch will be backfilled with clean, non-carbonaceous (non-coal) compacted fill.
- Depending on Site conditions clean fill material may need to be imported to the Site.
- A 24-inch compacted clay liner will be installed in the reconstructed section of the Davidson Ditch.
Mitigation:
• Any areas disturbed by the mitigation effort will be regraded to match the surrounding undisturbed topography.
• The site will then be seeded with a native seed mix developed for the area.

Lewis Mine Fire Mitigation
Questions:

• Q: Is exposing smoldering coal at the surface for cooling safe?

• A: Colorado DRMS has safely and successfully utilized the excavate and blend method for mitigating three much larger and hotter subsurface coal fires. As previously mentioned, any hot material will immediately be blended with cold soil and rock. In DRMS’ experience the blended material rapidly cools to below 100°F in 48 to 72 hours.
Questions:

• Q: Will hydrological changes occur due to the mitigation of the historical mine workings?

• A: According to the Colorado Geological Survey the project area is not within a significant alluvial aquifer or area of significant ground water recharge. The excavation work being done as part of the mitigation effort will not extend below the local groundwater table and should have little to no impact on the local water table.
Questions:

• Q: The Davidson Ditch failed in this general location during the 2013 floods. Will the rebuilding of the ditch in this location address this risk?

• A: The portion of the Davidson Ditch that was overtopped during the 2013 flood event is not within the Lewis Mine Fire Mitigation project area. The portion of the Davidson Ditch that will be replaced after the completion of the mitigation effort is designed to contain flows greater than the existing upstream Ditch segments.
Questions:

• Q: The 2013 and 2018 Inventory Reports indicated the Lewis fire was partially on City of Boulder property. What monitoring has been conducted to show it isn’t still on City property?

• A: Although the Lewis Coal Mine workings extend onto the City of Boulder OSMP property no evidence of heat or coal combustion has been observed since the 2013 Underground Coal Fire Report. The 2018 observation of airflow slightly above ambient temperature is consistent with air moving into and out of underground mine working as the underground air pressure equalizes with the atmospheric air pressure.
Questions:

• Q: A citizen reported smoke rising from the ground on Dec 30, 2021 approximately 1000 feet northwest of the Lewis site. Has the State evaluated this location?

• A: The area was scanned thermally in the days following the Marshall Wildfire and no heat or snowmelt was observed at the location in question. Additionally the area was again thermally scanned on August 18, 2023 and visited by DRMS personnel on August 24, 2023. No heat or evidence of coal combustion was observed in this area.

Thermal imagery form the area of reported smoke January 14, 2022. No areas of heat significantly above background were detected. Note the bright white heat signatures from structures in the upper left.
Questions:

Q: Are the Lewis and Marshall Mine networks connected?

A: The Mines at the Lewis Site and the mining at the Marshall Mesa Trailhead Site are not connected. They are separated by the Fox Fault which cuts through and vertically separates the coal layers. Additionally they lie on opposite sides of Marshall Creek which is a perineal gaining stream representing the intersection of the top of the groundwater table and the land surface. Any mine workings extending under Marshall Creek lie beneath the groundwater table and are flooded.
Questions:

• Q: Is DRMS monitoring the Marshall Site and what is the schedule for reclamation and trailhead improvements at the Marshall Mesa Trailhead?

• A: This past winter DRMS installed 67 temperature monitoring points to compliment the 9 preexisting temperature monitoring points at the Marshall Mesa Trailhead site. DRMS is continuing to monitor the Marshall Site and currently developing a mitigation strategy in coordination with the City of Boulder and Boulder County. Mitigation efforts are tentatively scheduled to begin in the summer of 2024.
Questions:
• Q: What long term monitoring will be conducted?

• A: Several of the temperature monitoring points installed during the 2023 subsurface investigation will remain in place at the Lewis Site once mitigation efforts are complete. The Lewis Site will continue to be monitored periodically to determine the effectiveness of the mitigation effort.
Questions:

• Q: Is there a point of contact with the State for the community to reach out to with questions?

• A: Questions regarding the Lewis Mine Fire Mitigation project may be directed to: dnr_lewismine@state.co.us.

A web page dedicated to project progress and updates will be available starting October 1\textsuperscript{st} and accessible through the Colorado DRMS website: https://drms.colorado.gov/
Lewis Mine Fire Mitigation

Works Cited:


8) Colorado Div. of Reclamation, Mining and Safety, 2013, Summary of Underground Coal Fires in Colorado, https://drive.google.com/file/d/18t34wO9UDfMGQ91IHQdx21QB84WgLw/view


Lewis Mine Fire Mitigation

Thank You

Colorado Department of Natural Resources
Division of Reclamation Mining & Safety
Inactive Mine Reclamation Program
https://drms.colorado.gov/
Email: dnr_lewismine@state.co.us