STATE OF COLORADO

Simmons - DNR, Leigh <leigh.simmons@state.co.us>

Fall 2024 Subsidence and Geologic Field Observations Report

Jonathan Kelly <jkelly@wrightwater.com> Wed, Apr 30, 2025 at 11:50 AM
To: "leigh.simmons@state.co.us" <leigh.simmons@state.co.us>
Cc: "Munz, Bob" <RobertMunz@coreresources.com>

Leigh,

Please see the attached Fall 2024 Subsidence and Geologic Field Observations Report.

Sincerely,

JONATHAN KELLY, P.E.

Principal Engineer

Chief Financial Officer

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2024 Fall Subsidence Report.pdf
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Fall 2024 Subsidence and Geologic Field Observations

Southern Panels, Sunset Trail, and Apache Rocks West Mining Areas

PREPARED FOR:
Mountain Coal Company, LLC
West Elk Mine
P.O. Box 591
Somerset, CO 81434

PREPARED BY:
Jonathan M. Kelly, P.E.
Wright Water Engineers, Inc.

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April 2025

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April 30, 2025

Mr. Leigh Simmons
Colorado Division of Reclamation, Mining and Safety
1313 Sherman St., Rm. 215
Denver, CO 80203

Re: Fall 2024 Subsidence Monitoring Report Preparation – Mountain Coal Company, LLC.

Dear Mr. Simmons,

The following report entitled *Fall 2024 Subsidence and Geologic Field Observations Southern Panels, Sunset Trail, and Apache Rocks West Mining Areas,* was prepared by Jonathan M. Kelly (a licensed professional engineer) and employee of Wright Water Engineers, Inc.

Sincerely,

WRIGHT WATER ENGINEERS, INC.

By _____
Jonathan M. Kelly, P.E.
Chief Financial Officer/Project Manager

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FALL 2024 SUBSIDENCE AND GEOLOGIC FIELD OBSERVATIONS SOUTHERN PANELS, SUNSET TRAIL, AND APACHE ROCKS WEST MINING AREAS[1]

1.0 BACKGROUND

This subsidence report is the second of two detailed documents on this subject to be generated based on 2024 calendar year observations. These reports of subsidence-related observations associated with the West Elk Mine have occurred annually between 1996 and 2006, and biannually since spring 2007. In accordance with Mountain Coal Company, LLC's (MCC) Colorado Division of Reclamation, Mining and Safety (CDRMS) permit, these subsidence reports are to be submitted by April 30 (for preceding fall monitoring) and by September 30 (for preceding spring monitoring) of each year.

Prior field observations and experience in the West Elk Mine area over the last twenty-nine years[2] (1996 to 2024 inclusive) indicate that subsidence-related features (cracks and bulges) are most visible on roads, well pads, and trails, where the ground is compact and free of brush. These areas have been, and will continue to be, the focus of the biannual observations. Other subsidence features such as rockfalls and landslides are generally observable from overview locations along roads or on well pads and have been, and will continue to be, noted when they occur.

Fall 2024 subsidence observations were performed on October 15, 2024, in the Southern Panels Mining Area with specific focus on the E-seam Longwall Panels 14, 15, and 16, in the Sunset Trail Mining Area relative to the E-seam Longwall Panels SS2 through SS3, and over Longwall Panel

[1] The Southern Panels Mining Area includes the E-seam Longwall Panels E1 through E8 included in the South of Divide Mining Area, some of which were included in the Dry Fork Mining Area. Also included in the Southern Panels Mining Area are E-seam Longwall Panels E14 through E16. The Southern Panels Mining Area also includes planned B-seam Longwall Panels B26 through B29 that underlie E-seam Longwall Panels E1 through E5. The term Southern Panels Mining Area will be used throughout this report to identify what was formerly referred to as the South of Divide and Dry Fork Mining Areas. The Sunset Trail Mining Area represents four panels (SS1 through SS4) located to the south of E-seam Longwall Panel E8 of the Southern Panels Mining Area. The Apache Rocks West Mining Area includes E-seam Longwall Panels E10 through E12 as well as B-Seam Longwall Panels B12, B13, and B13A.

[2] Annual subsidence and geologic hazard reports are maintained at Mountain Coal Company, LLC, and at the Colorado Division of Reclamation, Mining and Safety, and are exhibits to the permit document (Exhibits 60, 60A, 60B, 60C, 60D, and 60E).

E12 in the Apache Rocks West Mining Area. Traverse names used in the previous reports may not coincide with those used in this report. Observations associated with E-seam longwall mining of Panels E1 through E8 can be found in earlier reports. Observations of the Apache Rocks and Box Canyon B-seam Mining Areas are covered in reports prior to 2013.

During the fall 2024 field visit, accessible areas within the Southern Panels, Sunset Trail, and Apache Rocks West Mining Areas were visited, examined, and photographed to document subsidence-related features observed since the last field visit and to record newly observed features for future reference (see Maps 1 and 2). Field observations were made from a four-wheel drive vehicle and by foot as needed.

Thirteen photographic observation points with number designations were established and used starting in 2007 to view and assess changes that may occur as a result of mining. In 2016, all references to number designations for these locations were dropped. These historical photographic observation points are now checked only occasionally to assess substantial changes (i.e., no rockfalls or landslides). However, repeated visits and photographic documentation over several site visits are commonly performed once a subsidence feature is observed to track either further exacerbation of the feature or, more typically, ongoing weathering and disappearance.

2.0 GENERAL SUBSIDENCE OBSERVATION AND REPORTING

On October 15, 2024, Wright Water Engineers, Inc. (WWE) observed surface subsidence and geologic field conditions of the Southern Panels, Sunset Trail, and Apache Rocks West Mining Areas (consistent with current Exhibit 60E) for MCC relative to their coal mining activities. Mining in the area is performed below the surface within the West Elk Mine using longwall mining methods. Similar surface observations have been made annually since 1996 and semi-annually since 2007 to assess potential longwall mining effects on the environment.

Based on field observations from 1996 to fall 2024, the effects of longwall mining above the West Elk Mine have been less than initially projected as reported in Exhibit 60 (Dunrud et al., 1998 rev.) and 60E (WWE, 2012). Rockfalls and/or landslides were generally observed only sporadically in the Box Canyon Mining Area since 2006 where the steep, upper reaches of Sylvester Gulch and Box Canyon abut the large geographic feature known as West Flatiron. In the flatter and more rounded topography of the Apache Rocks, Southern Panels, and Sunset Trail Mining Areas, the rockfall and landslide potential is much smaller. However, subsidence-related tension cracks have occurred in these mining areas, particularly above the active longwall mining face.

E-seam longwall mining in the Southern Panels Mining Area was initiated on Panel E1 in December 2008 beginning at the east end and progressing westward. All mining in the Southern Panels Mining Area has been planned to progress from the east to west across the panels. As of 2020, mining was complete in E-seam Longwall Panels E1 through E8. Mining of the E-seam Longwall Panel SS1 in the Sunset Trail Mining Area was initiated in January 2020. Mining of Longwall Panels SS1 through SS4 (as revised) was completed by August 2023 (Map 1).

Beginning with the Spring 2011 Subsidence Report, an effort was made to reduce the size of the semi-annual subsidence reports by eliminating much of the regularly included background and historical information (e.g., subsidence projections). For this reason, specific details associated with subsidence projections and field recognition of subsidence and non-subsidence features were eliminated. Since that time, readers have been directed to Sections 1.0 and 2.0, respectively, of the Spring 2011 Subsidence Report and to Exhibits 60 and 60E of the West Elk Mine permit for this information.

Also, in keeping with the goal of reducing document size, the reports since 2011 have focused on the identification and discussion of those observations that reflect an obvious change in the conditions overlying the active portion of the mine and on documenting baseline conditions in areas that have yet to be mined. For this reason, observations from the fall 2024 field visit were focused on areas above mined E-seam Longwall Panels E14, E15, and E16 in the Southern Panels Mining Area, on E-seam Longwall Panel SS2 and SS3 of the Sunset Trail Mining Area, and on E-seam Longwall Panel E12 of the Apache Rocks West Mining Area.

Readers should note that observations are discussed relative to traverses along segments of drill roads providing access to drilling pads containing mine ventilation boreholes (MVBs). Given the dynamic nature of the mining activities (i.e., adding and reclaiming of road segments and MVB pads), future naming of traverses will likely vary from report to report. Specific nomenclature for observed features will be regularly represented on Map 1 of each report.

3.0 SUBSIDENCE MONITORING

MCC has been collecting data from monitoring locations near Minnesota Reservoir and Monument Dam, as well as numerous locations within the mining areas for many years. Ongoing monitoring by MCC personnel includes the U.S. Forest Service (USFS) roads and stock ponds, as well as the Monument Dam and Minnesota Reservoir area. Inspection forms for these areas are provided in Appendices A and B, respectively.

3.1 USFS Roads and Stock Pond Monitoring

Observations by MCC personnel of the USFS roads and stock ponds in the vicinity of active mining activities have occurred for many years. Inspection forms from observations conducted during 2024 are included with this report in Appendix A.

3.2 Monument Dam/Minnesota Reservoir Monitoring

As described in previous subsidence reports, MCC has conducted monitoring of the Monument Dam and strategic locations around Minnesota Reservoir since 2006. Currently, MCC has monitoring and reporting responsibilities for the land survey stations. Dam Inspection Forms for Monument Dam from January 2024 through December 2024 are provided in Appendix B.

Quarterly land surveys of the monuments (monthly when mining is within one mile of the dam) were completed. A summary of height and longitudinal displacement data is obtained by MCC. However, with advancing technology and more stringent regulations, MCC updated the Survey Monitoring System. New base point data, using the new technology that was required for MCC to obtain in order to comply with dam monitoring requirements. Fall 2023 data became the new base point data set for future displacement, as opposed to the 2006 data that was previously used. Appendix C shows the survey data in July and November 2024 for Monument Dam.

4.0 FALL 2024 SUBSIDENCE OBSERVATIONS

During WWE's fall 2024 field visit, pre-existing features were observed at various locations along the established traverses above mined E-seam longwall panels in both the Southern Panels and Sunset Trail Mining Areas as accessed by USFS Road 711 (Dry Fork Road) and on MVB pads, particularly where they exist above recent mining activities. However, WWE has ceased visiting historical features over Longwall Panel E7 that had been mined years ago and have been thoroughly documented in previous reports without significant changes. Similarly, previous traverses over Longwall Panels E3 through E8 were replaced with new traverses over active mining or proposed mining areas. Subsidence features previously observed over mined E-seam Longwall Panel SS1 were no longer visible or have been lost due to reclamation; therefore, observations over this panel were ceased.

Observations previously made over Longwall Panel SS2 from the northeast were replaced by a new traverse E-E' from the south to observe the area overlying the western portion of the panel that was mined since the fall 2021 field visit. Traverse E-E' also provided access for observations over Longwall Panel SS3. The access road to Longwall Panel SS4 has been reclaimed, so no observations were made over that panel.

No subsidence-related features were observed in alluvium, even above active longwall mining activities.

The remainder of this report provides a detailed discussion of new or recent observations associated with Traverses A-A' through F-F' (see Maps 1 and 2) as observed during the fall 2024 field visit. Details associated with these observations can be found in Sections 4.1 through 4.6 of this report. Map 1 shows the outline of E-seam mine workings along with surface topography and other surface features, including the named traverses. Map 2 shows the same area and detail as Map 1 (minus traverses) along with landslide and rockfall areas as delineated from aerial photo research and field observations.

4.1 Traverse A-A'

This traverse overlies portions of recently-mined E-seam Longwall Panel E12 and previously-mined Longwall Panel B13A in the Apache Rocks West Mining Area. Traverse A-A' originates just south of Monument Dam (and Minnesota Reservoir) and proceeds in a northerly direction across the dam and along Horse Creek, a distance of less than a mile. The southern end of this traverse is adjacent to Minnesota Reservoir and outside the proposed E-seam longwall mining influences. The northern end of this traverse is at the northern edge of Longwall Panel B13A (see Maps 1 and 2).

This traverse was important to observe because it was the area of the most recent mining in the E-seam and an area where B-seam mining had previously occurred. E-Seam overburden thickness over Longwall Panel E12 ranged from roughly 300 to 600 feet along the traverse. The area was accessed by foot using an existing hiking trail and observations were limited to the trail due to the vegetative cover elsewhere.

4.1.1 Location 6

A series of small cracks were observed along the trail that appeared to be subsidence related due to the frequency and linear nature of the cracks, the location relative to the longwall panel layout, and the fact that mining had recently occurred beneath the trail. Based on the mining progression map, Traverse A-A’ was mined under around April 2024, approximately 2 months prior to the spring observations.

Figure 1 shows one of the larger cracks observed in spring 2024 along this traverse. Most of the cracks had no discernible width and were very shallow. This crack was no longer evident in fall 2024 (Figure 2).

Figure 1: Small subsidence crack on the trail along Horse Gulch overlying Longwall Panel E12 during spring 2024. These cracks were no longer evident in fall 2024.

WWE has observed similar cracks at locations recently mined under in the E-seam longwall mining panels. Typically, these cracks are due to dynamic subsidence processes and heal/seal within a short timeframe. Observations during fall 2024 showed these cracks followed a similar pattern and were likely tension cracks that closed after the mining face had moved through the area.

Figure 2: Sealing of tension cracks was observed along Traverse A-A'.

Given the shallow overburden and the presence of two-seam mining, it was surprising that there was not more surficial evidence of the mining activity. The small tension cracks that were observed in spring 2024—shortly after mining had occurred beneath the traverse—were difficult to discern, indicating that they were likely short-term tension cracks that had sealed once the adjacent ground subsided.

4.2 Traverse B-B'

Traverse B-B′ begins where the Deer Creek drainage meets the Dry Fork Road (Traverse A-A′). It continues southward up the Deer Creek drainage, past a gate located near two manufactured stock watering troughs (fed by a nearby spring), to an intersection with another road located between the E-South Mains and E-seam Longwall Panel E14, a distance of approximately one-and-a-half miles (see Map 1). Two additional stock ponds (P74 and P93) with earthen embankments are located lower in the drainage. Both of these ponds are also fed by nearby springs. This traverse is mostly located between the E-South Mains and the western ends of mined E-seam

Longwall Panels E3, E4, E5, E6, and E7. The termination of this traverse (B′) is at Traverse C-C′, which proceeds both northwest and southeast from the intersection.

No subsidence-related features were observed along this traverse during the fall 2024 field visit.

4.3 Traverse C-C’

Traverse C-C’ is intersected by the end of Traverse B-B’ and extends from E-Seam Longwall Panel E15 to the northwest to the E-Seam Longwall SS Panels to the southeast, where traverse E-E’ originates. En route the traverse runs along the north side of E-Seam Longwall Panel E14, which was mined from mid-April through mid-September of 2022. The traverse also crosses Lick Creek and South Prong stream channels, providing an opportunity to observe whether there has been any observable longwall-mining induced subsidence impact to these drainages.

Traverse C-C’ extends to the northwest over the E-seam Longwall Panel E15. The road was passable for the initial stretch in our four-wheel drive vehicle, after which the rest of the observations had to occur on foot.

The traverse provided an opportunity to observe areas that had been mined beneath within the past couple of years. The segment southeast of the intersection with Traverse B-B’ was immediately adjacent to Longwall Panel E14. Location 2 is located over the E14 Headgate as shown in Map 1.

In addition to the observations made on the traverses along the access roads, WWE made considerable effort to make observations over the Sunset Mains South, where robbing of the pillars occurred. Traverse C-C’ crossed over the northern portion of the mains where the pillars were robbed; however, game trails that provided access to the southern areas were identified for additional observations where the overburden was at the minimum. No subsidence features were observed either along the roadway or along trails where the pillars were robbed.

4.3.1 Location 1

Location 1 was a new rockfall that was observed along the access road at the eastern edge of Longwall Panel E14. Figure 3 shows the large boulder that was observed for the first time during the fall 2024 site visit. There was no evidence that the rockfall was related to mining activity,

especially since mining of Longwall Panel E14 concluded in 2022. The rockfall may have been related to ongoing road maintenance activities that could have destabilized the boulder from the hillside above the road.

Figure 3: New rockfall observed along access road, though the cause is unclear.

4.3.2 Location 2

New cracks were first observed south of the access road overlying the north end of E-seam Longwall Panel E14 during the fall 2022 site visit. As shown on Map 1, the cracks were observed at Location 2 adjacent to cross cut 17 of the E14 Headgate. A series of parallel cracks were observed roughly parallel to the E14 Headgate with an orientation of South 40° East. The largest of the observed cracks followed the topographic contour for approximately 100 feet (Figure 4).

Figure 4: The largest of the cracks observed at Location 2 in fall 2022, south of the access road on Traverse C-C'.

The location of these cracks is consistent with locations where the tilt and horizontal displacement are largest near the edge of the panel as shown in Figure 3 of Exhibit 60E (WWE 2018). The existence of the series of parallel cracks was likely a combination of these horizontal strains in combination with the natural sloped hillside. In total, there were 5 cracks observed with the dimensions of the cracks generally decreasing in the downhill direction towards the center of the longwall panel.

During the fall 2024 site visit, these cracks were still evident but were much less prominent. The smaller cracks had largely healed/sealed, especially where cattle or large game trails occurred. The

larger cracks continue to heal; however, the sealing process appears to have stopped as some of the largest cracks remain open (Figure 5).

Figure 5: Continued healing of subsidence cracks overlying Longwall Panel E14 on Traverse C-C'.

4.3.3 Location 5

A newly-observed crack was documented along the path overlying E-seam Longwall Panel E15 as shown in Figure 6.

Figure 6: New crack observed over Longwall Panel E15 during spring 2024 site visit.

The crack was at a location that indicates mining occurred shortly after the fall 2023 site visit, at which time no subsidence features were observed. The crack appeared fresh, consistent with the timing of mining occurring beneath the location. The crack was approximately 15 to 20 feet in length with an east-west orientation. The maximum width of the crack was 2 to 3 inches with a maximum observed depth of 1.5 feet.

During the fall 2024 visit, the crack was still clearly evident; however, the crack was shorter in length as it appeared that it had begun to heal/seal in locations where the original width was smaller. As shown in Figure 7 at the maximum observed location, the crack was still of similar dimensions as it was originally observed in spring 2024 at the widest location.

Figure 7: Crack observed along Traverse C-C' over Longwall Panel E15.

4.4 Traverse D-D'

This traverse branches off Traverse C-C' to the southwest across E-seam Longwall Panel E14. We were able to drive the initial portion of this traverse across Panel E14 and then proceeded on foot to the end of the traverse as shown in Map 1.

The mining of Panel E14 occurred from mid-April to mid-October with the longwall passing underneath this traverse during June 2022. While no discernable subsidence features were observed along this traverse during either our fall 2022 or spring 2023 site visits, cracks were observed during the fall 2023 site visit.

4.4.1 Location 4

The newly observed cracks were located on both sides of the access road but were not seen on the road itself. This fact may indicate that the cracks were present, but not observed, prior to the fall 2023 site visit. The majority of the observed cracks were located on the eastern side of the road with E-seam overburden depth of roughly 500 to 600 feet. In general, the orientation of the cracks was north-south along the downslope of the topography away from the road that follows a ridgeline over Panel E14. The maximum depth of the cracks was 1.5 to 2.0 feet with a maximum width of approximately 4 inches. Figure 8 shows the largest of the cracks observed at Location 4 in the fall 2023.

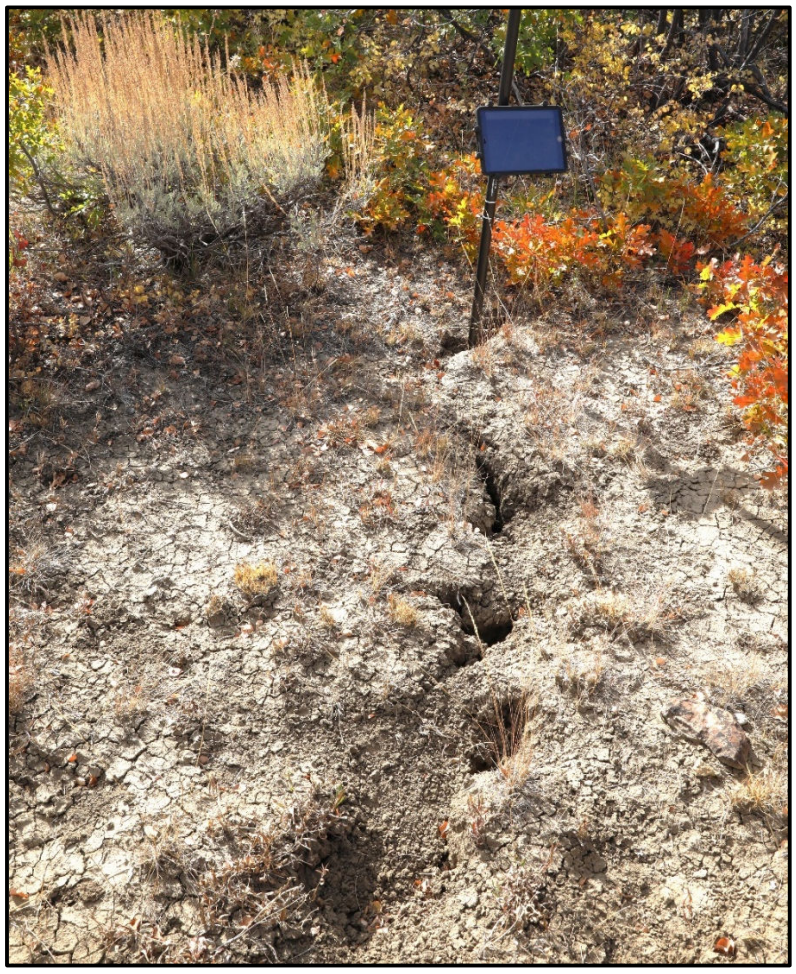

Figure 8: Crack observed along D-D' over Longwall Panel E14 during the fall 2023 site visit.

During the fall 2024 visit, the cracks were hardly discernible as cattle activity appears to have accelerated the healing process. While there were numerous desiccation cracks, surface evidence of the observed subsidence cracks was nonexistent. Figure 9 shows Location 4a during the fall 2024 visit with little surface expression of the subsidence feature.

Figure 9: Cattle activity accelerating healing of subsidence cracks over Longwall Panel E14 on Traverse D-D'.

4.5 Traverse E-E'

This traverse begins at Traverse C-C′ and continues north toward mined E-seam Longwall Panel SS2 before turning southeast toward E-seam Longwall Panel SS3 and terminating at MVB SS3-2 (see Map 1). Overburden along this traverse varies from about 250 feet over the mains up to just under 1,000 feet at the drill pad.

Cracks were observed along the access road to MVB SS3-2 overlying E-seam Longwall Panel SS3 Location 3 as shown in Map 1 during the spring 2023 field visit.

4.5.1 Location 3

Cracks were observed along the north side of the access road overlying the north end of E-seam Longwall Panel SS3 during the spring 2023 site visit. As shown on Map 1, the cracks were observed near Location 3. A series of cracks were observed roughly parallel to each other with an orientation of South 37° East. The cracks had no discernable depth or width and were not perpendicular to the road (Figure 10). It is unclear whether these observed cracks were related to mining subsidence; however, their consistent orientation was noteworthy and merited documentation. Longwall mining occurred under Location 3 during the months of December 2022 and January 2023.

Figure 10: Example of an observed crack along the north side of E-seam Longwall Panel SS3 during spring 2023 site visit

During the fall 2023 site visit, the access road for Traverse E-E' had undergone significant work to install water bars prior to winter. The location could not be accessed by our vehicle, so the traverse was observed on foot. The roadwork made observations challenging and, for the most part, the previous cracks were not observed with the exception of one small crack observed on the north side of the road. During the spring 2024 site visit, no cracks were observed at Location 3.

No cracks were observed during the fall 2024 site visit and the pad for MVB SS3-2 had been reclaimed (Figure 11). Traverse E-E' will no longer be included in the subsidence observations.

Figure 11: Reclaimed Pad MVB SS3-2 at end of E-E’ Traverse.

4.6 Traverse F-F'

This new traverse begins at Traverse C-C′ and continues north toward mined E-seam Longwall Panel E16 (see Map 1). Longwall mining Panel E16 had just begun shortly before the fall 2024 site visit, so this traverse was intended to establish baseline for continued observations over the panel as mining continues. There are no roads that allow vehicular access to the ground overlying the panel, so the traverse was made by foot along old roads and game trails. The lack of manmade features overlying the panel will make observations more challenging as the cleared, compacted ground associated with roads and pads usually represents the best opportunity to identify potential subsidence features.

5.0 CONCLUSIONS

1. The conceptual B- and E-seam mining model presented in the Exhibit 60 series of the mining permit has been verified by annual field observations in the various West Elk Mine mining areas. With the use of longwall mining methods in which the uniform downwarping of the overburden rocks and unconsolidated material act as laterally constrained plates, cracks in zones under tensile stress narrow with depth and close at the neutral surface. Below the neutral surface, the materials are therefore in compression. This has an important bearing on the hydrologic consequences of longwall mining. Any groundwater or surface water in contact with a given subsidence crack is prevented from traveling downward beyond the neutral surface of the deformed plate. Annual field observations from 1996 through fall 2024 verify this conceptual model in bedrock and surficial material (colluvium, alluvium, mudflow, and debris flow deposits) where the overburden is laterally constrained.

2. Typically, uniform downwarping occurs in association with longwall mining when there is lateral constraint. Where there are steep slopes and cliffs, there is little lateral support in at least one direction, which causes the associated rocks and unconsolidated materials to deform like unconstrained beams, plates, or cantilevers as the longwall mining faces move beneath them. This lack of lateral constraint allows subsidence cracks to commonly extend completely through sandstones and other brittle units, and groundwater or surface water present near or within these cracks will likely flow through and exit into existing surface drainages. The relatively few cliffs and over-steepened slopes in the Southern Panels and Sunset Trail Mining Areas tend to provide the lateral constraint needed to produce a more uniform downwarping with fewer significant subsidence cracks observable at the surface.

3. To date, there have been no reported impacts on surface flow or induced inflows to the underground mine workings even while longwall mining directly beneath surface water features including those associated with the Southern Panels and Sunset Trail Mining Areas. A roof failure that happened while driving the E Mains southward in 2020 (temporarily capturing flow from South Prong Creek) did not occur as a result of

subsidence. Details surrounding this occurrence are discussed in TR-149 and resulted in revisions to Exhibit 60E regarding main entry development.

4. Continuous annual observations find substantial weathering of previously observed subsidence cracks with edges rounding, widths reducing, and depths filling with eroded material. The only exception to these observations has been those cracks in thick, exposed, brittle sandstone units above previously mined B-seam panels (i.e., Apache Rocks) where rounding of edges and filling of cracks have occurred over time, but widths have remained relatively constant.

5. The length of time that tension cracks are expected to be visible before the effects of erosion and deposition, mass wasting, infilling, and revegetation obliterate them (duration of cracks), is a function of their location with respect to the mine geometry and type of material in which the cracks formed. Crack duration in zones of permanent tensile stress, such as above mine boundaries and unmined pillars between longwall panels, commonly last: 1) from one to three years in colluvium, 2) from three to six years in soft, friable sandstone, and 3) many decades in hard, durable sandstone. However, cracks that form in the zone of temporary tensile stress, such as above moving longwall faces, commonly close again when the longwall moves out of their area of influence.

6. Observed mine-induced subsidence effects have been less in the Southern Panels and Sunset Trail Mining Areas than were observed annually in the Box Canyon and Apache Rocks B-seam Mining Areas dating back to 1996. The more subdued topography and the fewer cliffs and ledges of the Southern Panels and Sunset Train Mining Areas reduce the potential for rockfall/landslide areas where E-seam mining has been underway since December 2008. Recent mining in the Apache Rocks West Mining area showed surprisingly little subsidence effects despite shallow overburden and the presence of previously-mined B-seam panels.

7. Field visits have revealed the healing and sealing capacity of cracks in surficial material by weathering, mass wasting, and crack infilling over time. This is particularly true in the colluvium that covers much of the surface of the Southern Panels and Sunset Trail Mining

Areas. The healing and sealing capacity of these materials causes softening and rounding of the crack edges as well as reduction of crack continuity and depth to a point of being nearly imperceptible within a year or two.

8. Subsidence-related effects were observed during the fall 2024 field visit at the following location(s):

    - Just south of the access road near the chain pillars on the north side of E-seam Longwall Panel E14. While the cracks showed evidence of healing and/or sealing since the fall 2022 site visit, the larger cracks were still noticeable features within the brush.

    - Newly observed cracks in fall 2023 over the center of Longwall Panel E14 were not previously observed even though longwall mining occurred at this location in June 2022. These features showed significant evidence of healing and sealing processes with no new subsidence features observed.

    - The crack was first observed in spring 2024 over the center of Longwall Panel E15, which had been mined under immediately following the fall 2023 site visit. The crack had begun showing signs of healing during the fall 2024 visit. The crack did not show signs of sealing, which is not surprising given the orientation parallel to the direction of mining.

    Previously observed subsidence effects were not observed during the spring 2024 field visit at the following locations:

    - With one exception, the cracks along the access road on the north side of E-seam Longwall Panel SS3 were no longer evident.

    - The small features identified as tension cracks overlying Longwall Panel E12 had sealed and were indistinguishable from desiccation cracks.

    All subsidence-related features were within the expected angle of draw for the E-seam and were generally focused in areas of maximum temporary tensile stress, such as above current or recent longwall mining activities.

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____. 2014b. *Fall 2014 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas*. Denver, CO: Wright Water Engineers, Inc.

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____. 2015b. *Fall 2015 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas*. Denver, CO: Wright Water Engineers, Inc.

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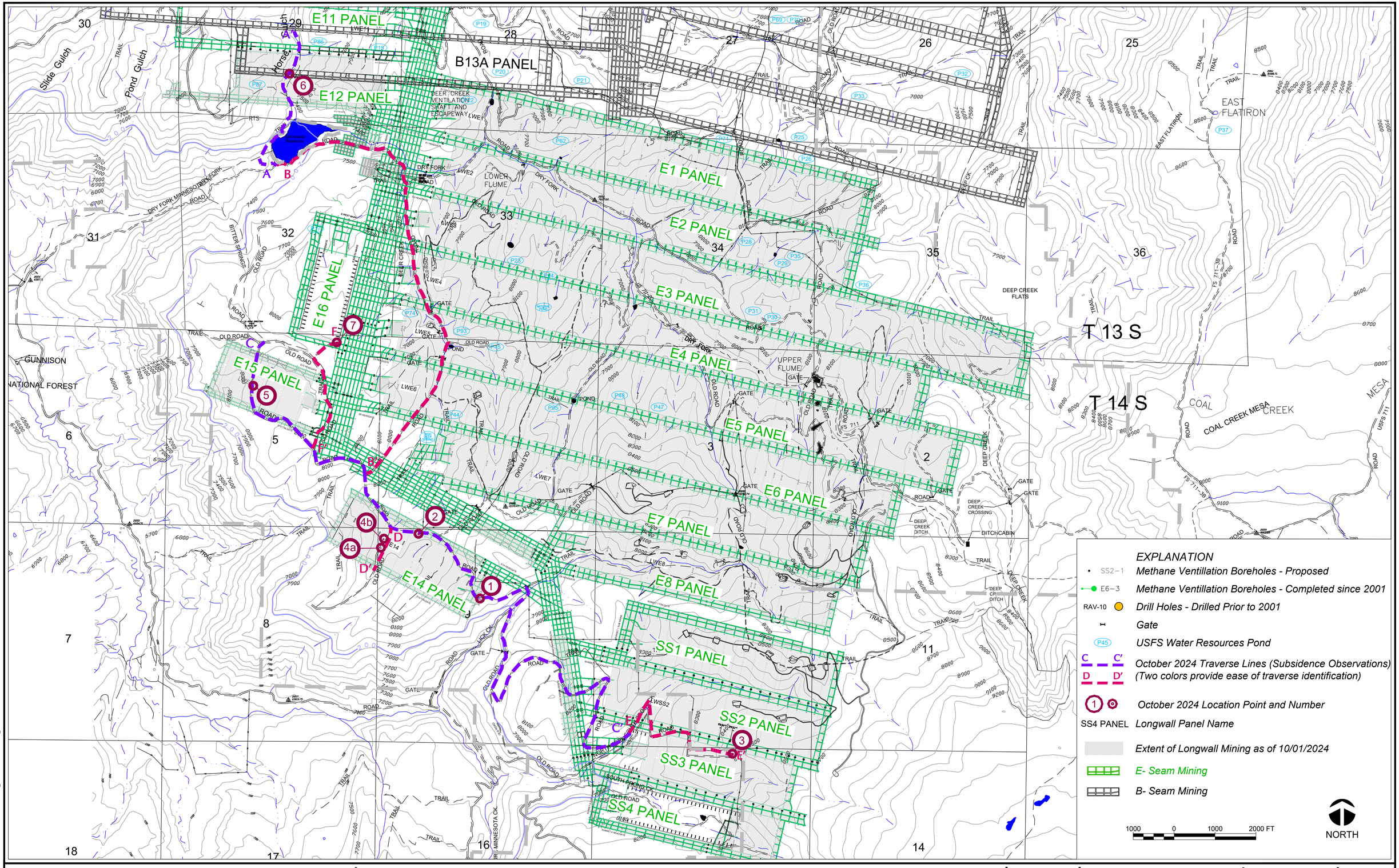
MAPS



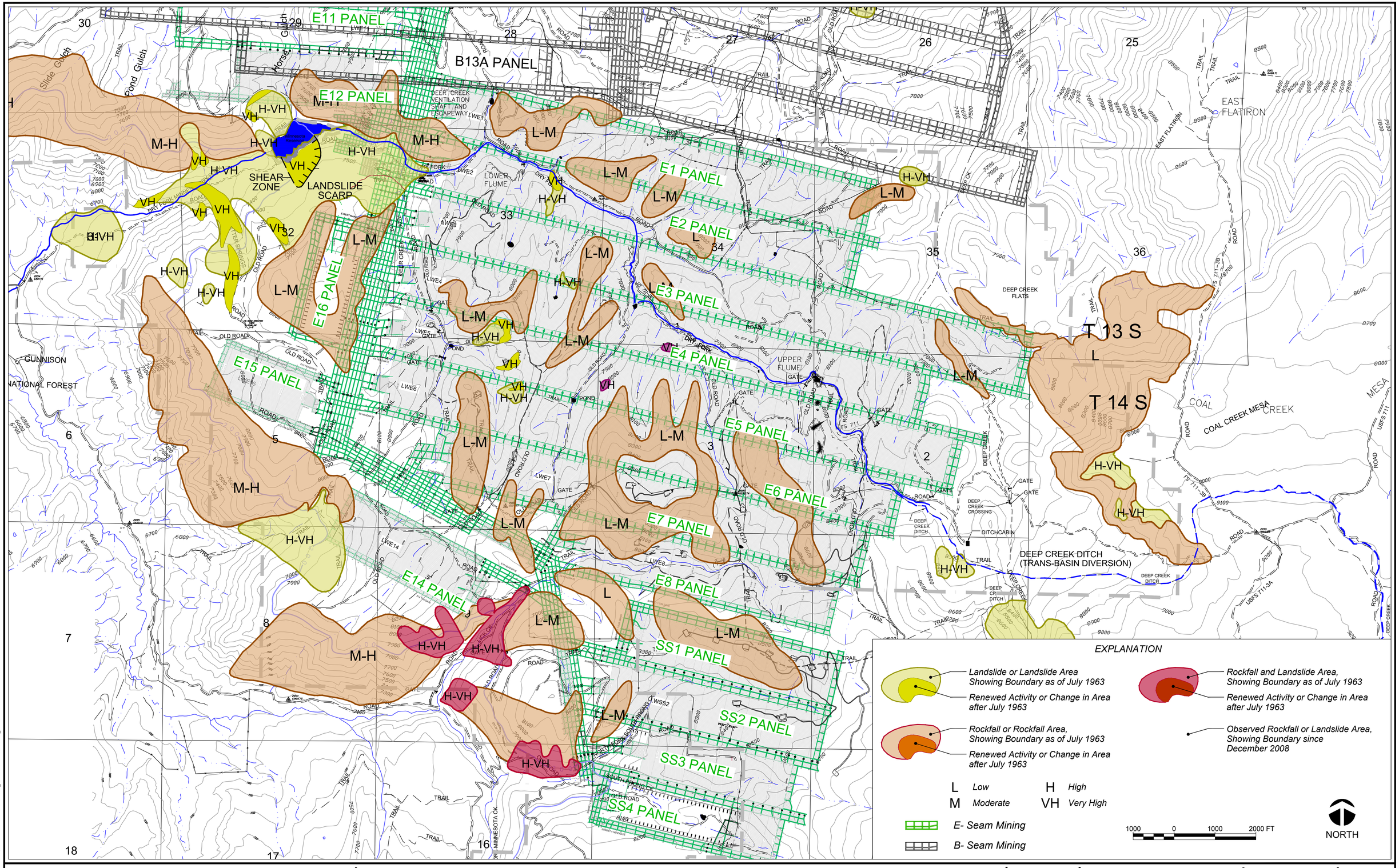
WRIGHT WATER ENGINEERS, INC.
2490 W. 26TH AVE. SUITE 100A
DENVER, CO 80211
(303)480-1700 FAX(303)480-1020

MOUNTAIN COAL COMPANY WEST ELK MINE

LOCATIONS OF OBSERVATIONS - OCTOBER 2024

DESIGN	DETAIL	CHECK	DATE	SCALE
JMK	LMC	JMK	04/28/2025	1"=1000'

PROJECT NUMBER	DATE	MAP
831-032.915	10/11/24	1



EXPLANATION

- *Landslide or Landslide Area Showing Boundary as of July 1963*
- *Renewed Activity or Change in Area after July 1963*
- *Rockfall or Rockfall Area, Showing Boundary as of July 1963*
- *Renewed Activity or Change in Area after July 1963*
- *Rockfall and Landslide Area, Showing Boundary as of July 1963*
- *Renewed Activity or Change in Area after July 1963*
- *Observed Rockfall or Landslide Area, Showing Boundary since December 2008*

L *Low* H *High*
M *Moderate* VH *Very High*

E- Seam Mining
B- Seam Mining

1000 0 1000 2000 FT

NORTH

WWE
WRIGHT WATER ENGINEERS, INC.
2490 W. 26TH AVE. SUITE 100A
DENVER, CO 80211
(303)480-1700 FAX(303)480-1020

MOUNTAIN COAL COMPANY WEST ELK MINE

LANDSLIDES AND ROCKFALLS - JUNE 2024

DESIGN JMK	PROJECT NUMBER	DATE	MAP
DETAIL LMC			
CHECK JMK	831-032.915	9/27/24	2
DATE 04/23/2025			
SCALE 1"=1000'			

Plot Date/Time: 04/23/2025, 09:04:25 AM; G:\WWE\831-032\915\CAD\02_DWG\SWWE-WORKING_10-10-24.DWG\MAP 2 LANDSLIDES AND ROCKFALL

APPENDIX A

U.S. Forest Service Road and Stock Pond Inspection Forms

Forest Service Roads
Inspection Form

Date: 1/15/2024
Time: 7:30am
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LW E12
Road(s) Being Inspected:

Yes	No	
☐	☒	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s):
☐	☐	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.):
☐	☐	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe:
☐	☐	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe:
☐	☐	Is mitigation needed? If yes, list suggestions:

Notes: No access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Forest Service Roads
Inspection Form

Date: 2/12/24
Time: 8:30am
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: CWE12
Road(s) Being Inspected:

Yes	No	
☐	☒	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s):
☐	☐	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.):
☐	☐	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe:
☐	☐	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe:
☐	☐	Is mitigation needed? If yes, list suggestions:

Notes: No access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Forest Service Roads
Inspection Form

Date: 3/15/24
Time: 8:00am
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LWE12
Road(s) Being Inspected:

Yes	No	
☐	☒	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s):
☐	☐	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.):
☐	☐	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe:
☐	☐	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe:
☐	☐	Is mitigation needed? If yes, list suggestions:

Notes: NO access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Forest Service Roads
Inspection Form

Date: 4/30/24
Time: 1:45pm
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: E12
Road(s) Being Inspected: N/A

Yes	No	
☐	☒	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s):
☐	☐	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.):
☐	☐	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe:
☐	☐	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe:
☐	☐	Is mitigation needed? If yes, list suggestions:

Notes:

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Forest Service Roads
Inspection Form

Date: 5/16/24
Time: 1:30p
Name of Inspector: CH
Current Panel and XC Being Mined: E12
Road(s) Being Inspected: West Flat Iron RD

Yes	No	
☒	☐	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s):
☐	☒	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.):
☐	☒	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe:
☐	☒	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe:
☐	☒	Is mitigation needed? If yes, list suggestions:

Notes: Everything looked good at time of inspection

Signature of Inspector: [signature]

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Forest Service Roads
Inspection Form

Date: 10/18/24
Time: 12:30
Name of Inspector: CH
Current Panel and XC Being Mined: E12
Road(s) Being Inspected: West Flat Iron RD

Yes	No	
☒	☐	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s):
☐	☒	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.):
☐	☒	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe:
☐	☒	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe:
☐	☒	Is mitigation needed? If yes, list suggestions:

Notes:
Everything looked good at time of Inspection

Signature of Inspector: [signature]

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Forest Service Roads
Inspection Form

Date: 7/12/24
Time: 2:00P
Name of Inspector: Chase
Current Panel and XC Being Mined: LWE 12
Road(s) Being Inspected: Dry Fork RD

Yes	No	
☒	☐	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): Dry Fork RD
☐	☒	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.):
☐	☒	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe:
☐	☒	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe:
☐	☒	Is mitigation needed? If yes, list suggestions:

Notes: Roads looked good at time of Inspection

Signature of Inspector: Chas Kitt

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Forest Service Roads
Inspection Form

Date: 8/15/24
Time: 2:00P
Name of Inspector: Chase
Current Panel and XC Being Mined: LWE 12
Road(s) Being Inspected: Dry Fork RD

Yes	No	
☒	☐	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): Dry Fork RD
☐	☒	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.):
☐	☒	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe:
☐	☒	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe:
☐	☒	Is mitigation needed? If yes, list suggestions:

Notes: Roads looked good at time of Inspection

Signature of Inspector: Chas Kitt

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Forest Service Roads
Inspection Form

Date: 9/24/24
Time: 12:00p
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LWE16
Road(s) Being Inspected: Dry Fork Road

Yes	No	
☒	☐	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): Dry Fork Road
☐	☒	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.):
☐	☒	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe:
☐	☒	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe:
☐	☒	Is mitigation needed? If yes, list suggestions:

Notes: Road looked good at time of inspection

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Forest Service Roads
Inspection Form

Date:
Time:
Name of Inspector:
Current Panel and XC Being Mined:
Road(s) Being Inspected: Dry Fork Road

Yes	No	
☒	☐	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): Dry Fork Road
☐	☒	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.):
☐	☒	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe:
☐	☒	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe:
☐	☒	Is mitigation needed? If yes, list suggestions:

Notes: Road looked good at time of inspection

Signature of Inspector: [signature]

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Forest Service Roads
Inspection Form

Date: 11/12/24
Time: 12:00
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LW16
Road(s) Being Inspected:

Yes	No	
☐	☒	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s):
☐	☐	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.):
☐	☐	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe:
☐	☐	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe:
☐	☐	Is mitigation needed? If yes, list suggestions:

Notes: No Access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Forest Service Roads
Inspection Form

Date: 12/11/24
Time: 8:00a
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LW14
Road(s) Being Inspected:

Yes	No	
☒	☐	Is the Forest Service road within the projected angle of draw of subsidence? If yes, which road(s): _____
☐	☐	Are there visible surface cracks on the road? If yes, describe (location, width, length, etc.): _____ _____ _____
☐	☐	Is there any recent evidence of potential subsidence induced slope failure? If yes, describe: _____
☐	☐	Are there any other potentially damaging, subsidence induced features on or near the road? If yes, describe: _____
☐	☐	Is mitigation needed? If yes, list suggestions: _____

Notes:

NO access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the public or operations, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 1/15/24
Time: 7:30am
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LWE12
Stock Pond(s) Being Inspected:

Yes	No	
☐	☒	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____
☐	☐	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____
☐	☐	Is there any evidence of potential subsidence induced water loss? If yes, describe: _____
☐	☐	Is there water in the pond? If yes, describe: _____
☐	☐	Is mitigation needed? If yes, list suggestions: _____

Notes: No access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 2/12/24
Time: 8:00
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LAVE12
Stock Pond(s) Being Inspected:

Yes	No	
☐	☒	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s):
☐	☐	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.):
☐	☐	Is there any evidence of potential subsidence induced water loss? If yes, describe:
☐	☐	Is there water in the pond? If yes, describe:
☐	☐	Is mitigation needed? If yes, list suggestions:

Notes:
No access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 3/15/24
Time: 8:15am
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LWE12
Stock Pond(s) Being Inspected:

Yes	No	
☐	☒	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s):
☐	☐	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.):
☐	☐	Is there any evidence of potential subsidence induced water loss? If yes, describe:
☐	☐	Is there water in the pond? If yes, describe:
☐	☐	Is mitigation needed? If yes, list suggestions:

Notes: No access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 4/30/24
Time: 1:30pm
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: E12
Stock Pond(s) Being Inspected: N/A

Yes	No	
☐	☒	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____
☐	☐	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____
☐	☐	Is there any evidence of potential subsidence induced water loss? If yes, describe: _____
☐	☐	Is there water in the pond? If yes, describe: _____
☐	☐	Is mitigation needed? If yes, list suggestions: _____

Notes:

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 5/16/24
Time: 12:30?
Name of Inspector: CH
Current Panel and XC Being Mined: E12
Stock Pond(s) Being Inspected: none

Yes	No	
☐	☒	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____
☐	☒	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____
☐	☒	Is there any evidence of potential subsidence induced water loss? If yes, describe: _____
☐	☒	Is there water in the pond? If yes, describe: _____
☐	☒	Is mitigation needed? If yes, list suggestions: _____

Notes:
Everything looked good at time of Inspection

Signature of Inspector: Chase Knotts

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 6/18/24
Time: 1:30
Name of Inspector: CH
Current Panel and XC Being Mined: E12
Stock Pond(s) Being Inspected: None

Yes	No	
☐	☒	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s):
☐	☐	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.):
☐	☐	Is there any evidence of potential subsidence induced water loss? If yes, describe:
☐	☐	Is there water in the pond? If yes, describe:
☐	☐	Is mitigation needed? If yes, list suggestions:

Notes:
Everything looked good around mon Dam

Signature of Inspector: [signature]

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 7/12/24
Time: 2:30p
Name of Inspector: CH
Current Panel and XC Being Mined: LWE12
Stock Pond(s) Being Inspected: SW-3

Yes	No	
X	☐	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): SW-3
☐	X	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.):
☐	X	Is there any evidence of potential subsidence induced water loss? If yes, describe:
☐	X	Is there water in the pond? If yes, describe:
☐	X	Is mitigation needed? If yes, list suggestions:

Notes:
Pond was empty, Everything looked good at time of Inspection

Signature of Inspector: Chad Knott

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 8/15/24
Time: 2:30p
Name of Inspector: CH
Current Panel and XC Being Mined: LWE12
Stock Pond(s) Being Inspected: SW-3

Yes	No	
☒	☐	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): SW-3
☐	☒	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.):
☐	☒	Is there any evidence of potential subsidence induced water loss? If yes, describe:
☐	☒	Is there water in the pond? If yes, describe:
☐	☒	Is mitigation needed? If yes, list suggestions:

Notes:
Pond was empty, Everything looked good at time of Inspection

Signature of Inspector: Chad Knott

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 9/24/24
Time: 12:30p
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LWE16
Stock Pond(s) Being Inspected:

Yes	No	
☐	☒	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____
☐	☐	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____
☐	☐	Is there any evidence of potential subsidence induced water loss? If yes, describe: _____
☐	☐	Is there water in the pond? If yes, describe: _____
☐	☐	Is mitigation needed? If yes, list suggestions: _____

Notes:

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 10/17/24
Time: 1:30P
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LW E16
Stock Pond(s) Being Inspected: none

Yes	No	
☐	☒	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____
☐	☐	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____
☐	☐	Is there any evidence of potential subsidence induced water loss? If yes, describe: _____
☐	☐	Is there water in the pond? If yes, describe: _____
☐	☐	Is mitigation needed? If yes, list suggestions: _____

Notes:

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 11/12/24
Time: 1:00pm
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LW14
Stock Pond(s) Being Inspected: .

Yes	No	
☐	☒	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): _____
☐	☐	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.): _____ _____ _____
☐	☐	Is there any evidence of potential subsidence induced water loss? If yes, describe: _____
☐	☐	Is there water in the pond? If yes, describe: _____
☐	☐	Is mitigation needed? If yes, list suggestions: _____

Notes:
No Access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

Stock Pond
Inspection Form

Date: 12/11/24
Time: 8:00a
Name of Inspector: Chase Hiatt
Current Panel and XC Being Mined: LW 16
Stock Pond(s) Being Inspected:

Yes	No	
☐	☒	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s):
☐	☐	Are there visible surface cracks in or near the stock pond? If yes, describe (location, width, length, etc.):
☐	☐	Is there any evidence of potential subsidence induced water loss? If yes, describe:
☐	☐	Is there water in the pond? If yes, describe:
☐	☐	Is mitigation needed? If yes, list suggestions:

Notes:

No access due to weather

Signature of Inspector: Chase Hiatt

* If any potential subsidence induced features are observed that could cause harm to the pond, notify Jessica Wilczek immediately.

APPENDIX B

Monument Dam Inspection Forms

Monument Dam
Inspection Form

Date: 1/15/24
Time: 8:00 am
Name of Inspector: Chase Hiatt
Current Panel Being Mined: LWE12
☐ Weekly Inspection ☒ Monthly Inspection

Yes	No	
☒	☐	Is mining within 1 mile of Monument Dam?
☐	☐	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☐	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☐	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☐	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☐	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☐	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes: No access due to weather
& weekly survey monitoring is taking place

Signature of Inspector: Chase Hiatt

Inspections are performed under the direction of Mike Peacock, P.E.

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

Monument Dam
Inspection Form

Date: 2/12/24
Time: 7:30am
Name of Inspector: Chase Hiatt
Current Panel Being Mined: LWE12
☐ Weekly Inspection ☒ Monthly Inspection

Yes	No	
☒	☐	Is mining within 1 mile of Monument Dam?
☐	☐	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☐	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☐	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☐	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☐	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☐	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes: No access due to weather
Weekly Survey Monitoring is taking Place

Signature of Inspector: Chase Hiatt

Inspections are performed under the direction of Mike Peacock, P.E.

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

Monument Dam
Inspection Form

Date: 3/15/24
Time: 8:30am
Name of Inspector: Chase Hiatt
Current Panel Being Mined: LWE12
☐ Weekly Inspection ☒ Monthly Inspection

Yes	No	
☒	☐	Is mining within 1 mile of Monument Dam?
☐	☐	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☐	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☐	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☐	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☐	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☐	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes:
No acsess due to weather
Surveying for monument dam looks good

Signature of Inspector: Chase Hiatt

Inspections are performed under the direction of Mike Peacock, P.E.

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

Monument Dam
Inspection Form

Date: 4/30/24
Time: 2:30 PM
Name of Inspector: Mark Pierce
Current Panel Being Mined: E12
☐ Weekly Inspection ☐ Monthly Inspection

Yes	No	
☑	☐	Is mining within 1 mile of Monument Dam?
☐	☑	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☑	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☑	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☑	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☑	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☑	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes: Everything looked good.

Signature of Inspector: Mark Pierce

Inspections are performed under the direction of Jessica Wilczek, P.E.

If cracks or other potentially damaging features occur, notify Jessica Wilczek immediately.

Monument Dam
Inspection Form

Date: 5/14/24
Time: 1:00p
Name of Inspector: Chase Hiatt
Current Panel Being Mined: E12
☐ Weekly Inspection ☒ Monthly Inspection

Yes	No	
☒	☐	Is mining within 1 mile of Monument Dam?
☐	☒	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☒	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☒	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☒	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☒	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☒	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes: Everything Looked good

Signature of Inspector: _____

Inspections are performed under the direction of Mike Peacock, P.E.

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

Monument Dam
Inspection Form

Date: 6/18/24
Time: 2:00p
Name of Inspector: Chase Hiatt
Current Panel Being Mined: E12
☐ Weekly Inspection ☒ Monthly Inspection

Yes	No	
☒	☐	Is mining within 1 mile of Monument Dam?
☐	☒	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☒	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☒	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☒	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☒	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☒	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes: Everything looked good

Signature of Inspector: _____

Inspections are performed under the direction of Mike Peacock, P.E.

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

Monument Dam
Inspection Form

Date: 7-12-24
Time: 1:00p
Name of Inspector: CH
Current Panel Being Mined: LWE 12
☐ Weekly Inspection ☒ Monthly Inspection

Yes	No	
☒	☐	Is mining within 1 mile of Monument Dam?
☐	☒	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☒	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☒	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☒	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☒	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☒	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes: Walked Dam, Looked good at time of Inspection

Signature of Inspector: Chase Watt

Inspections are performed under the direction of Mike Peacock, P.E.

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

Monument Dam
Inspection Form

Date: 8/15/24
Time: 1:30p
Name of Inspector: Chase
Current Panel Being Mined: LWE12
☒ Weekly Inspection ☐ Monthly Inspection

Yes	No	
☒	☐	Is mining within 1 mile of Monument Dam?
☐	☒	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☒	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☒	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☒	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☒	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☒	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes: Walked Dam, looked good at time of inspection

Signature of Inspector: Chase Klatt

Inspections are performed under the direction of Jessica Wilczek, P.E.

If cracks or other potentially damaging features occur, notify Jessica Wilczek immediately.

Monument Dam
Inspection Form

Date: 9/24/24
Time: 1:00p
Name of Inspector: Chase Hiatt
Current Panel Being Mined: Twelve
☐ Weekly Inspection ☒ Monthly Inspection

Yes	No	
☒	☐	Is mining within 1 mile of Monument Dam?
☐	☒	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☒	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☒	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☒	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☒	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☒	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes: Dam looked good at time of inspection

Signature of Inspector: Chase Hiatt

Inspections are performed under the direction of Mike Peacock, P.E.

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

Monument Dam
Inspection Form

Date: 10/17/24
Time: 1:00p
Name of Inspector: Chase Hiatt
Current Panel Being Mined: LWE16.
☐ Weekly Inspection ☒ Monthly Inspection

Yes	No	
☒	☐	Is mining within 1 mile of Monument Dam?
☐	☒	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☒	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☒	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☒	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☒	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☒	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes: Dam looked good at time of inspection

Signature of Inspector: Chase Hiatt

Inspections are performed under the direction of Mike Peacock, P.E.

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

Monument Dam
Inspection Form

Date: 11/12/24
Time: 2000
Name of Inspector: Chase Hiatt
Current Panel Being Mined: LW11e
☐ Weekly Inspection ☒ Monthly Inspection

Yes	No	
☒	☐	Is mining within 1 mile of Monument Dam?
☐	☒	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☒	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☒	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☒	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☒	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☒	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes: Limited/tough visability Because of Snow

Signature of Inspector: Chase Hiatt

Inspections are performed under the direction of Mike Peacock, P.E.

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

Monument Dam
Inspection Form

Date: 12/11/24
Time: 8:00a
Name of Inspector: Chase Hiatt
Current Panel Being Mined: LW16
☐ Weekly Inspection ☒ Monthly Inspection

Yes	No	
☒	☐	Is mining within 1 mile of Monument Dam?
☐	☐	Are there visible surface cracks on the dam? If yes, indicate length and size of crack. _____.
☐	☐	Is there evidence of subsided areas on or around the dam? If yes, indicate where and degree. _____.
☐	☐	Are there bulges on the dam? If yes, indicate where and degree. _____.
☐	☐	Are there signs of seeps on the dam? If yes, indicate where and estimated flow._____.
☐	☐	Are there any other potentially damaging features on the dam? If yes, describe. _____.
☐	☐	Are there any recent evidences of slope failure on the landside south of the dam (perform visual inspection and data analysis of inclinometers)? If yes, describe. _____.

Notes:

No access due to weather

Signature of Inspector: Chase Hiatt

Inspections are performed under the direction of Mike Peacock, P.E.

If cracks or other potentially damaging features occur, notify Mike Peacock or Kathy Welt immediately.

APPENDIX C

Monument Dam Monitoring Data

Point Name	Easting 7-2-24	Northing 7-2-24	Elevation 7-2-24	Easting 11/1/2024	Northing 11/1/2024	Elevation 11/1/2024	Easting	Northing	Elevation
64	1437718.34	388642.77	7887.26	1437718.34	388642.77	7887.26	0	0	0
6501	1441366.609	387524.044	7499.503	1441364.962	387518.634	7499.5	1.647	5.41	0.003
6502	1439617.617	388740.731	7387.996	1439617.617	388740.731	7387.996	0	0	0
6503	1440269.016	388520.974	7332.525	1440269.016	388520.974	7332.525	0	0	0
6504	1438363.543	385924.35	7627.146	1438363.543	385924.35	7627.146	0	0	0
6001	1438800.979	387917.746	7338.077	1438800.491	387917.022	7338.124	0.488	0.724	-0.047
6002	1438840.534	387802.397	7338.642	1438839.235	387801.3	7338.593	1.299	1.097	0.049
6003	1438780.697	387855.245	7323.548	1438780.337	387854.761	7323.6	0.36	0.484	-0.052
6004	1438734.64	387773.025	7305.908	1438734.184	387772.484	7305.947	0.456	0.541	-0.039
6005	1438584.17	387703.465	7290.638	1438583.789	387703.007	7290.627	0.381	0.458	0.011
6006	1438479.424	387648.319	7257.455	1438478.933	387647.937	7257.447	0.491	0.382	0.008
6007	1439013.071	387696.94	7337.81	1439012.611	387696.284	7337.837	0.46	0.656	-0.027
6008	1438921.97	387687.095	7340.453	1438921.5	387686.512	7340.473	0.47	0.583	-0.02
6009	1438807.1	387652.493	7329.936	1438806.583	387651.938	7329.953	0.517	0.555	-0.017
6010	1438656.457	387651.863	7291.408	1438656.02	387651.447	7291.385	0.437	0.416	0.023
6011	1438565.76	387543.637	7265.542	1438565.213	387543.212	7265.544	0.547	0.425	-0.002
6012	1438846.637	387563.472	7335.168	1438846.066	387562.946	7335.16	0.571	0.526	0.008
7000	1438586.696	387402.155	7324.083	1438586.071	387401.719	7324.073	0.625	0.436	0.01
7001	1438835.749	387316.407	7361.5	1438835.108	387315.87	7361.497	0.641	0.537	0.003
7002	1438986.517	387197.417	7399.632	1438985.737	387196.823	7399.65	0.78	0.594	-0.018
7003	1439085.528	387351.028	7381.973	1439084.94	387350.405	7381.921	0.588	0.623	0.052
7004	1439264.783	387577.484	7351.551	1439264.243	387576.748	7351.501	0.54	0.736	0.05
7005	1439353.071	387711.562	7349.947	1439352.584	387710.819	7349.853	0.487	0.743	0.094
7006	1439509.936	387789.046	7343.488	1439509.687	387788.123	7343.437	0.249	0.923	0.051
7007	1439681.674	387965.25	7358.793	1439681.34	387964.279	7358.812	0.334	0.971	-0.019
7008	1439833.503	388030.431	7367.571	1439832.592	388027.349	7367.535	0.911	3.082	0.036
7009	1439781.123	387821.864	7402.657	1439780.746	387820.869	7402.6	0.377	0.995	0.057
7010	1439961.032	388080.09	7369.288	1439960.512	388078.074	7369.315	0.52	2.016	-0.027
7011	1439811.984	387958.603	7400.307	1439811.078	387955.588	7400.291	0.906	3.015	0.016
7012	1439832.057	387765.129	7426.982	1439830.484	387761.474	7426.941	1.573	3.655	0.041
7013	1439926.749	387643.556	7494.904	1439925.253	387640.323	7494.924	1.496	3.233	-0.02
7014	1439822.926	387604.21	7446.252	1439821.36	387601.115	7446.253	1.566	3.095	-0.001
7015	1439878.823	387528.434	7498.567	1439878.823	387528.434	7498.567	0	0	0
7016	1439687.137	387517.2	7447.844	1439685.109	387513.695	7447.883	2.028	3.505	-0.039
7017	1439776.438	387432.4	7489.47	1439776.438	387432.4	7489.47	0	0	0
7018	1439192.947	387386.316	7385.786	1439192.307	387385.62	7385.75	0.64	0.696	0.036
7019	1438689.312	387187.602	7367.968	1438688.258	387186.929	7367.937	1.054	0.673	0.031
7020	1438878.074	386891.844	7464.527	1438877.185	386891.25	7464.502	0.889	0.594	0.025
7021	1439257.639	387240.421	7417.921	1439256.927	387239.661	7417.922	0.712	0.76	-0.001
7023	1439326.449	387134.399	7458.417	1439326.449	387134.399	7458.417	0	0	0
7024	1438990.076	386701.357	7517.994	1438989.083	386700.824	7518.009	0.993	0.533	-0.015
7025	1439690.395	386958.538	7605.927	1439687.481	386955.175	7605.924	2.914	3.363	0.003

APPENDIX D

Extent of E-seam Longwall Mining Map

LWE1
LWE2
LWE3
LWE4
LWE5
LWE6
LWE7
LWE8
LWE10
LWE11
LWE12
LWE14
LWE15
LWE16
LWSS1
LWSS2
LWSS3
LWSS4
GATE
DEEP CREEK FLATS
DEEP CREEK CROSSING
DEEP CREEK DITCH
DITCHCABIN
MINNESOTA RESERVOIR
DRY FORK
BITTER SPRINGS
SUNSET TRAIL
ATV TRAIL
T 13 S
T 14 S

NOTES:

- Gateroad entries for longwall panels LWE1 through LWE8 were generally developed from west to east and then longwall mined from east to west. These longwall panels were mined in order from north to south within the coal lease areas shown.
- The proposed western longwall panels LWE9 through LWE12 will likely be the last E Seam panels mined due to the locations along the main entries.
- The projected panel layout and timing were based on the best available exploration data, professional judgement, and markets at the time this map was prepared. Pillar and panel dimensions may be adjusted within the Projected Potential Mining Area and permit boundary if warranted by actual mining conditions, including coal thickness, coal quality, and geotechnical conditions to fulfill federal coal lease maximum economic recovery requirements.

1. See Exhibit 60E. The actual E-seam angle-of-draw has been conservatively calculated as 16.3°. (See Appendix B of the Spring 2010 Subsidence Report.) The angle of draw is measured using the greatest vertical distance between the top of the E seam at the nearest edge of each longwall panel and the ground surface elevation equal to the point of no discernable subsidence.
2. Also referred to as the "Projected Potential Mining Area." Although not anticipated (based on available data, as above), should mining be extended in this area and beyond the projected E-seam mining shown, the associated projected impacts of subsidence have been evaluated in Exhibits 55B & 60E.

LEGEND

- Permit Area Boundary
- Coal Lease Boundary (Federal Lease C-1362 Excludes 24.8 Acres Under Minnesota Reservoir a.k.a. Independent Reservoir or Monument Dam)
- Approximate limit of the maximum predicted 19° E-seam angle of draw.[1]
- Maximum Projected Areal Extent of Potential Mineable E-seam.[2]
- Projected E Seam mining
- MINED AREAS
- PERMITTED UNMINED AREAS

THIS DRAWING WAS PREPARED UNDER MY SUPERVISION AND REPRESENTS INFORMATION THAT IS ACCURATE TO THE BEST OF MY KNOWLEDGE

DRAWN	
DATE	BY
12/31/17	TR-143 JAW
REVISED	
DATE	BY
1-19-18	TR-144 GBG
3-19-18	PR-15 GBG
6-29-18	PR-15 EDL
2-1-21	TR-149 GBG
3-18-22	TR-150 NP
5-25-22	SUB. NP
5-25-22	SUB. NP
7-7-23	SUB. NP
4-29-24	JAW
4-24-25	BM

COORDINATE SYSTEM: NAD 27

SCALE 0 2000 feet

ARCH WEST ELK
5174 Highway 133
Somerset, CO 81434
Operated by Mountain Coal Company, L.L.C.
A subsidiary of Arch Resources, Inc.

Fall 2024 Subsidence Survey Map

FILE NO.
Spring 2024 Subsidence Map
Path: W:\MCC-ENGINEERING\ENVIRONMENTAL (EV)\AGENCIES\CDRMS\QUARTERLY REPORTS\SUBSIDENCE REPORTS

DENVER
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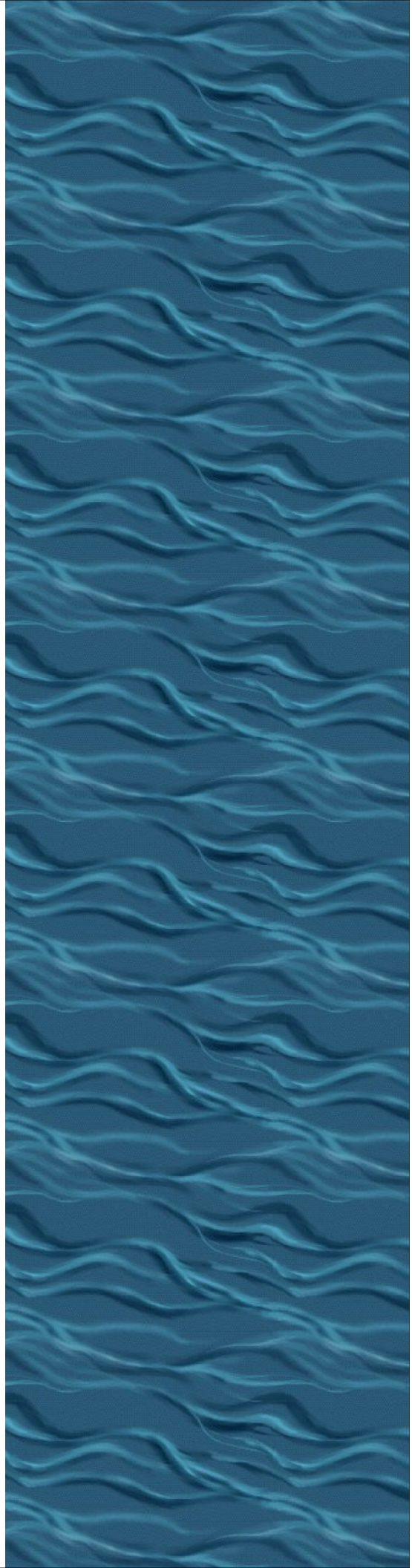

Wright Water Engineers, Inc.