Spring 2022 Subsidence and Geologic Field Observations

Southern Panels and Sunset Trail Mining Areas

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

PREPARED BY:
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Wright Water Engineers, Inc.

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September 2022

831-032.913

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September 30, 2022

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

Re: Spring 2022 Subsidence Monitoring Report Preparation – Mountain Coal Company, LLC.

Dear Mr. Simmons,

The following report entitled *Spring 2022 Subsidence and Geologic Field Observations – Southern Panels and Sunset Trail 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.
Vice President/Project Manager

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SPRING 2022 SUBSIDENCE AND GEOLOGIC FIELD OBSERVATIONS SOUTHERN PANELS AND SUNSET TRAIL MINING AREAS[1]

1.0 BACKGROUND

This subsidence report is the first of two detailed documents on this subject to be generated based on 2022 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-six years[2] (1996 to 2021 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.

Spring 2022 subsidence observations were performed on June 2, 2021, in the Southern Panels Mining Area with specific focus on the E-seam Longwall Panel 14, currently being mined, and in the Sunset Trail Mining Area relative to the first two E-seam Longwall Panels (SS1 and SS2). 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

[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 Miing Area are E-seam Longwall Panels E14 through E17. 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.

[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).

earlier reports. Observations of the Apache Rocks and Box Canyon B-seam Mining Areas are covered in reports prior to 2013.

During the spring 2022 field visit, accessible areas within the Southern Panels and Sunset Trail 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 June 2, 2022, Wright Water Engineers, Inc. (WWE) observed surface subsidence and geologic field conditions of the Southern Panels and Sunset Trail 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 spring 2022, 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 and was 100% complete at the time of WWE's fall 2021 field visit. E-seam Longwall Panel SS2 was initiated in June 2021 and was approximately 100% complete at the time of the spring 2022 field visit. Mining of E-seam Longwall Panel E14 was initiated in April 2022 and was approximately 23% complete at the time of our spring 2022 site visit.

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 our spring 2022 field visit were focused on areas above mined E-seam Longwall Panel E14 in the Southern Panels Mining Area and on E-seam Longwall Panel SS1 and SS2 of the Sunset Trail Mining Area. We also performed initial reconnaissance observations over a portion of the proposed E-seam Longwall Panel E15.

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. Note that the term "displacement," as used in Appendix C, is the difference in the measurements recorded in the last two surveys.

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 2022 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 2022 through spring 2022 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 both average height and longitudinal displacement data obtained from fall 2021 to spring 2022 is provided in Table 1 of Appendix C.

4.0 SPRING 2022 SUBSIDENCE OBSERVATIONS

During WWE's spring 2022 field visit, pre-existing subsidence-related tension cracks were observed at various locations along the established traverses above mined E-seam longwall panels in both the Southern Panels and Sunset Trail Mining Area as accessed by USFS Road 711 (Dry Fork Road) and on MVB pads, particularly where they exist above current mining activities. However, WWE ceased visiting some 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 overactive mining or proposed mining areas. Subsidence features previously observed along Traverse G-G' over mined E-seam Longwall Panel SS1 were no longer visible or have been lost due to reclamation. New subsidence-related features were noted during the spring 2022 field visit above the chain pillars adjacent to Longwall Panel E14.

It should also be noted that reclamation had occurred along Traverse G-G' west of MVB SS1-6, requiring Traverse G-G' to be accessed by foot. The previously observed subsidence features on the road and on the MVB SS1-7 pad could no longer be located due to the reclamation activities. 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.

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 G-G' (see Maps 1 and 2) as observed during the spring 2022 field visit. Details associated with these observations can be found in Sections 4.1 through 4.7 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 recently active, or potentially active, landslide and rockfall areas as delineated from aerial photo research and field observations. Also on Map 1, note that a designation such as E6-1/2/3 indicates one MVB pad containing three drill holes. The surface and

termination points of each drill hole are shown by small and large filled green circles, respectively, that are connected by green lines.

4.1 Traverse A-A'

This traverse overlies portions of mined E-seam Longwall Panels E1 through E4. Traverse A-A' originates just south of Monument Dam (and Minnesota Reservoir) and proceeds in a southeasterly direction along Dry Fork Road a distance of approximately three miles. The western end of this traverse is adjacent to Minnesota Reservoir and outside the proposed E-seam longwall mining influences. The eastern end of this traverse is adjacent to the upper flume on the Dry Fork of Minnesota Creek.

Traverse A-A' is included in this report to provide context for other traverses that originate along this path and continue southward across the Southern Panels and Sunset Trail Mining Areas (see Maps 1 and 2).

No subsidence-related features were observed along this traverse during our spring 2022 field visit.

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 the starting point for Traverse C-C′.

No subsidence-related features were observed along this traverse during the spring 2022 field visit.

4.3 Traverse C-C'

Traverse C-C' is bisected by the end of Traverse B-B' and extends from the proposed E-Seam Longwall Panel E15 to the northwest to the E-Seam Longwall Panels SS2 and SS3 to the southeast. En route the traverse runs along the north side of E-Seam Longwall Panel E14, which was actively being mined at the time of the spring 2022 site visit. 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 proposed E-seam Longwall Panel E15. The road was passible for the initial stretch in our four-wheel drive vehicle, after which we had to perform the rest of the observations on foot.

The traverse provided the best opportunity to observe areas that had most recently been mined beneath. The segment southeast of the intersection with Traverse B-B' was immediately adjacent to the active longwall mining occurring in Longwall Panel E14. Locations 1 and 2 are located over the E14 Headgate between cross cuts 21 and 23 as shown in Map 1.

4.3.1 Location 1

Cracks were observed along the existing road over the E14 Headgate with the initial observations occurring between Crosscuts 23 and 22. As shown in Figure 1, the cracks were generally parallel to the road with a S40°E orientation. No cracks had previously been observed along this traverse with all prior observations occurring prior to mining in Longwall Panel E14. Therefore, the cracks were deemed to be subsidence-related features. The E-seam overburden thickness at this location is approximately 650 to 700 feet.

There were multiple cracks at this location with the longest continuous crack being on the order of 10 to 20 feet. Most of the cracks with localized and only a few feet in length. The maximum observed width of the cracks was between one-half and one inch, and the maximum depth of the cracks was three to four inches.

Figure 1: Southeast view of subsidence crack parallel to road on Traverse C-C' located over the E14 Headgate, between crosscuts 23 and 22.

4.3.2 Location 2

Farther to the southeast along Traverse C-C', additional cracks were observed along the road over the E14 Headgate between Crosscuts 22 and 21. As shown in Figure 2, the cracks were generally

diagonal to the road with a S30°E to S35°E orientation. At this location, the road is approximately over of the edge of the longwall panel. No cracks had previously been observed along this traverse with all prior observations occurring prior to mining in Longwall Panel E14. Therefore, the cracks were also deemed to be subsidence-related features. The E-seam overburden thickness at this location is approximately 650 to 700 feet.

The cracks at Location 2 were more pronounced than those observed at Location 1. There were multiple cracks at this location with lengths on the order of 10 to 20 feet, with the maximum continuous crack being approximately 30 feet in length. The maximum observed width of the cracks was about one inch, and the maximum depth of the cracks was 1.3 feet. The cracks occurred over a reach of approximately 130 feet.

Figure 2: East-Southeast view of subsidence crack diagonal across road on Traverse C-C' located over the E14 Headgate, between Crosscuts 22 and 21.

4.4 Traverse D-D'

This new 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 had not yet reached this traverse at the time of our spring 2022 site visit. No discernable subsidence features were observed; however, it is anticipated that this traverse will be important to observe in the fall 2022 site visit after mining has occurred.

4.5 Traverse E-E'

This new traverse begins at Traverse C-C′ and continues north toward mined E-seam Longwall Panel SS2 before turning southeast toward the unmined 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.

No subsidence features were observed along this traverse during the spring 2022 field visit.

4.6 Traverse F-F'

Traverse F-F′ departs Traverse E-E′ in a southeasterly direction over the east end of mined E-seam Longwall Panels E5, E6, and E7. All MVB pads along this traverse have been reclaimed except E6-4. The E-seam overburden depth along this traverse varies from 1,000 feet to 1,200 feet.

No subsidence features were observed along this traverse during the fall 2021 field visit.

4.7 Traverse G-G′

Traverse G-G′ departs Traverse F-F′ in a southerly direction from the east end of mined E-seam Longwall Panel E7 (see Map 1). This traverse continues south over Lick Creek and to the east end of E-seam Longwall Panel SS1 of the Sunset Trail Mining Area. From this location, the traverse west across mined portions of E-seam Longwall Panel SS1 to several MVB pads (i.e., SS1-1 through SS1-7).

Longwall mining of E-seam Longwall Panel SS1 began in January 2020. As of our spring 2022 field visit, mining of this panel was complete and that portion of the traverse west of MVB pad had been reclaimed. As a result of reclamation, subsidence features originally observed during our spring 2021 field visit (on the road leading to the MVB pad SS1-7) could not be located during our spring 2022 field visit. In addition, another subsidence feature first observed during our spring

2021 field visit on MVB pad SS1-6 at Location 3 on Map 1 was no longer visible during our spring 2022 field visit due to reclamation activities.

No other subsidence-related features were observed along this traverse during our spring 2022 field visit.

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 to fall 2021, inclusive, 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.

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 spring 2022 field visit at the following locations:

   - along the access road over the chain pillars on the north side of E-seam Longwall Panel E14 in between Crosscuts 21 and 23 immediately adjacent to active mining at the time of our field visit.

   Previously observed subsidence effects were not observed during the fall 2021 field visit at the following locations:

   - along 60 feet of roadway approximately 240 feet east of (i.e., on Traverse G-G′ between MVB pad E8-5 and E8-6 [Location 3]). No evidence of subsidence effects could be identified.

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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____. 2018a. *Spring 2018 Subsidence and Geologic Field Observations South of Divide and Dry Fork Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2018b. *Fall 2018 Subsidence and Geologic Field Observations Southern Panels Mining Area (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2019a. *Spring 2019 Subsidence and Geologic Field Observations Southern Panels Mining Area (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2019b. *Fall 2019 Subsidence and Geologic Field Observations Southern Panels Mining Area (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2020a. *Spring 2020 Subsidence and Geologic Field Observations Southern Panels and Sunset Trail Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2020b. *Fall 2020 Subsidence and Geologic Field Observations Southern Panels and Sunset Trail Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

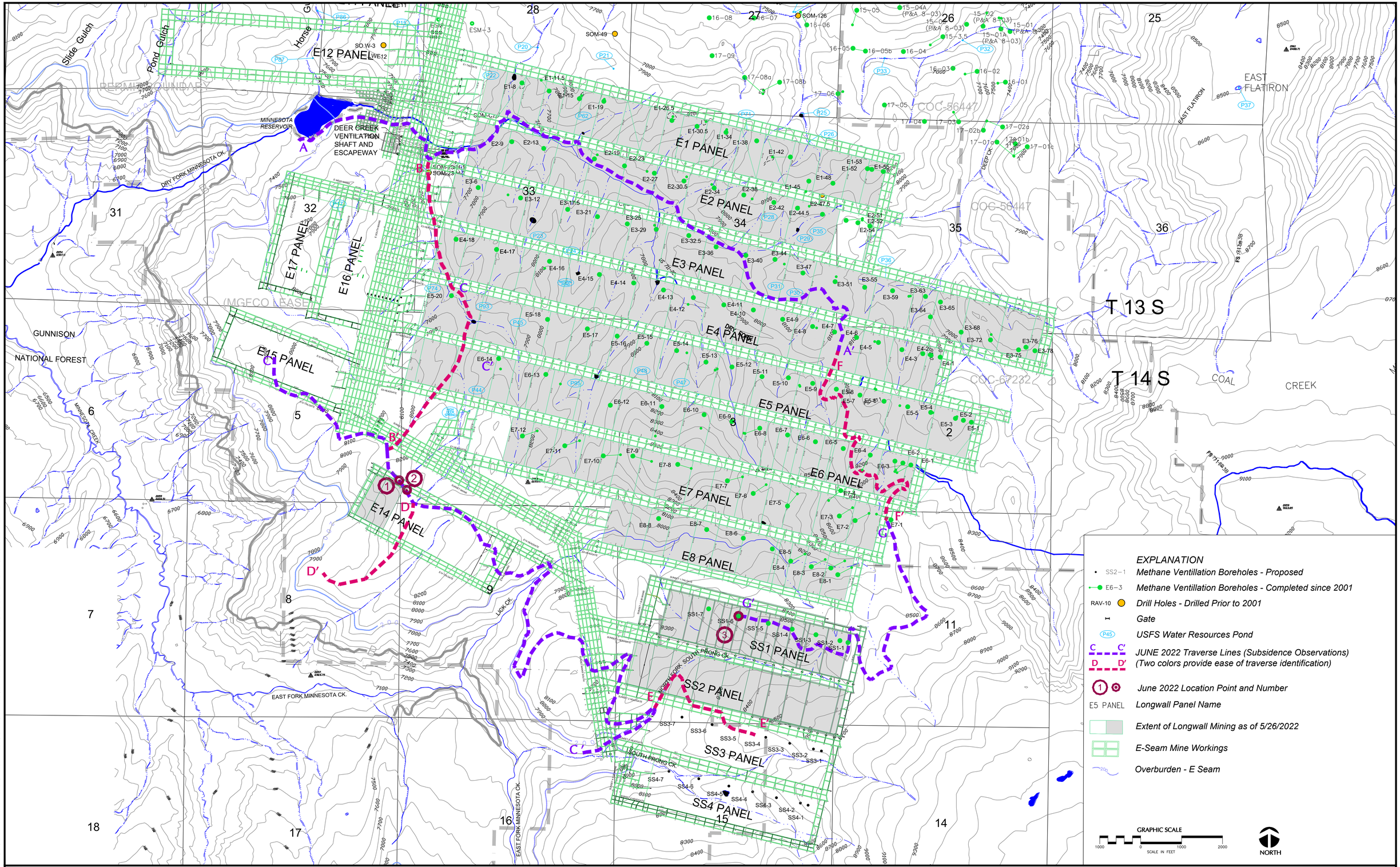
____. 2021a. *Spring 2021 Subsidence and Geologic Field Observations Southern Panels and Sunset Trail Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

____. 2021b. *Fall 2021 Subsidence and Geologic Field Observations Southern Panels and Sunset Trail Mining Areas (E-Seam)*. Denver, CO: Wright Water Engineers, Inc.

Wright Water Engineers, Inc. 2012. *Exhibit 60E: Subsidence Evaluation and Geologic Hazard Field Observations for the South of Divide and Dry Fork Mining Areas*. Glenwood Springs, CO: Wright Water Engineers, Inc.

____. 2021. *Exhibit 60E: Subsidence Evaluation for the Southern Panels, Apache Rocks West, & Sunset Trail Mining Areas*. Glenwood Springs, CO: Wright Water Engineers, Inc.

MAPS



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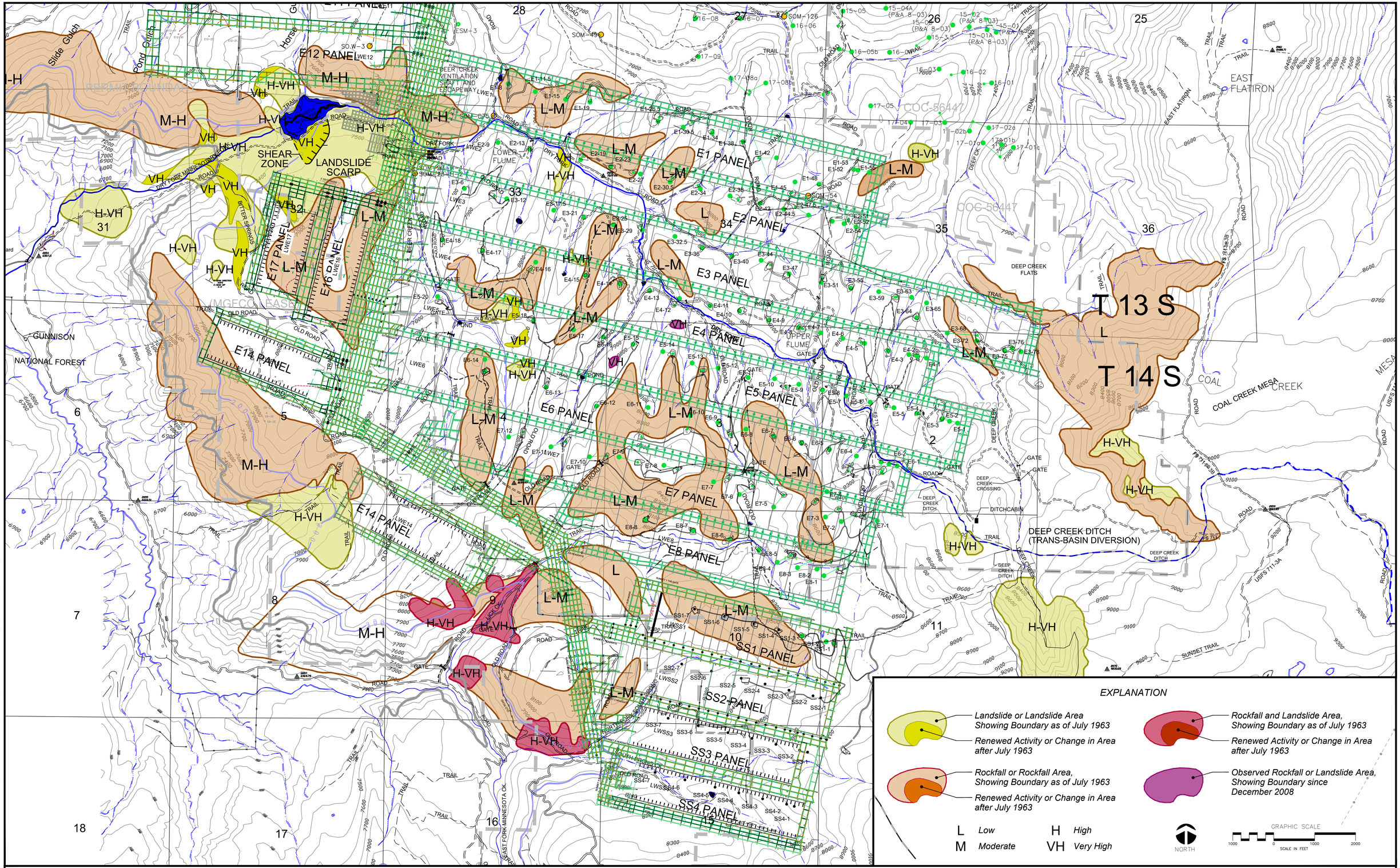
WRIGHT WATER ENGINEERS, INC.
2490 W. 26TH AVE. SUITE 100A
DENVER, CO 80211
(303)480-1700 FAX(303)480-1020

MOUNTAIN COAL COMPANY WEST ELK MINE

LOCATIONS OF OBSERVATIONS IN THE SOUTHERN PANELS AND SUNSET TRAIL MINING AREAS - JUNE 2022

DESIGN	GDW
DETAIL	BBT
CHECK	GDW
DATE	9/23/22
SCALE	1"=1000'

PROJECT NUMBER	DATE	MAP
831-032.913	9/23/22	1



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 IN THE SOUTHERN PANELS AND SUNSET TRAIL MINING AREAS – JUNE 2022

DESIGN	GDW
DETAIL	RBT
CHECK	JMK
DATE	9/23/22
SCALE	1"=1000'

PROJECT NUMBER	DATE	MAP
831-032.913	9/23/22	2

Plot Date/Time: 09/30/2022, 05:11:14 PM; Z:\PROJECT FILES\72-99\831-032\831-032.912\CAD-GIS\CAD\FALL 2021\01_DWGS\SRF 2022-FALL.DWG-SOUTH OF DIVIDE (24X36)

APPENDIX A

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

Forest Service Roads
Inspection Form

Date: 4-8-22
Time:
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: LW move SSZ - LWE14
Road(s) Being Inspected: Dry Fork, Deer Creek

Yes	No	
☐	☒ NP	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: Nicole Poulos

* 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: 05/11/2022
Time: 1:00 PM
Name of Inspector: Cody Rapke
Current Panel and XC Being Mined: LW E14 Approx. 22XC in HG
Road(s) Being Inspected: Dry Fork + Deer Creek

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: Cody Rapke

* 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: 6-4-22
Time: 2:20p
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: LWE14
Road(s) Being Inspected: Dry Fork Deer Creek

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: Nicole Poulos

* 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: 9/6/22
Time: 12:30PM
Name of Inspector: Cody Rapke
Current Panel and XC Being Mined: E14 ~ XC 17 in HG
Road(s) Being Inspected: Dry Fork & Deer Creek

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: _____

* 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: 08-03-22
Time: 1:30
Name of Inspector: Cody Rapke
Current Panel and XC Being Mined: LWE14 ~XC 15.5
Road(s) Being Inspected: Dry fork & Deer creek

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: Cody Rapke

* 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: 9/9/22
Time: 11:30 AM
Name of Inspector: Cody Rapine
Current Panel and XC Being Mined: LW E14 ~ XC 12
Road(s) Being Inspected: Dry Fork & Deer Creek

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: Cody Rapine

* 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: 4-8-22
Time:
Name of Inspector: N. Poulos
Current Panel and XC Being Mined: LW move from SS3 - LWE14
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: Nicole Poulos

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

Stock Pond
Inspection Form

Date: 05-11-2022
Time: 11:45 AM
Name of Inspector: Cody Ragsdale
Current Panel and XC Being Mined: LW 614 APPROX. 22 XC IN HG
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: _____

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

Stock Pond
Inspection Form

Date: 6/27/22
Time: 11:45A
Name of Inspector: Cody Rapke
Current Panel and XC Being Mined: E14 ~18xc in HG
Stock Pond(s) Being Inspected: 124

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:
Pond was dry

Signature of Inspector: _____

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

Stock Pond
Inspection Form

Date: 7/6/22
Time: 9:30 AM
Name of Inspector: Cody Ruppe
Current Panel and XC Being Mined: E14 XC 17 IN HG
Stock Pond(s) Being Inspected: 124

Yes	No	
☑	☐	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): 124 & 125
☐	☑	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: Cody Ruppe

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

Stock Pond
Inspection Form

Date: 8-3-2022
Time: 10:00 AM
Name of Inspector: Cody Rapke
Current Panel and XC Being Mined: LW E14 ~ XC 15.5 XC
Stock Pond(s) Being Inspected: 124 & 125

Yes	No	
☑	☐	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): 124 & 125
☐	☑	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: Cody Rapke

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

Stock Pond
Inspection Form

Date: 9/9/22
Time: 9:44AM
Name of Inspector: Cody Radke
Current Panel and XC Being Mined: LW E14 ~XC 12
Stock Pond(s) Being Inspected: 124 & 125

Yes	No	
☑	☐	Is the stock pond within twice the projected angle of draw of subsidence? If yes, which pond(s): 124 & 125
☐	☑	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: Yes water in Pond 124
☐	☑	Is mitigation needed? If yes, list suggestions:

Notes:

Signature of Inspector: Cody

* 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: 1-11-22
Time:
Name of Inspector: Nicki Poulos
Current Panel Being Mined: LW552
☐ 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:

unable to access due to winter weather

Signature of Inspector: Nicki Poulos

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: 2-17-22
Time:
Name of Inspector: Nicki Paulos
Current Panel Being Mined: LW552
☐ 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:
unable to access due to winter weather conditions

Signature of Inspector: Nicki Paulos

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: 3-14-22
Time:
Name of Inspector: Nicki Poulos
Current Panel Being Mined: LW552
☐ 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:
unable to access due to winter weather

Signature of Inspector: Nicki Poulos

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: 4-8-22
Time:
Name of Inspector: N. Poulos
Current Panel Being Mined: LW move 852 - LW 614
☐ 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:

unable to access due to weather

Signature of Inspector: Nicole Poulos

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: 05/11/2022
Time: 10:30 am
Name of Inspector: Cody Rapke
Current Panel Being Mined: LWE14
☐ 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:

Signature of Inspector: Cody Rapke

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: 6-4-22
Time: 5:38p
Name of Inspector: N. Poulos
Current Panel Being Mined: LWE14
☐ 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:

Signature of Inspector: Nicole Poulos

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: 7/6/22
Time: 11:15 AM
Name of Inspector: Cody Rupke
Current Panel Being Mined: E14 ~XC17 in HG
☐ 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:

Signature of Inspector: Cody [signature]

Jessica Wilczek P.E.

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

Jessica Wilczec Micki Powos

If cracks or other potentially damaging features occur, notify ~~Mike Peac~~ock or ~~Kathy Welt~~ immediately.

Monument Dam
Inspection Form

Date: 08/3/2022
Time: 10:45
Name of Inspector: Cody Rapke
Current Panel Being Mined: LW E14
☐ 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:

Signature of Inspector: Cody Rapke
Jessica Wilczek

Inspections are performed under the direction of ~~Mike Peacock~~, P.E.
Jessica Wilczek Nicki Poulos

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

Monument Dam
Inspection Form

Date: 9/9/22
Time: 10:30
Name of Inspector: Cody
Current Panel Being Mined: LW E14
☐ 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:

Signature of Inspector: Cody

Jessica Wilczek

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

Jessica Wilczek Nicki Polous

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

APPENDIX C

Monument Dam Monitoring Data

Spring 2022 Semi- Annual Subsidence Report
Appendix C
Table 1
Monument Dam Survey Data

		Fall 2021 to Spring 2022 Easting Displacement (X)	Fall 2021 to Spring 2022 Northing Displacement (Y)	Fall 2021 to Spring 2022 Elevation Displacement (Z)
	Survey Points	Displacement (ft)	Displacement (ft)	Displacement (ft)
Monument Dam	6001	Not Surveyed*	Not Surveyed*	Not Surveyed*
	6003	-0.50	-0.12	0.22
	6004	-0.46	-0.45	0.03
	6005	-0.42	-0.63	0.05
	6006	-0.47	-0.45	0.12
	6007	-0.59	-0.40	0.13
	6008	-0.53	-0.42	0.13
	6009	-0.50	-0.46	0.12
	6010	-0.36	-0.48	0.00
	6011	-0.44	-0.61	-0.05
	6012	-0.62	-0.58	0.09
Hillside south of road past Monument Dam	7000	-0.41	-0.68	-0.09
	7001	-0.60	-0.56	0.21
	7002	-0.80	-0.91	0.06
	7003	-0.72	-0.66	0.08
	7004	-0.88	-0.65	0.01
	7005	-0.75	-0.46	-0.01
	7006	-0.98	-0.30	0.10
	7007	-1.09	-0.36	0.07
	7008	-0.97	-0.28	0.06
	7009	-1.05	-0.34	0.02
	7010	Not Surveyed*	Not Surveyed*	Not Surveyed*
	7011	-0.97	-0.23	0.06
	7012	-1.02	-0.44	0.00
	7013	-1.18	-0.54	-0.16
	7014	-1.21	-0.55	0.14
	7015	-1.67	-0.66	0.09
	7016	-0.40	-0.09	0.80
	7017	-1.20	-0.66	0.07
	7018	-0.75	-0.69	0.04
	7019	-0.53	-0.74	0.13
	7020	-0.66	-0.97	0.07
	7021	Not Surveyed*	Not Surveyed*	Not Surveyed*
	7022	-0.96	-0.83	0.06
	7023	0.00	0.00	0.00
	7024	Not Surveyed*	Not Surveyed*	Not Surveyed*
	7025	-1.06	-0.98	0.00
	6501	0.00	0.00	0.00
	6502	0.00	0.00	0.00
	6503	0.00	0.00	0.00
	6504	0.00	0.00	0.00

* Survey monument not avalible due to damage, obstruction, ect.

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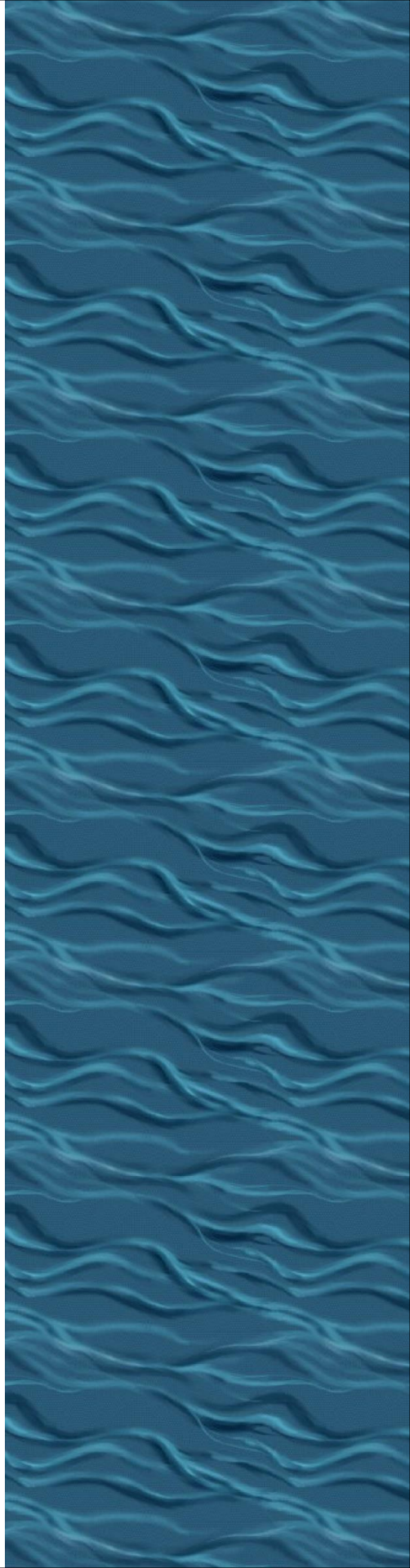

Wright Water Engineers, Inc.