

2020 Removal Design Work Plan

Illinois Gulch Site Time-Critical Removal Action

Summit County, Colorado

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LIST OF ACRONYMS/ABBREVIATIONS

ARAR	Applicable and/or Relevant and Appropriate Requirement
ASTM	American Society for Testing and Material
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQA	Construction Quality Assurance
CQC	Construction Quality Control
ECO	Engineering Change Order
EPA	U.S. Environmental Protection Agency
HASP	Health and Safety Plan
HDPE	high density polyethylene
lbs/day	pounds per day
mg/kg	milligrams per kilogram
NRHP	National Register of Historic Places
PES	Puzzle Extension Shaft
RAO	Removal Action Objective
SHPO	State Historic Preservation Office
SOW	Statement of Work
TCRA	Time-Critical Removal Action
UAO	Unilateral Administrative Order
USGS	United States Geological Survey

1.0 INTRODUCTION

This 2020 Removal Design Work Plan (“Work Plan”) was prepared in accordance with the Unilateral Administrative Order for Removal Action (“UAO”) with attached Statement of Work (“SOW”) issued to Respondent, TABR Realty Services, LLC (“TABR”) by U.S. EPA Region 8, Docket No. CERCLA-08-2020-0003 (Effective Date of September 14, 2020). The Work Plan describes environmental conditions and presents Removal Action designs that will be implemented to address certain mining-related impacts on and adjacent to properties owned by TABR¹ near the town of Breckenridge in Summit County, Colorado (“Site”). The Site is located within a larger geographic area identified by EPA as the Illinois Gulch Superfund Site. Additional Removal Action designs will be presented in a 2021 Work Plan. The general location of the Site and property owned by TABR are shown on Figure 1.

Investigations conducted by EPA indicate that metals concentrations in surface water affected by the Site pose risks to fish and other aquatic organisms and metals concentrations in the Site waste rock and soil of adjacent residential properties may pose risks to human health (Weston, 2017). These findings resulted in EPA’s issuance of the UAO/SOW requiring TABR to implement a Time-Critical Removal Action (“TCRA”) at the Site.

The rest of this Work Plan is organized as follows. Section 2.0 provides a summary of relevant background information on the Site history, setting, and environmental conditions. The objectives of the Phase 1 Removal Action work are presented in Section 3.0. A summary of all Phase 1 work to be implemented in 2020, 2021, and possibly subsequent years, is provided in Section 4.0. The designs for Removal Actions that were planned initially for implementation in 2020 are described in Section 5.0. Health and safety are discussed in Section 6.0. Section 7.0 describes general construction quality assurance / construction quality control (“CQA/CQC”) measures that will be implemented to ensure that the Removal Action construction activities are implemented consistent with project design criteria. References cited in this Work Plan are listed in Section 8.0.

The Phase 1 Removal Action construction activities will attain, to the extent practicable, Applicable and/or Relevant and Appropriate Requirements (“ARARs”) identified by EPA for the Phase 1 work. A list of potential ARARs is provided in Appendix A, including those ARARs that EPA has already determined are not practicable to achieve. EPA may supplement its determination of appropriate waivers as final designs are approved. Appendix B comprises two memorandums associated with removal of an existing pond. Appendix B1 is a memorandum summarizing recent water quality data for ponded water that was present at the Site and Appendix

¹ The Summit County, Colorado County Assessor identifies the owner of these claims as Transamerica Realty Services, Inc. However, the present legal owner of the claims is TABR Realty Services, LLC. On December 1, 2002, Transamerica Realty Services, Inc. became Transamerica Realty Services, LLC. Subsequently, on May 14, 2015, Transamerica Realty Services, LLC changed its name to TABR Realty Services, LLC. TABR Realty Services, LLC and its predecessors have owned property at the Site since the 1970s.

B2 is a memorandum that describes a monitoring approach that was implemented while the ponded water was drained to receiving streams. Design drawings and technical specifications for the Phase 1 work described herein are presented in Appendix C and a memorandum describing a Site drainage analysis is provided as Appendix D. A project-specific Health and Safety Plan (“HASP”) for the construction work and other planned field activities during Phases 1 and 2, including COVID-19-related protocols, is provided in Appendix E.

2.0 BACKGROUND INFORMATION

The Site is situated in Iron Springs Gulch, along the Boreas Pass Road (County Road 10), approximately ½-mile southeast of the Stephen C. West Ice Arena. The Site includes two collapsed mine adits referenced herein as the Willard No. 1² and Willard No. 2, the Willard waste rock pile, the Cally waste rock pile, the Puzzle Extension Shaft (“PES”) and waste rock pile, and seven privately owned residential lots on Brooks Hill Drive. The residential lots are included by EPA as the concentrations of metals in soil in areas of said lots may pose risk to human health. The locations of these and other Site features are shown on Figure 2 along with TABR’s property ownership in the Site vicinity.

The Removal Action work activities are described in the UAO/SOW in three phases. Phase 1 includes Removal Action construction work to address the Site waste rock piles and reduce the quantity of water flowing from the Willard No. 1 adit. Phase 1 also includes sampling and analysis activities to characterize metals concentrations in the residential yards of properties on Brooks Hill Drive. Phase 2 consists of one to two years of monitoring and bench-scale testing to evaluate potential passive approaches for treating the adit flows. Phase 3 will include construction and operation of a passive water treatment system. Phase 1 will commence beginning in 2020 and Phase 2 monitoring will commence after Phase 1 construction activities are completed. Phases 1 and 2 will be implemented over the next three to four years. Phase 3 will be initiated following completion of the Phase 2 monitoring activities (2023 or 2024).

This Work Plan describes a portion of the Phase 1 work that initially was planned for implementation in 2020. Work described in this Work Plan that is not completed in 2020 due to the onset of winter conditions will be completed in 2021. Additional Phase 1 work will be described in a 2021 Removal Design Work Plan.

2.1 Physical Setting

The Site is located in drainages associated with Iron Springs Gulch and Illinois Gulch at an elevation of approximately 9,800 feet above mean sea level. Site winters are typically severe with heavy snowfall that will limit construction activities to the late spring through fall time frames each year.

Iron Springs Gulch discharges surface water to the northwest through a residential area and into Illinois Gulch, approximately 1,700 feet downstream from the Willard waste rock pile. Much of the surface water in Iron Springs Gulch originates from the Willard No. 1 adit, and to a lesser extent, the Willard No. 2 adit. Illinois Gulch flows approximately 3,500 feet west-northwest from the Iron Springs Gulch confluence to join the Blue River, which flows approximately 6.5 miles northward to Dillon Reservoir, a water supply for the Denver, Colorado metropolitan area. The

² The Willard No. 1 adit is also called the Willard Tunnel of the Puzzle Mine.

Blue River continues northward from Dillon Reservoir to join the Colorado River near Kremmling, Colorado.

The Willard waste rock pile covers approximately 2.1 acres and is the largest accumulation of waste rock at the Site (Figure 2). It is located in a wet area on TABR-owned property in the inside of a horseshoe-shaped curve of the Boreas Pass Road (County Road 10). The waste rock was removed from underground workings of the Puzzle Mine accessed by the Willard No. 1 adit. The base of the Willard waste rock pile is likely saturated due to shallow subsurface flow through the adjacent wet area and the presence of a pond on the southwestern side of the pile. Based on available topographic mapping (2-foot contours) and interpolation of the underlying native ground surface, the volume of the Willard waste rock pile is estimated to be approximately 20,000 cubic yards (cy). The surface of the waste rock pile includes depressions that likely retain water following storms and snow melt events, promoting infiltration through the waste rock.

Waste rock from the Cally adit of the Ouray Mine is located to the south of the Willard waste rock pile and is partially covered by the Boreas Pass Road embankment. The PES and associated waste rock pile are located in Illinois Gulch approximately 1,500 feet east of the Willard waste rock pile (Figure 2).

The Willard Nos. 1 and 2 adits are located to the east and northeast of the Willard waste rock pile, respectively (Figure 2). Water from the Willard No. 1 is heavily iron stained and flows across the top of a portion of the Willard waste rock pile and then to its northern edge. The Willard No 2 flow is also heavily ironed stained. The two adit flows merge in a wet area and the merged flows continue downstream in Iron Springs Gulch. The northern portion of the wet area, adjacent to the residential area, is correspondingly iron stained due to the influence of the two adit flows. The hillside above and to the east of the Willard waste rock pile is steep and timbered. A remnant historic mining feature, the Gold Run Ditch, traverses this hillside to the east of the adits.

Seven residential lots with homes are located on Brooks Hill Drive to the north of the Willard waste rock pile (Figure 2).

2.2 Site History

The Site includes portions of the Puzzle Mine, which was formerly accessed by the Willard No. 1 adit, and the Ouray Mine, which was formerly accessed by the Cally adit (Figure 3). The underground workings of the two mines are connected. The Puzzle and Ouray mines exploited ore from the same mineralized vein and produced lead, zinc, and iron ores in the form of sulfides, sulfates, and carbonates with minor silver and gold (Lovering, 1934). Production began in 1885 with most of the production occurring between 1888 and 1900. Ore milling reportedly occurred at the Puzzle Mine site in the late 1890s and again from 1917 to 1918 (Mountain States Historical, 2004). The Willard No. 1 adit served as the main drainage tunnel and haulage way for the Puzzle Mine. It is connected to the PES which is located in Illinois Gulch. Additional mine workings extend beyond the PES to the northeast and southeast (Figure 3) on private and public lands.

No historical information is available for the Willard No. 2 adit. It does not appear to be connected to or associated with the Puzzle and/or Ouray mines.

2.3 Cultural Resources

An initial evaluation of cultural resources associated with the Puzzle and Ouray mines was completed in 2004 (Twitty, 2004). The Ouray Mine was found to have lost its integrity due to highway development, bull dozing, and waste rock removal, though a subsequently constructed sawmill on the Ouray Mine site was deemed to be historically important. The sawmill, located off-Site to the south of the Boreas Pass Road, is still present and has been improved with interpretive signage. The planned Removal Action construction activities will not extend to the south of the Boreas Pass Road and therefore will not affect the sawmill. The evaluation recommended the Puzzle Mine site as ineligible for inclusion on the National Register of Historic Places due to lost integrity from natural decay and adjacent residential development, which destroyed the integrity of any important structures and features.

In July 2020, an updated cultural resources survey was implemented by Paleowest, on behalf of TABR, to confirm the findings of the earlier (2004) evaluation and demonstrate substantive compliance with section 106 of the National Historic Preservation Act (Paleowest, 2020).³ Paleowest recommended only one Site feature, the Gold Run Ditch, as eligible for the National Register of Historic Places ("NRHP"). The portion of the Gold Run Ditch within the Site is located on the steep timbered hillside between the Boreas Pass Road and the Willard No.1 and Willard No. 2 adits (Figure 2). The planned Phase 1 Removal Action construction activities are not expected to adversely affect the Gold Run Ditch.⁴ Paleowest, consistent with Twitty (2004), recommended other Site features, such as the Puzzle Mine, the PES, a former railroad grade, and a former mill site as ineligible for the NRHP because the remnants of these mining features generally lack sufficient integrity to convey historical significance.

2.4 Existing Environmental Conditions

EPA and its contractors collected water and soil samples for chemical analysis and conducted X-ray fluorescence surveys of soil in 2014 and 2015. Their conclusions based on those analyses are presented below (Weston, 2017).

³ The Paleowest report was transmitted to U.S. EPA Region 8 on September 28, 2020 and to the Colorado State Historic Preservation Office ("SHPO") on November 3, 2020.

⁴ A possible exception is the unlikely event that the present location of the Willard waste rock is found to be unsuitable as a long-term repository based on the planned geotechnical investigation. In this case, an alternative repository location on the hillside to the southeast of the Willard waste rock pile may be used. This location could involve covering a portion of the Gold Run Ditch on TABR owned property. If a conclusion is reached that the alternative repository location will adversely affect the Gold Run Ditch, and avoidance and preservation in place is not feasible, TABR would propose to catalog (e.g, photo document) the Gold Run Ditch on TABR property as mitigation.

“The Puzzle mine/Willard adit was determined to be a primary focus under consideration for cleanup actions within the watershed at this time due to its documented impact on Illinois Gulch water quality, proximity to residential properties, accessibility to human and ecological receptors, and volume of mine waste rock. The waste pile area is approximately 2.1 acres and contains metals at concentrations many orders of magnitude above background concentrations and exceed residential regional screening levels (although not a direct indication of immediate risks to residents but serve as initial screening levels related to the potential for risks to occur). Arsenic concentrations ranged from 93.1 milligrams per kilogram (mg/kg) to 1,300 mg/kg, cadmium ranged from 0.114 mg/kg to 37.3 mg/kg, lead ranged from 166 mg/kg to 95,000 mg/kg, and zinc ranged from 42.2 mg/kg to 8,930 mg/kg. There are also observations of many wildlife species using the mine waste area, and the concentrations would be considered detrimental to wildlife if prolonged use and exposures were to occur.

Elevated concentrations of several dissolved metals, including cadmium, lead, manganese, nickel, and zinc occur in surface waters of Illinois Gulch, Iron Springs Gulch, and in discharges from drainage, run off, and leachate from waste piles at the Willard adit waste area. Visual observations of discolored/stained run off from the mine waste area indicate contaminated wastes have migrated into downstream Illinois Gulch. Dissolved cadmium loading directly downstream of the confluence of Iron Springs Gulch and Illinois Gulch range from 0.0093 to 0.056 pounds per day (lbs/day) and dissolved zinc loading ranges from 2.58 to 11.46 lbs/day. During high flow, these loading rates are about double what they are just upstream of the confluence. Potential for uncontrolled blowouts at the collapsed Willard adits could exacerbate the high-flow scenario and be an imminent threat to downstream aquatic life. These loading rates are also double what is measured downstream by Breckenridge Ice Rink, showing some dilution occurs. Nevertheless, available water quality results from this investigation demonstrate that Iron Springs Gulch and the Puzzle mine/Willard adits are the primary contributors of heavy metals into Illinois Gulch.”

The U.S. Geological Survey (“USGS”) conducted a tracer study in the Illinois Gulch area which consisted of introducing a bromide solution into Illinois Gulch Creek and measuring its dilution at downstream locations to estimate the stream flow rates. As part of this study, stream flow rates in Illinois Gulch Creek were measured upstream and downstream of the PES. This comparison revealed a loss in stream flow in this area, suggesting that some of the Illinois Gulch Creek flow is seeping through the subsurface, entering the Puzzle Mine workings through the PES, and contributing to flow at the Willard No. 1 adit.⁵ Sampling at the adit during the tracer study revealed the presence of bromide and thus confirmed that flow from Illinois Gulch Creek is reporting to the adit. The USGS estimated that approximately half of the cadmium and zinc loads (in pounds per

⁵ An earlier dye tracer study conducted by the Colorado Department of Public Health and Environment demonstrated that water injected into the PES reports to the Willard No. 1 adit discharge.

day) in the adit flow may originate from Illinois Gulch Creek (Runkel, 2017 and Runkel et al., 2019).

3.0 REMOVAL ACTION OBJECTIVES AND APPLICABLE AND/OR RELEVANT AND APPROPRIATE REQUIREMENTS

3.1 Removal Action Objectives

The Removal Action Objectives (RAOs) that will be met through implementation of the Phase 1 work during 2020 and 2021 are as follows.

1. Reduce the degree of saturation at the base of the Willard waste rock pile.
2. Reduce the flow rate and potentially improve the quality of water that drains from the Willard No. 1 adit.
3. Eliminate physical hazards associated with the PES.
4. Prevent direct human and wildlife contact with material comprising the Willard waste rock pile.
5. Reduce the amount of water that infiltrates into the Willard waste rock pile due to direct precipitation and snowmelt.
6. Investigate whether there are potential human health risks associated with arsenic and/or metals in soil at residences on Brooks Hill Drive and eliminate any identified unacceptable exposure risks.

3.2 Applicable and/or Relevant and Appropriate Requirements

PLACEHOLDER: EPA HAS NOT YET PROVIDED ARARS.

EPA compiled a list of ARARs for the Illinois Gulch Site (Appendix A). “Applicable requirements” mean those cleanup standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a Comprehensive Environmental Response, Compensation, and Liability Act (“CERCLA”) site. “Relevant and appropriate requirements” mean those cleanup standards that address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

The Phase 1 Removal Actions for the Illinois Gulch Site, as required by the UAO and described in its attached SOW as well as this Work Plan, are expected to comply with ARARs presented in Appendix A, except for those ARARs EPA has (or later determines) are not practicable to achieve.

4.0 SUMMARY OF PHASE 1 REMOVAL ACTION COMPONENTS

An overview of all Phase 1 Removal Action components is provided below. As previously discussed, some of the Phase 1 work will be implemented in 2020 (extending into 2021) and is described in detail in this Work Plan. Additional Phase 1 work items will be described in a subsequent work plan that will be submitted to EPA by March 31, 2021 as required by the UAO/SOW. Areas and features identified in the Removal Action component summary below are shown on Figure 2.

- Drain existing pond(s) to reduce saturation of the Willard waste rock pile. This component will address RAO No. 1 as listed in Section 3.0.
- Construct a driveway to facilitate access from the Boreas Pass Road to the Willard waste rock pile and the Willard Nos. 1 and 2 adits.
- Route Illinois Gulch creek flows through pipes in the area adjacent to the PES to limit or eliminate leakage into the PES and thence the Puzzle Mine workings. This is expected to reduce the flow rate at the Willard No. 1 adit, thus addressing RAO No. 2 as listed in Section 3.0.
- Conduct a geotechnical investigation of the Willard waste rock pile after the ponds are drained and access driveway is constructed to ensure that the foundation conditions are acceptable for in-place closure.
- Direct flows from the Willard No. 1 and Willard No. 2 adits to a new sedimentation pond(s) to promote the removal of iron.
- Remove the PES waste rock pile and transport it to the Willard waste rock pile for inclusion in the repository.
- Engage the Colorado Division of Reclamation, Mining, and Safety to install a concrete plug in the PES to eliminate physical hazards. This component will address RAO No. 3 as listed in Section 3.0. Plugging of the PES may also reduce the amount of water entering the mine workings and flowing from the Willard No. 1 adit.
- Remove the remnant of the Cally waste rock pile and transport it to the Willard waste rock pile for inclusion in the repository.
- Remove iron-stained sediment in the areas to the north and northwest of the Willard waste rock pile to the extent feasible and transport it to the waste rock pile for inclusion in the repository.

- Regrade the Willard waste rock pile, with incorporated waste rock from the PES, Cally adit, and iron-stained sediment, to promote positive drainage and to eliminate ponding. Cover the Willard waste rock pile with clean soil and revegetate. This component will address RAO Nos. 4 and 5 as listed in Section 3.0.
- Sample residential yards on Brooks Hill Drive using the methods set forth in EPA's "Lead Handbook" (EPA, 2003), analyze the samples for a suite of metals as well as arsenic, and provide the resulting data to EPA so that EPA may assess potential human health risks. Remediate portions of the residential yards that are determined to pose potential human health risks through soil removal/replacement and revegetation. This component will address RAO No. 6 as listed in Section 3.0.

5.0 DESIGN

This section describes the design for portions of the Phase 1 Removal Action that were intended to be implemented in 2020.⁶ TABR retained Formation Environmental, LLC, (“Formation”) of Boulder, Colorado to prepare the design. Formation subcontracted The Sanitas Group, LLC of Louisville, Colorado to assist with specific civil engineering design elements. Technical factors of importance that were considered during the design and will be taken into account during the Removal Action construction include employment of standard and widely used environmental control measures (i.e., best management practices [BMPs] and standard construction practices and techniques).

5.1 Pond Removal

A pond was present to the southwest of the Willard waste rock pile (see item 5 on Figure 2). Impounded water in the pond appeared to saturate a portion of the waste rock, potentially resulting in the release of metals by leaching mechanisms. The pond was therefore drained and permanently eliminated to promote drying of the waste rock pile and a possible reduction in metals releases.

The initial step toward removal of the pond was confirmation that the pond water could be safely directed to Iron Springs Gulch Creek and thence Illinois Gulch Creek. Water quality samples were collected from the pond, and a smaller ponded area to its north, in September 2020 and submitted for laboratory analysis. The sample collection and analysis methods were consistent with the Sampling and Analysis Plan and Quality Assurance Project Plan previously employed for sampling at the Site by EPA (U.S. Forest Service Region 2, 2014). The analytical data were compared with previous surface water results from the pond area as well as ecological screening benchmarks (Weston, 2017).⁷ The analytical data and comparison results were provided to EPA in a brief technical memorandum, which concluded that the pond water can be safely directed to Iron Springs Gulch. EPA provided its concurrence with this conclusion in October 2020. The technical memorandum is provided in Appendix B1 of this Work Plan. EPA requested that streams receiving the water pumped from the pond be monitored for pH, specific conductance, and any changes in appearance at regular time intervals. A technical memorandum detailing this monitoring approach is provided in Appendix B2 of this Work Plan.

The pond was drained between October 29 and November 3, 2020, using trash pumps and flexible hosing to direct the water to the vicinity of the culvert underlying Bright Hope Circle near

⁶ As previously described, any Removal Action construction planned for but not completed in 2020 will be addressed in 2021.

⁷ Water quality sampling conducted by EPA indicates generally good water quality in the inflow and outflow of the pond in 2014. An exceedance of the chronic ecological screening benchmark for selenium was noted in the pond inflow (Weston, 2017).

its intersection with the Boreas Pass Road (Figure 2). The pumping rate and hose locations were carefully controlled to minimize disturbance of the iron-rich sediment present in the wet areas at the northern end of the Site such that no visible color change occurred in Iron Springs Gulch downstream of the Site. The monitoring approach described in Appendix B2 was implemented as the pond was being drained and the collected data were provided to EPA on a daily basis.

After draining, the earthen berm that formerly contained the pond was breached using a small excavator to preclude further water impoundment. Straw wattles were installed downstream of the breach area to limit any sediment migration from the former pond area. It is expected that the former pond will naturally infill with native vegetation.

5.2 Driveway Construction

Vehicle and construction equipment access to the Willard waste rock pile, Willard No. 1 adit, and Willard No. 2 adit from Boreas Pass Road is not currently possible given the presence of wet areas and heavy vegetation in most of the Site. Therefore, a new driveway will be constructed on TABR property to provide such access. The generalized location and configuration of the proposed driveway are shown on Figure 2.

Detailed design information for the driveway is presented in Appendix C. The overall length of the driveway will be approximately 800 feet. Its width at the juncture with Boreas Pass Road will be 20 feet for the first 120 feet of its length during construction, reducing to 16 feet for the remainder of the driveway length. The additional width will facilitate turning of loaded haul trucks around the initial driveway curve (Appendix C, Sheet C2.0). Following completion of the Removal Action construction activities, at the request of local jurisdictions, the first 120 feet of the driveway will be reduced in width to 16 feet to reduce the pullout width and to limit use of the intersection by passing traffic as a pull off (Appendix C, Sheet C3.0). A locking gate will be installed across the driveway near the Boreas Pass Road intersection to control Site access.

The driveway's departure point from the Boreas Pass Road was selected with input from Summit County, Town and EPA representatives. The departure point is based on consideration of sight-line distances for oncoming traffic as well as other Summit County and Town of Breckenridge rules and guidance. The curve radii and driveway width were selected to allow safe passage of typical 10 to 12 cubic yard (cy) dump trucks.

Construction of the driveway will require approximately 1,200 net cy of imported fill material. Import of fill to construct the driveway will necessitate material hauling on public roads from a borrow source (to be identified). The loaded trucks will enter the Site from the Boreas Pass Road. Given the heavy use of that road by the community, flaggers will be used to safely control traffic as the imported fill arrives at the Site. Waste rock from the PES area will be transported to the Willard waste rock pile for incorporation into the repository. Transport of this waste rock will require hauling on both the Illinois Gulch Road and on the Boreas Pass Road. A Traffic Control Plan

consisting of construction notification signage and flaggers will also be used to safely control traffic while the PES waste rock is being moved.

Culverts will be installed to pass drainage beneath the driveway. Dual 36-inch culverts, approximately 32 feet in length, will be installed at approximate Sta. 3+70. Eighteen-inch diameter culverts will be installed near Sta. 5+00 and Sta. 6+85 (Appendix C, Sheets C2.0 and C3.0). Culvert bedding and outfall details are shown on Appendix C, Sheet C5.0.

Cross sections and design details for the driveway were developed with input from local government representatives and are presented in Appendix C, Sheet C5.0. The driveway top surface will be sloped at 3 percent toward the inside of the curve to facilitate runoff of rainfall and snow melt. Tie slopes above and below the driveway will be sloped at a maximum of 2 (horizontal) to 1 (vertical). Organic material and topsoil will be stripped from the driveway subgrade and the remaining suitable soil will be compacted to a depth of approximately nine inches to achieve at least 95 percent of maximum dry density. The compacted soil will be overlain with six inches of road base or equal suitable material.

5.3 Reduction of Seepage from Illinois Gulch Creek to Mine Workings

As previously discussed, studies by the USGS demonstrate that some streamflow from Illinois Gulch enters the PES and exits the mine workings at the Willard No. 1 adit. The Removal Action will include routing Illinois Gulch streamflow through a pipe system to reduce this seepage which is expected to reduce the discharge volume at the Willard No. 1 adit. EPA has consulted with the State of Colorado and confirmed the use of a pipe system is acceptable. Use of a pipe system was selected over an open, concrete-lined channel based on expected longevity and effectiveness. Installation of the pipe system will be fully completed before any work on the PES and its associated waste rock pile is implemented to ensure that streamflow in Illinois Gulch does not inadvertently enter the PES.

A preliminary pipe system design is presented in Appendix C, Sheet C4.0; details are provided on Sheets C5.0 and C5.1. The pipe system is designed to convey maximum flows of 160 cubic feet per second, which is the estimated 500-year flow rate plus a Standard Error of Prediction (33 percent). The flow rate estimate is detailed in Appendix D. The system will consist of dual 36-inch-high density polyethylene (HDPE) pipes with an overall length of approximately 134 feet. The system will comprise two sections separated by a drop structure in order to mitigate flow velocities in the system. The more upstream section will be approximately 73 feet in length and will be sloped at approximately eight percent. The downstream section will be approximately 61 feet in length and will be sloped at approximately two percent. A roadside swale above the pipe system will be used as a secondary conveyance element in the event that overtopping occurs at the pipe system inlet.

A concrete headwall/cutoff wall will be installed at the inlet to the pipe system. The headwall will extend to a depth of at least four feet below the pipe inverts to eliminate undercutting by streamflow and to promote capture of groundwater into the pipe system (Appendix C, Sheet C5.0).

The drop structure will consist of a five- by ten-foot rectangular concrete box, approximately seven feet deep and with eight-inch-thick walls (Appendix C, Sheet C5.1). The difference in inlet and outlet pipe invert elevations will be approximately three feet. Access to the drop structure interior for maintenance purposes will consist of a 24-inch manhole with ladder rungs on the drop structure interior wall.

The pipe system outlet will consist of an energy dissipation basin/apron with dimensions of approximately 20 feet by 20 feet. The basin/apron will be constructed of seven- to eight-inch riprap approximately two feet in thickness. A concrete headwall/cutoff wall will be constructed at the downstream pipe terminus to anchor the pipe and eliminate undercutting.

Flow rates at the Willard No.1 adit will be monitored and compared to past flow measurements to assess whether, and to what extent, the piping system in Illinois Gulch has decreased the flow rate. If the flow rate is not found to have decreased significantly, additional measures may be undertaken. Such measures could include installation of a concrete liner in the Illinois Gulch streambed upstream of the pipe structure and/or installation of a groundwater cutoff wall across the width of Illinois Gulch to capture additional groundwater prior to leakage into the PES.

5.4 Geotechnical Investigation of Willard Waste Rock Pile

The interior and foundation materials of the Willard waste rock pile will be investigated to confirm its suitability as a long-term repository. The investigation will be conducted by excavating test pits, observing and documenting the subsurface conditions, and collection of bulk material samples for analysis by a geotechnical laboratory. The test pit program will be overseen by a qualified geologist or engineer. The specific objectives of the geotechnical investigation include:

- Confirming the thickness and volume of the waste rock material;
- Evaluating the geotechnical characteristics and engineering properties of the waste rock material;
- Evaluating groundwater conditions within and beneath the waste rock pile; and
- Evaluating the geotechnical characteristics and engineering properties of the subsurface materials underlying the waste rock pile.

Four test pits will be excavated into and through the Willard waste rock pile. The number of test pits may be adjusted in the field, either upward or downward, based on field observations. Each test pit will be extended through the waste rock and into underlying native material if possible. Bulk samples (i.e., 5-gallon buckets with sealable tops) will be collected from each major distinct material type encountered in the test pits. Each test pit will be logged by the field geologist or engineer who will also assign preliminary material classifications according to the Unified Soil Classification System. In particular, any soft, compressible materials encountered in the test pits will be described and sampled. Such materials could result in differential settlement of the repository leading to the formation of depressions that could hold water and/or cracks in the cover soil material.

Geotechnical laboratory analyses will include grain-size distribution by the American Society of Testing and Materials ("ASTM") method D-422-63 and Atterberg Limits by ASTM D-4318. The results of these tests will be used to confirm or revise the field USCS classifications.

6.0 HEALTH AND SAFETY

The project HASP is provided in Appendix E. The intent of the HASP is to protect on-site personnel and visitors from potential hazards associated with the construction and sampling activities. Pursuant to 40 C.F.R. Part 300.150, the HASP complies with all currently applicable Occupational Safety and Health Act requirements, standards and regulations found at 29 C.F.R. Part 1910, (Occupational Safety and Health Standards); Part 1926 (Construction Standards), including the General Industry Standards found in Part 1910.

The HASP describes the following: site personnel and safety responsibilities, hazard analyses, personal protective equipment, decontamination procedures, emergency response, and safety training. Copies of the HASP will be maintained in the construction contractor's project field office.

7.0 CONSTRUCTION QUALITY CONTROL AND QUALITY ASSURANCE

CQC and CQA will be performed to assure that the project is constructed in conformance with approved plans and specifications. The information and guidelines provided in this section are intended to provide verification that the Removal Action implementation at the Illinois Gulch Site is performed in accordance with the approved design plans and specifications and any approved ECOs issued during construction.

Generally, CQC is the day-to-day tracking of construction quality whereas CQA is a periodic audit of CQC to ensure that it is properly conducted. CQC will be performed by the Removal Action construction contractor and its subcontractors, such as a geotechnical testing laboratory. CQA will be performed by TABR and its designees, including the design engineer and contractors such as a geotechnical testing laboratory different from that used for CQC purposes.

7.1 Personnel Roles and Responsibilities

Project Coordinator – TABR's Project Coordinator is Edwin Downey, CIH, CHMM. He, with support from Formation Environmental, is responsible for ensuring that TABR successfully accomplishes all relevant requirements set forth in the UAO/SOW.

Project Manager/Engineer – Formation's Project Manager/Engineer, is Brian Hansen, P.E., P.G. Mr. Hansen is a registered Professional Engineer in the State of Colorado. He is responsible for the Removal Action design, ensuring that the Removal Action construction is successfully implemented, and preparation of the construction certification report.

Construction Manager - The Construction Manager, who is an employee of the construction contractor, is responsible for ensuring that the construction team follows the final design drawings and specifications. The Construction Manager will have overall responsibility for implementing the CQC program, including providing daily construction reports, which document testing and construction activities. The daily reports will be provided to the Project Engineer and the CQA Manager.

CQC Manager - The CQC Manager, who is an employee of the construction contractor, is responsible for overseeing all CQC testing and supporting the Construction Manager. The CQC Manager will ensure that the equipment operators are properly following the plans and specifications.

CQA Manager - The CQA Manager will report directly to the Project Engineer. The CQA Manager, who is an employee or subcontractor of Formation, will be on-site with sufficient frequency to ensure that the TCRA is properly constructed in accordance with all plans and specifications.

Regulatory Oversight – EPA will be responsible for providing oversight of the TCRA implementation activities. TABR will provide full and complete access to TABR property to the EPA and/or its designated representatives during periodic inspections and, to the extent practicable, accompany them during these inspections. Any deficiencies in construction or construction not in substantial compliance with the approved design, as may be modified by ECOs, will be noted during periodic inspections.

7.2 Construction Quality Control

The CQC will be an ongoing process of controlling and measuring material and earthwork characteristics to provide verification that the work is performed in accordance with the approved plans, specifications, and field changes. The CQC will be performed by qualified members of the construction contractor's team and recorded in daily logs.

7.2.1 Materials Sampling and Materials Installation

Material quality control will consist of inspecting materials (e.g., riprap, concrete, seed mix, culverts, etc.) to ensure that they meet the project requirements.

7.2.2 Earthwork

Nuclear instrument testing of structural fill areas, such as the driveway embankments, will be performed in accordance with American Society for Testing and Materials (ASTM) D6938 to confirm in-place compacted density and moisture of fill materials as compared with ASTM D698 (Standard Proctor Compaction Curve). In general, the compacted earthen structures are required to exhibit densities equal to or exceeding 95 percent of the maximum dry density per ASTM D698. The frequency of compaction testing for compacted fill in the driveway embankments will be one test per 250 cy, or one test per lift, whichever is more frequent. Any area of embankment fill that fails to meet the compaction acceptance criteria will be reworked until a subsequent test shows acceptable results.

CQC of geometric limits (e.g., grade and contour) for the cover will be through use of wooden grade stakes. The placement of stakes will be by a qualified surveyor using standard surveying techniques. Surveys will be implemented, as needed, during construction to verify that design lines and grades are achieved within acceptable tolerances.

7.2.3 Surveying

Survey control will be established prior to construction using the existing coordinate system and topography. Day-to-day surveying during construction to ensure that the TCRA is constructed according the approved design will be performed by a contracted surveyor. A final survey will be

performed to document as-constructed conditions. The final survey will be performed to General-Order surveying accuracy by a surveyor registered in Colorado or by a qualified surveyor under the supervision of a Colorado-registered surveyor.

7.3 Construction Quality Assurance

Independent CQA inspection and testing will be performed by Formation and a subcontracted geotechnical testing firm to verify the adequacy and effectiveness of the construction. The CQA will include construction inspection and management, as necessary; periodic confirmation testing of earthwork and materials; review of material submittals, construction reporting and communications; and documentation of all CQA activities. Should CQA and CQC test results vary significantly, additional testing may be requested by the Project Engineer to validate the results.

7.3.1 Construction Inspection and Management

Formation will conduct CQA inspections as the construction work proceeds. Minor questions from the construction contractor will be answered by Formation's CQA Manager. The Project Engineer will be contacted, as necessary, for clarification of design intent or possible design change needs. It is anticipated that the Project Engineer will visit the site periodically during construction. Necessary design changes identified by the Project Engineer during construction will be documented and submitted to EPA for review through the ECO process described in Section 8.4.

The CQA manager will coordinate all third-party site surveying needs and will coordinate CQA testing to identify the appropriate timing and locations of CQA testing in light of the required frequency, the locations of recently constructed areas, and CQC compaction tests. A qualified individual will periodically perform CQA tests for field compaction. It is estimated that the CQA tests for embankment-fill compaction will be performed at a rate of at least 10 percent of the CQC tests. CQA compaction tests will be sufficiently distributed, both horizontally and vertically, to be representative of density conditions throughout a given fill area and to thus verify the findings of CQC compaction testing. Quality assurance surveying may be performed, as necessary, to verify the accuracy of the surveying.

7.3.2 Verification Sampling and Testing of Earthwork and Materials

Submittals for materials (e.g., culverts, etc.) and testing results will be reviewed by the CQA Manager and the Project Engineer for compliance with specifications. If alternative materials, other than the specified material, do not meet the specifications, a revised submittal will be obtained to provide conformance with specifications.

7.3.3 Review of Material Submittals and CQC Data

Submittals for materials (e.g., silt fence, seed, fertilizer, etc.) used to construct the TCRA will be reviewed by the Project Engineer for compliance with specifications. If alternative materials, other than the specified material, do not meet the specifications, a revised submittal will be obtained to provide conformance with specifications.

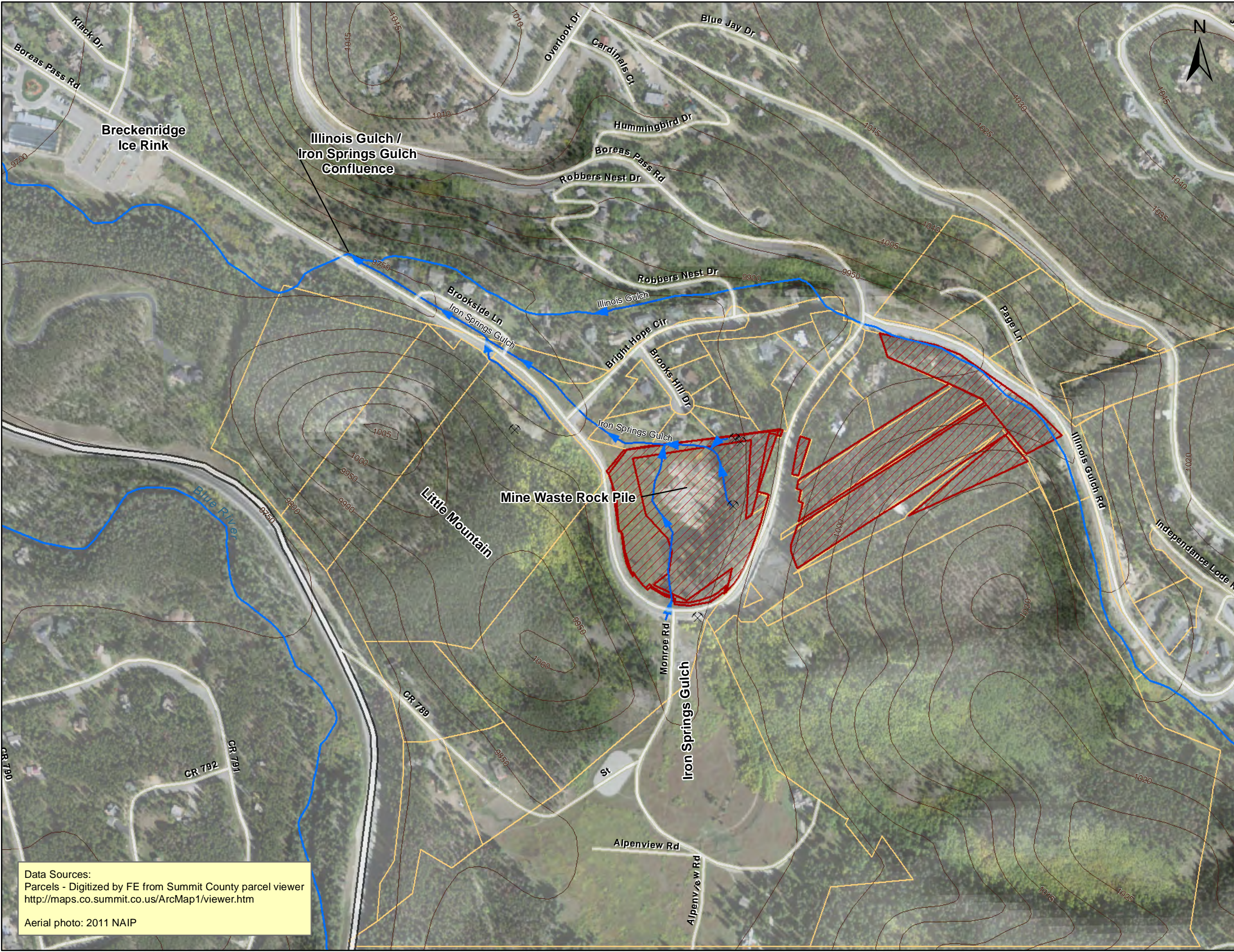
7.4 Engineering Change Orders

Engineering Change Orders will be developed and submitted to EPA for review when a necessary change to the final design is identified before construction commences. EPA will review the ECO and provide comments, if appropriate. If the ECO does not contain significant design changes, as determined by EPA, TABR will develop a final ECO, which will address EPA comments as appropriate. If the ECO contains significant design changes, as determined by EPA, TABR will submit a final ECO addressing EPA's comments, if appropriate, and wait for EPA approval and signature before effecting changes detailed in the ECO.

8.0 REFERENCES CITED

- EPA, 2003. Superfund Lead-Contaminated Residential Sites Handbook. OSWER 9285.7-50. August.
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- Mountain States Historical, 2004. Mining the Golden Horseshoe – An Inventory of Select Historic Sites Around Breckenridge, Summit County, Colorado. Prepared for the Town of Breckenridge. November.
- Paleowest, 2020. Puzzle Mine Documentation Project, Summit County, Colorado. Paleowest Technical Report 20-524. Submitted to TABR Realty Services, LLC. September 25.
- Runkel, R.L., 2017. Hydrologic & Geochemical Investigation of Illinois Gulch/Iron springs, Breckenridge, CO. Powerpoint presentation at EPA public meeting. June 29.
- Runkel, R.L., P.L. Verplanck, R.B. McClesky, K. Walton-Day, and P. Byrne 2019. Synoptic Sampling Data from Illinois Gulch and Iron Springs Near Breckenridge, Colorado, August 2016 and September 2017. U.S. Geological Survey Data Release. December 2. https://urldefense.proofpoint.com/v2/url?u=https-3A__doi.org_10.5066_P9VNIGJZ&d=DwICAg&c=euGZstcaTDIlvimEN8b7jXrwqOf-v5A_CdpqnVfiiMM&r=ik_YiY1WSFqs6yuoJUC6uiOFXe-t2jGpx9MJWUqoM8s&m=wx faj6hLivPIMu-TJmQ4dr-jfmcCwNwnnOnz3fBI1SM&s=kgzYbgpMomiZ9GqisA7x26jdIZRL-3YTmABn1I9wFGo&e=
- U.S. Forest Service Region 2, 2014. Sampling and Analysis Plan/Quality Assurance Project Plan – Initial Removal Site Inspection at Illinois Gulch, Breckenridge Mining District, Summit County, Colorado. Prepared by U.S. Forest Service Region 2 Rocky Mountain Region in coordination with U.S. EPA Region 8 Ecosystem Protection and Remediation. June.
- Weston, 2017. Combined Assessment for Site Inspection/Removal Assessment at Illinois Gulch, Breckenridge, Summit County, Colorado. Prepared for U.S. EPA Region 8 by Weston Solutions, Inc. – Region 8 Superfund Technical Assessment and Response Team. March.

FIGURES

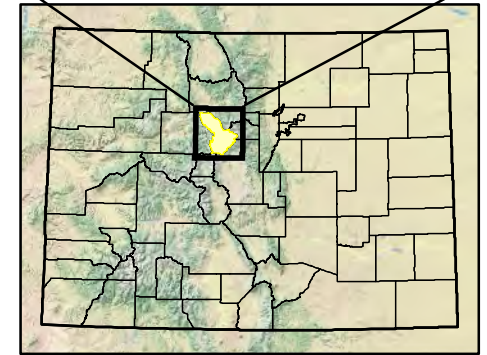
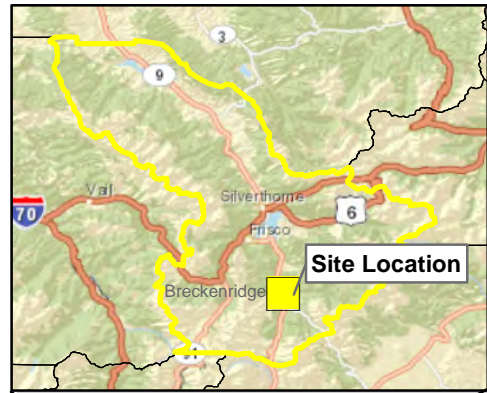


Data Sources:
Parcels - Digitized by FE from Summit County parcel viewer
<http://maps.co.summit.co.us/ArcMap1/viewer.htm>
Aerial photo: 2011 NAIP

Legend

- Adit Location
- Major Roads
- Local Roads
- Local Stream / Flow Direction
- Stream/Water Source
- Contour Interval = 50 feet
- TABR Parcels
- Other Parcels

Site Location In Summit County, Colorado



0 100 200 400 600 800 Feet

TABR REALTY SERVICES LLC

ILLINOIS GULCH SITE, SUMMIT COUNTY, CO

FIGURE 1

SITE LOCATION

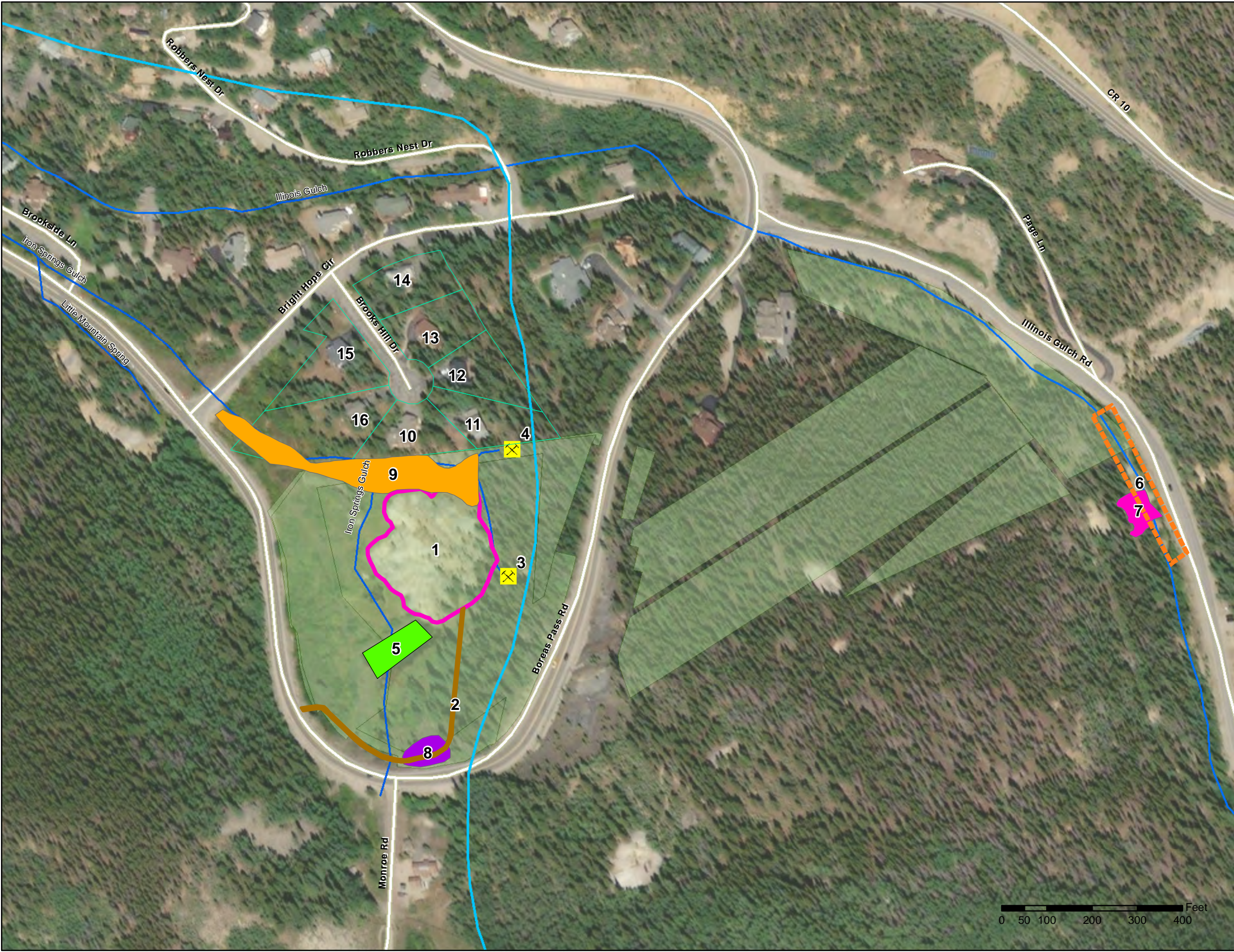
DATE: OCT 19, 2020

BY: CRL

FOR: BGH

FORMATION

ENVIRONMENTAL



Legend

- 1. Willard Waste Rock Pile
- 2. New Access Road (Location and configuration subject to revision)
- 3. Willard 1 Adit Discharge
- 4. Willard 2 Adit Discharge
- 5. Existing Pond
- 6. Illinois Gulch Adjacent to Puzzle Extension Shaft
- 7. Puzzle Extension Shaft and Waste Pile
- 8. Cally Adit Waste Rock Pile
- 9. Wet Area Affected by Orange Precipitate
- 10-16 Residential Properties to be Sampled
- Gold Run Ditch (From USGS 1908 24K Topo Map)
- Rivers / Streams
- TABR Parcels



TABR REALTY SERVICES, LLC

ILLINOIS GULCH SITE, SUMMIT COUNTY, CO

FIGURE 2

SITE FEATURES

DATE: OCT 20, 2020

BY: DKG

FOR: BGH

FORMATION

ENVIRONMENTAL



Legend

- Adit Location
- Mine Workings (approximate location)
- Major Roads
- Local Roads
- Local Stream / Flow Direction
- Rivers / Streams
- Contour Interval = 50 feet
- TABR Parcels

Extent of mine workings taken from:
 Lovering, T.S., Geology and Ore Deposits of the Breckenridge Mining District, Colorado. United States Geological Survey, Professional Paper 176, 1934.

0 65 130 260 390 520 Feet

TABR REALTY SERVICES, LLC
 ILLINOIS GULCH SITE, SUMMIT COUNTY, CO

FIGURE 3

LOCATION OF MINE WORKINGS

DATE: OCT 19, 2020	FORMATION ENVIRONMENTAL
BY: DKG FOR: BGH	

APPENDIX A

**APPLICABLE AND/OR RELEVANT AND
APPROPRIATE REQUIREMENTS (ARARS)**

(To be provided by EPA)

APPENDIX B
TECHNICAL MEMORANDUMS – POND REMOVAL

APPENDIX B1

MEMORANDUM: WATER QUALITY RESULTS FOR AN EXISTING POND, ILLINOIS GULCH SITE, SUMMIT COUNTY, COLORADO



MEMORANDUM

TO: Paul Peronard, Martin McComb – U.S. EPA Region 8

FROM: Brian Hansen

DATE: October 8, 2020

SUBJECT: Water Quality Results for an Existing Pond, Illinois Gulch Site, Summit County, Colorado

TABR Realty Services, LLC (“TABR”) proposes to drain and remove an existing pond on its property in Summit County, Colorado to support the work required by Unilateral Administrative Order (“UAO”) for Removal Action CERCLA Docket No. CERCLA-08-2020-0003 issued by U.S. EPA Region 8. Draining the pond is proposed to reduce the potential for saturation of the bottom of the waste rock pile. This memorandum provides water quality information for the existing pond confirming that the pond water can be safely directed to Iron Springs Gulch.

The Site location is shown on Figure 1 and a description of the pond removal work is summarized on Figure 2. Removal of the pond will entail pumping the pond water to Iron Springs Gulch. Surface water in Iron Springs Gulch enters Illinois Gulch and thence the Blue River, which flows to Lake Dillon, a water supply for the Denver metropolitan area.

U.S. EPA collected and analyzed surface water samples from the outlet and inlet of the pond that will be removed (sample locations IG-17 and IG-18, respectively) in July and September 2014.¹ The sample locations are shown on Figure 3. The analytical results for these samples are presented in Table 1 along with Colorado Department of Public Health and Environment (CDPHE) water quality standards. The results indicate generally good water quality. Exceedances of CDPHE standards noted in the 2014 data are as follows.

¹ The results are reported on Tables 6-2a and 6-2b of the “Combined Assessment for Site Inspection/Removal Assessment at Illinois Gulch, Breckenridge, Summit County, Colorado.” Prepared for U.S. EPA Region 8 by Weston Solutions, Inc. March 2017.

- The duplicate sample collected in July 2014 from station IG-17 exceeded the chronic aquatic life criterion for cadmium and the acute aquatic life criterion for zinc. This exceedance appears to be associated with an anomalously low hardness measured in this sample (74 mg CaCO₃/L versus other sample results that range from 280 to 298 mg CaCO₃/L).
- The sample collected in July 2014 from station IG-18 exceeded the chronic aquatic life criterion for selenium.

TABR collected and analyzed surface water samples from the pond to be removed, and from an adjacent, smaller ponded area, to confirm EPA's previous analytical results and to ensure that the pond water can be safely directed to Iron Springs Gulch. A five-point composite sample, named "Pond-S," was collected on September 16, 2020 from the pond that will be removed. A single grab sample, named "Pond-N," was collected from the smaller ponded area² to the north of the Pond-S sample on September 22, 2020. Sample locations are shown on Figure 3. The Pond-S and Pond-N samples were analyzed for the same parameter suite used by EPA in 2014 (Table 1). Observations regarding the 2020 analytical results are as follows:

- CDPHE standards for certain dissolved metals are calculated based on the hardness of the sample water (Table 1) and the concentrations for these dissolved metals are generally similar between the 2014 and 2020 data sets. With the exception of the cadmium exceedance described above, the 2014 dissolved metals results did not exceed the respective hardness based CDPHE water quality standards. The hardness in the 2014 samples collected from IG-17 and IG-18 (280 to 298 mg CaCO₃/L, excluding the anomalously low hardness measurement for the IG-17 duplicate sample from July 2014) is similar to that in the 2020 Pond-S and Pond-N samples (266 to 280 mg CaCO₃/L). Based on the similar hardness levels, the 2020 sample results also do not exceed the respective hardness based CDPHE water quality standards.
- No other exceedances of CDPHE water quality criteria are noted in the Pond-S and Pond-N samples.

The 2020 sample results thus indicate that the water drained from in the pond can be safely directed to Iron Springs Gulch. The proposed approach for draining the pond will rely on pumping at a relatively low rate (50 to 100 gallons per minute) during daylight hours (generally 8 am to 6 pm). Once the pond is sufficiently drained, a small channel will be cut in the pond's northwest corner to direct spring flows to the vegetated area to the northwest and to eliminate water impoundment (Figure 2).

² This small ponded area is expected to dry up following removal of the larger, more southerly pond.

Table 1
Analytical Results for Pond Water Samples - Illinois Gulch Site

EPA Jul. & Sep. 2014 Data --->>	CDPHE Water Quality Standards			Sample ID Date: Type:	IG-17 7/2/2014 Primary Sample	IG-17 Dup 7/2/2014 Field Duplicate	IG-18 7/2/2014 Primary Sample	IG-17 9/18/2014 Primary Sample	IG-17 Dup 9/18/2014 Field Duplicate	IG-18 9/18/2014 Primary Sample	Formation Sep. 2020 Data --->>	Sample ID Date: Type:	Pond-S 9/16/2020 Primary Sample	Pond-S Dup 9/16/2020 Field Duplicate	Pond-N 9/22/2020 Primary Sample
	Aquatic Life		Human Health												
	Acute	Chronic	Water + Fish	Units								Units			
General Chemistry											General Chemistry				
Hardness	NE	NE	NE	mg/L	280 J	74 J	296	298	297	290	Hardness	mg/L	266	267	280
Total Alkalinity	NE	NE	NE	mg CaCO3/L	184 J	66.2 J	212	201	204	215	Total Alkalinity	mg CaCO3/L	179	176	186
Chloride	NE	NE	NE	mg/L	5.3	5	2.3 J+	4.8	4.8	2.1	Chloride	mg/L	4.68	4.66	4.29
Fluoride	NE	NE	NE	mg/L	0.2	0.2	0.1 J	0.2	0.2	0.2	Fluoride	mg/L	1.71	1.73	1.7
Nitrate as N	NE	NE	NE	mg/L	0.1 R	0.2 J	0.1 R	NA	NA	NA	Nitrate as N	mg/L	0.02 U	0.02 U	0.02 U
Nitrate/Nitrite as N	NE	NE	NE	mg/L	1 R	1 R	1 R	1 R	1 R	1 R	Nitrate/Nitrite as N	mg/L	0.006 U	0.006 U	0.006 U
Nitrite as N	NE	NE	NE	mg/L	0.1 R	0.1 J	0.1 R	NA	NA	NA	Nitrite as N	mg/L	0.006 U	0.006 U	0.006 U
Sulfate as SO4	NE	NE	NE	mg/L	89.6 J	8.7 J	77.9	99.2	99.4	82.6	Sulfate as SO4	mg/L	88.6	85.5	88.6
Dissolved Metals											Dissolved Metals				
Antimony	NE	NE	5.6	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	Antimony	µg/L	0.154	0.152	0.118
Arsenic	340	150	NE	µg/L	0.726 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	Arsenic	µg/L	0.36 J	0.37 J	0.41 J
Barium	NE	NE	NE	µg/L	56.4	54.6	64.5	58.1	60.9	59.6	Barium	µg/L	57.7	57.1	59.8
Cadmium*	Calculated	Calculated	NE	µg/L	0.1 UJ	1.65 (1.28) J	0.14 J	0.1 U	0.1 U	0.1 U	Cadmium	µg/L	0.014 J	0.014 J	0.009 J
Chromium*	Calculated	Calculated	NE	µg/L	1.36 J	1 U	1.49 J	1 U	1 U	1 U	Chromium	µg/L	2.1 U	2.1 U	2.1 U
Cobalt	NE	NE	NE	µg/L	0.277 J	0.1 U	0.236	0.39	0.457	0.195 J	Cobalt	µg/L	0.378	0.278	0.496
Copper*	Calculated	Calculated	1300	µg/L	1.51	1.39	1.08	0.573 J-	0.609 J	0.5 UJ	Copper	µg/L	2.1 U	2.1 U	2.1 U
Lead*	Calculated	Calculated	NE	µg/L	0.1 U	0.196 J	0.1 U	0.1 U	0.1 U	0.1 U	Lead	µg/L	0.09	0.077	0.041
Nickel*	Calculated	Calculated	610	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	Nickel	µg/L	2.4 J	2.9 J	2.3 J
Selenium	18.40	4.60	170	µg/L	3.68 J	1 UJ	4.61	2.45	3.17	4.23	Selenium	µg/L	1.7	1.6	1.3
Silver*	Calculated	Calculated	NE	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	Silver	µg/L	0.009 U	0.009 U	0.009 U
Thallium*	NE	Calculated	0.24	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	Thallium	µg/L	0.061	0.026	0.035
Vanadium	NE	NE	NE	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	Vanadium	µg/L	0.11 J	0.08 J	0.05 J
Aluminum	NE	NE	NE	µg/L	33.8 J	20 U	29.8 J	20.9 J	20 U	20 U	Aluminum	µg/L	5 U	5 U	5 U
Beryllium	NE	NE	NE	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	Beryllium	µg/L	0.005 U	0.005 U	0.005 U
Calcium	NE	NE	NE	µg/L	80700 J	22700 J	88200	88200	87800	86400	Calcium	µg/L	79800	77700	83300
Iron	NE	NE	NE	µg/L	100 U	100 U	100 U	100 U	100 U	100 U	Iron	µg/L	37	27	35
Magnesium	NE	NE	NE	µg/L	19000 J	4240 J	18400	19000	18900	18000	Magnesium	µg/L	17300	16800	16900
Manganese*	Calculated	Calculated	NE	µg/L	59.1 J	2 UJ	36.1	277	277	60.7	Manganese	µg/L	153	156	266
Potassium	NE	NE	NE	µg/L	1150	765 J	1140	1320	1320	1160	Potassium	µg/L	1310	1360	1470
Sodium	NE	NE	NE	µg/L	4300 J	2860 J	3650	4110	4090	3560	Sodium	µg/L	4070	3980	3960
Zinc*	Calculated	Calculated	7400	µg/L	20.2 J	141 J	34	17.6 J	18.2 J	20.6	Zinc	µg/L	5.6	6.2	4.5
Total Metals											Total Metals				
Antimony	NE	NE	NE	µg/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	Antimony	µg/L	0.133	0.147	0.124
Arsenic	NE	NE	0.02 - 3.0	µg/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	Arsenic	µg/L	0.57	0.61	0.68
Barium	NE	NE	NE	µg/L	56.8	55.2	69	62.9	63.4	60.6	Barium	µg/L	60.9	61	62.4
Cadmium	NE	NE	NE	µg/L	0.5 UJ	1.54 J	0.5 U	0.5 U	0.5 U	0.5 U	Cadmium	µg/L	0.107	0.098	0.108
Chromium	NE	NE	NE	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	Chromium	µg/L	2.1 U	2.1 U	2.1 U
Cobalt	NE	NE	NE	µg/L	0.5 U	0.5 U	0.5 U	0.63 J	0.653 J	0.5 U	Cobalt	µg/L	0.328	0.334	0.514
Copper	NE	NE	NE	µg/L	2.5 U	2.5 U	3.73 J	2.5 U	2.5 U	2.5 U	Copper	µg/L	2.1 U	2.1 U	2.1 U
Lead	NE	NE	NE	µg/L	2.1 J+	1.42 J+	0.5 U	1.6	1.73	0.5 U	Lead	µg/L	1.65	1.69	1.03
Nickel	NE	NE	NE	µg/L	2.5 U	2.5 U	2.5 U	2.5 UJ	10.5 J	2.5 U	Nickel	µg/L	3 J	2.8 J	2.9 J
Selenium	NE	NE	NE	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	Selenium	µg/L	1.6	1.7	1.4
Silver	NE	NE	NE	µg/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	Silver	µg/L	0.021	0.014 J	0.009 U
Thallium	NE	NE	NE	µg/L	2.5 U	2.5 U	2.5 U	2.5 UJ	9.08 J	2.5 U	Thallium	µg/L	0.038	0.021	0.017 J
Vanadium	NE	NE	NE	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	Vanadium	µg/L	0.44	0.46	0.29
Aluminum**	6432.46	918.29	NE	µg/L	64.8	48.2 J	48.2 J	117	121	68.3	Aluminum	µg/L	134	152	69
Beryllium	NE	NE	NE	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	Beryllium	µg/L	0.016 J	0.018 J	0.008 J
Calcium	NE	NE	NE	µg/L	78600 J	21800 J	85800	93200	89000	91800	Calcium	µg/L	78000	78500	83500
Iron**	NE	1000.00	NE	µg/L	510 J	100 UJ	100 U	773	788	341	Iron	µg/L	925	978	925
Magnesium	NE	NE	NE	µg/L	18300 J	4100 J	18000	19100	18900	18300	Magnesium	µg/L	17400	17200	17300
Manganese	NE	NE	NE	µg/L	83.5 J	2.23 J	43.3 J	309	301	93.5	Manganese	µg/L	166	175	304
Potassium	NE	NE	NE	µg/L	1150	889 J	1130	1430	1460	1260	Potassium	µg/L	1480	1370	1510
Sodium	NE	NE	NE	µg/L	4130 J	2840 J	3570	4060	4030	3540	Sodium	µg/L	4060	4030	4030
Zinc	NE	NE	NE	µg/L	50.8 J+	147 J	36.9 J+	58	57.1	35.9	Zinc	µg/L	25.9	27.6	27.6
Mercury	NE	NE	NE	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U	0.05 U	0.05 U	Mercury	µg/L	0.02 U	0.02 U	0.02 U

Table 1
Analytical Results for Pond Water Samples - Illinois Gulch Site

Notes:	
Bold	The analyte was detected above the method detection limit.
Bold	The analyte concentration exceeds the chronic ecological screening benchmark.
Bold	The analyte concentration exceeds both ecological screening benchmarks.
<i>Bold Italics</i>	The analyte concentration exceeds the human health water and fish screening benchmark.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity with a positive bias
NE	None Established
R	The result is unuseable, presence or absence cannot be verified.
U	The material was analyzed for, but was not detected above the reporting limit.
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
mg CaCO ₃ /L	milligrams Calcium Carbonate per liter
mg/L	milligrams per liter
µg/L	microgram(s) per liter
CDPHE	Colorado Department of Public Health and Environment
* Hardness dependent dissolved water quality standard calculated.	
**Aquatic Life standards based on total recoverable concentration	
¹	Sample locations are available in Figure 4.
()	Adjusted value for J qualified data based on OSWER Directive Factors for Inorganic Analytes.



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend <div><div></div>Property boundaries per Summit County Assessor's web site</div> <div><div></div>Drainage Line</div> <div><div></div>Springs</div>		TABR REALTY SERVICES LLC ILLINOIS GULCH SITE, SUMMIT COUNTY, CO	
		FIGURE 2	
		POND DRAINAGE SCHEMATIC	
DATE: OCT 07, 2020		FORMATION	
BY: DKG		FOR: BGH	ENVIRONMENTAL



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

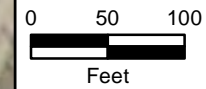
Legend

- Surface Water Sample Locations

Notes:

IG-17 and IG-18 were sampled by EPA in July and September 2014.

Pond-S is a five-point composite sample and Pond-N is a single grab sample collected by TABR in September 2020.



TABR REALTY SERVICES LLC

ILLINOIS GULCH SITE, SUMMIT COUNTY, CO

FIGURE 3

SURFACE WATER SAMPLE LOCATIONS

DATE: OCT 07, 2020

BY: DKG

FOR: BGH

FORMATION

ENVIRONMENTAL

APPENDIX B2

MEMORANDUM: WATER QUALITY MONITORING DURING DRAINING OF AN EXISTING POND, ILLINOIS GULCH SITE, SUMMIT COUNTY, COLORADO



MEMORANDUM

TO: Paul Peronard, Martin McComb – U.S. EPA Region 8

CC: Mark Rudolph, CDPHE

FROM: Brian Hansen

DATE: October 28, 2020

SUBJECT: Water Quality Monitoring During Draining of an Existing Pond,
Illinois Gulch Site, Summit County, Colorado

TABR Realty Services, LLC (“TABR”) has submitted and EPA has approved TABR’s plan to drain and remove an existing pond on its property in Summit County, Colorado. This activity was proposed by TABR to support the work required by Unilateral Administrative Order (“UAO”) for Removal Action CERCLA Docket No. CERCLA-08-2020-0003 issued by U.S. EPA Region 8 (“EPA”). In response to EPA’s request for a monitoring plan, this memorandum describes the approach that will be taken to monitor surface water quality in areas downstream of the pond as it is dewatered. EPA has approved an October 29, 2020 start date for pond removal activities. Surface water monitoring will commence on that date and conclude with completion of pond dewatering activities.

The Site location is shown on Figure 1 and a description of the pond removal work is summarized on Figure 2. Draining the pond is proposed to reduce the potential for saturation of the bottom of the Willard waste rock pile. This will be accomplished by pumping the pond water to Iron Springs Gulch and then breaching the earthen retaining berm.

Water quality monitoring will be accomplished by measuring and recording the following field parameters in surface water:

- pH (standard units)
- Specific conductance (microsiemens per centimeter [“µS/cm”])

Observations regarding the general conditions (e.g. stream color) will also be recorded. The measurements and observations will be made at four locations (Figure 3):

- **Station 1** - near the pump intake in the pond
- **Station 2** - on Iron Springs Gulch creek downstream of the intersection of Brookside Lane and Boreas Pass Road (previously sampled as station IG-5 by EPA and the Colorado Department of Public Health and Environment [“CDPHE”])
- **Station 3**- on Illinois Gulch creek near the Steven C. West Ice Arena (previously sampled as station IG-1 by EPA and CDPHE)
- **Station 4** - on the Blue River within the Town of Breckenridge approximately 2,000 feet downstream of its confluence with Illinois Gulch creek.¹

Pumping to draw down the pond will be implemented from approximately 8:00 am to 6:00 pm each day until the pond is emptied to the extent practicable. Monitoring at Stations 1 through 4 will occur throughout the pond dewatering process as follows: Station 1 will be monitored once each day just as pumping begins; Stations 2, 3, and 4 will be monitored on approximate three-hour cycles until pumping ceases for the day. At least one photograph will be taken at each station each time it is monitored.

Field parameter measurements will be made using a YSI DSS Pro² hand-held meter according to Section 2.5 of the attached Formation Environmental, LLC (“Formation”) Standard Operating Procedure (SOP) No. 6.

Formation personnel will coordinate with EPA and its contractors to provide the recorded field information to EPA and information regarding dewatering progress, as requested. The recorded field information will also be included in forthcoming progress reports provided under the UAO for the October / November reporting periods.

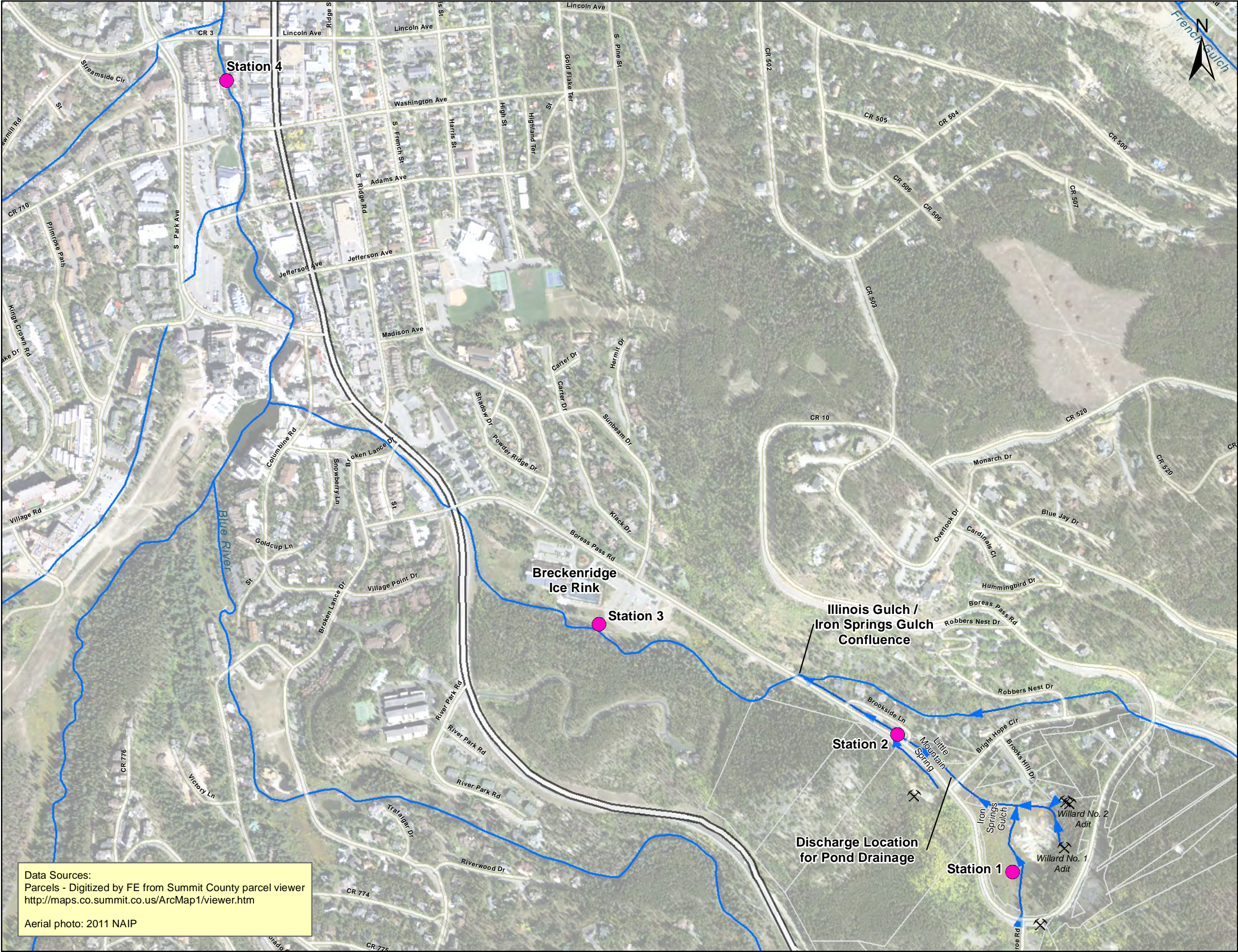
¹ The Station 4 location was selected based on ease of access.

² <https://www.ysi.com/ProDSS>



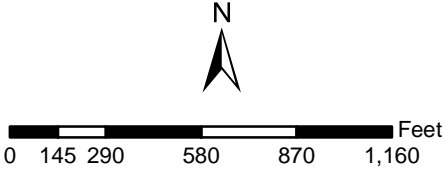
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend <div><div></div>Property boundaries per Summit County Assessor's web site</div> <div><div></div>Drainage Line</div> <div><div></div>Springs</div>		TABR REALTY SERVICES LLC ILLINOIS GULCH SITE, SUMMIT COUNTY, CO	
		FIGURE 2	
		POND DRAINAGE SCHEMATIC	
DATE: OCT 07, 2020		FORMATION	
BY: DKG		FOR: BGH	ENVIRONMENTAL



Data Sources:
Parcels - Digitized by FE from Summit County parcel viewer
<http://maps.co.summit.co.us/ArcMap1/viewer.htm>
Aerial photo: 2011 NAIP

- Legend**
- Monitoring Locations
 - Adit Location
 - Major Roads
 - Local Roads
 - Local Stream / Flow Direction
 - Stream/Water Source
 - Other Parcels



TABR REALTY SERVICES LLC
ILLINOIS GULCH SITE, SUMMIT COUNTY, CO
FIGURE 3
**FIELD PARAMETER
MONITORING LOCATIONS**

DATE: OCT 27, 2020
BY: ASF FOR: BGH

FORMATION
ENVIRONMENTAL

FORMATION ENVIRONMENTAL, LLC
STANDARD OPERATING PROCEDURE No. 6
WATER QUALITY SAMPLING

1.0 SCOPE AND APPLICABILITY

This Standard Operating Procedure (SOP) describes the protocol to be followed during sampling of surface water, stormwater or wastewater. The procedures presented herein are intended to be general in nature. Appropriate revisions may be made to accommodate site-specific conditions or project-specific protocols when they are approved in writing by the Project Manager or detailed in a project work plan, sampling plan or quality assurance project plan.

2.0 PROCEDURES

2.1 Sample Collection

Individual samples from surface water and spring/seep sampling stations will be collected as follows:

- A. Where multiple sampling stations exist along a moving water source (i.e., a creek or drainage channel), the downstream station will be sampled first. A moving water sample will be taken from the portion of the water with maximum flow at any given sampling station unless otherwise specified. If the sampling point is inaccessible from shore, the sampling personnel will enter the water from a point downstream of the sampling point, taking care not to disturb the water.
- B. A standing water sample will be taken at a point in the body of water at least three feet from the shore, if possible, or unless otherwise specified.
- C. A surface water sample will be collected according to one of the following, or similar, techniques.
 - 1. Direct Method -- Sample bottle is inverted, submerged to the specified depth, turned upright, removed from the water, and then capped. Add preservative, if any, after sample collection.

2. Dipper Method -- Sample bottle or container attached to a pole is dipped in the water, raised above the water, and then capped (if actual sample bottle used).
 3. Bailer Method -- A appropriate sampling bailer with a ball check valve is submerged to the desired sample depth, either directly or by suspending the bailer on a rope from a pole.
 4. Syringe Method (for very shallow water) -- A disposable plastic filtering syringe may be used to collect very shallow surface water without disturbing the sediment. The syringe will be disposed of after each use.
 5. Peristaltic Pump Method -- The sample is collected through a section of new, clean, flexible Tygon (polyvinylchloride) tubing. The tubing intake will be secured manually or by attaching weights. This procedure may be modified to collect the sample through a Teflon tube into a sample flask by running the pump on a vacuum.
- D. The first collected water will be used to rinse the sampling equipment. Sample bottles that do not contain preservative should be rinsed with the sample water prior to filling. Subsequent water collected will be used to fill the analytical sample bottles until all bottles are filled. Field measurement of parameters will be taken once for each sampling station. Field parameters (pH, specific conductance, temperature, ORP, dissolved oxygen, odor, turbidity, and/or sediment) will be measured in-situ or from a separate container (instruments will not contact the analytical samples) if in-situ measurements are not possible.
- E. GPS coordinates and geographic coordinate system should be collected with a handheld GPS unit and transcribed into the field notebook and on appropriate field forms. Personnel will record a brief description of the sampling location (example: location is approximately 100 feet west along Markley Creek from Somersville Road, on north-side shore). Personnel will include a sketch map of the sampling station in the Surface Water Sampling Record. Additionally, personnel will take at least one photograph of the sampling station.

2.2 Sample Filtration

When required, a field-filtered water sample will be collected using a clean, disposable, in-line 0.45 μm filter. The water sample will be pumped through the filter using a peristaltic pump and a section of Tygon (polyvinylchloride) tubing or other appropriate method. An aliquot of approximately 100 ml of sample will be run through the tubing and filter prior to collection into the sampling containers. Both the filter and tubing will be disposed of between samples and a new filter and length of tubing will be used for each subsequent sample collected.

2.3 Sample Containers and Volumes

The sample containers will be appropriate to the analytical method and will be obtained from the water analysis laboratory or other approved source. Different containers will be required for specific groups of analytes in accordance with U.S. EPA Methods, project-specific requirements, and/or other local jurisdictional guidance. The sampler will confirm with the laboratory performing the analyses that appropriate bottleware and preservatives are used and ensure that a sufficient volume of sample is collected.

2.4 Sample Preservation and Storage

If required by the project or analytical method, water samples submitted for chemical analysis will be stored at 4°C in chilled, insulated containers or coolers immediately after collection. Preservation and storage methods depend on the chemical constituents to be analyzed and should be discussed with the water analysis laboratory prior to sample collection. EPA and/or other local jurisdictional requirements and/or the requirements of a project-specific plan (e.g., sampling and analysis plan, work plan, quality assurance project plan, etc.) shall be adhered to in preservation and storage of water samples.

2.5 Field Measurements

Temperature, pH, specific conductance, ORP, dissolved oxygen, and turbidity measurements may be performed on water samples at the time of sample collection. Data obtained from these (or other) field water quality measurements will be recorded on the appropriate sampling records. In-situ measurements will be recorded whenever practicable, or separate aliquots of water shall be used to make field measurements (i.e., sample containers for laboratory analysis shall not be reopened). For surface water sampling, the parameters will be measured once after stabilization of readings and recorded.

2.5.1 Temperature Measurement

Temperature will be measured directly from the water source or from a separate sample aliquot. Temperature measurements will be made with a mercury-filled thermometer, bimetallic-element thermometer, or electronic thermistor. All measurements will be recorded in degrees Celsius (°C). Temperature measurements may be measured by using a multi-probe that measures pH, conductivity, dissolved oxygen, and ORP as well.

2.5.2 pH Measurement

A pH measurement will be made using a suitable multi-parameter meter. The instrument will be checked and/or calibrated at least daily prior to initiating field activities and periodically throughout the day or as recommended by the instrument manufacturer. A pH measurement will be made by dipping the probe directly into the water source or into a separate sample aliquot. Prior to measurement, the container in which the field parameter sample will be collected will be acclimated to the approximate temperature of the sample if in-situ readings are not possible. This can be accomplished by immersing the container in water removed from a well during the purging process. The pH measurement will be made as soon as possible after collection of the field parameter sample, preferably within a few minutes, using a pH electrode. The value displayed on the calibrated instrument will be recorded after the reading has stabilized. If the value falls outside of the calibrated range, then the pH meter will be recalibrated using the appropriate buffer solutions.

2.5.3 Specific Conductance Measurement

Specific conductance will be measured by using a suitable multi-parameter meter. The instrument will be checked and/or calibrated at least daily prior to initiating field activities and periodically throughout the day or as recommended by the instrument manufacturer. Specific conductance will be measured by dipping the probe directly into the water source or into a separate sample aliquot. The probe must be immersed to the manufacturer's recommended depth. Specific conductance will be reported in micromhos/cm at 25°C. If the meter is not equipped with an automatic temperature compensation function, then the field value will be adjusted at a later time using the temperature data and the following formula:

$$SC_{25} = SC_T / [1 + \{(T - 25) \times 0.025\}]$$

where: SC_{25} = specific conductance at 25°C
 SC_T = specific conductance measured at temperature T (°C)
T = sample temperature (°C)

The value displayed on the calibrated instrument will be recorded after the reading has stabilized. If the value falls outside of the calibrated "range" set by the range dial on the instrument, then the range setting will be changed to a position which gives maximum definition. If the specific conductance value falls outside of the calibrated range of the conductivity standard solution, then the instrument will be recalibrated using the appropriate standard prior to measurement.

2.5.4 Oxidation-Reduction Potential (ORP) Measurement

Oxidation Reduction Potential (ORP) or Eh will be measured by using a suitable multi-parameter meter. The instrument will be checked and/or calibrated at least daily prior to initiating field activities and periodically throughout the day or as recommended by the instrument manufacturer. ORP/Eh measurements will be reported in mV.

2.5.5 Dissolved Oxygen (DO) Measurement

Dissolved oxygen (DO) will be measured by using a suitable multi-parameter meter. The instrument will be checked and/or calibrated at least daily prior to initiating field activities and periodically throughout the day or as recommended by the instrument manufacturer. DO measurements will be reported in milligrams per liter (mg/L).

2.5.6 Turbidity Measurement

Turbidity will be measured by using a field portable turbidimeter separate from the multi-parameter meter used for the other field measurements and capable of reading down to 0.1 NTU. The instrument will be checked and/or calibrated at least daily prior to initiating field activities and periodically throughout the day or as recommended by the instrument manufacturer. Turbidity measurements will be reported in nephelometric turbidity units (NTU).

2.5.7 Equipment Calibration

Equipment used to measure field parameters will be calibrated by personnel according to manufacturer's instructions. Calibration checks will be performed at least once prior to and following each day of instrument use in the field and the results will be documented on the Sampling Record for each sampling station and in field notebooks.

2.6 DOCUMENTATION

Surface Water Sampling Record

Each sampling event for each surface water sampling station will be recorded on a separate Surface Water Sampling Record form (see Figure SOP-6-1). The documentation should include the following:

- Project identification;

- Location identification (sampling station);

- Sample identification(s) (including quality control samples);

- Date and time of sampling;

Description of sampling location;

Sampling location coordinates;

Sampling depth below water surface;

Sampling method;

Condition of water (standing or moving);

Description of flow measurement method, if applicable, and any flow data;

Instrument calibration and cleaning record;

Results of field measurements and observations (time, temperature, pH, specific conductance, turbidity, sediment, color);

Name(s) of sample collector(s); and

Sketch map showing location of sampling station and permanent landmarks.

When the sampling activity is completed, the Surface Water Sampling Record will be checked by the Field Supervisor or his/her designee, and the original record will be placed in the project file.

Additional field notes will be recorded in the field notebooks of field personnel according to SOP 16 (Field Documentation).

3.0 QUALITY CONTROL

3.1 Equipment Cleaning

Sample bottles and bottle caps will be cleaned and prepared by the analytical laboratory or their supplier using standard EPA-approved protocols. Sample bottles and bottle caps will be protected from dust or other contamination between time of receipt by sampler and time of actual usage at the sampling site.

Sampling equipment that will be used at multiple sampling locations will be cleaned after sampling at each location is completed in accordance with the SOP 13 (Equipment Decontamination).

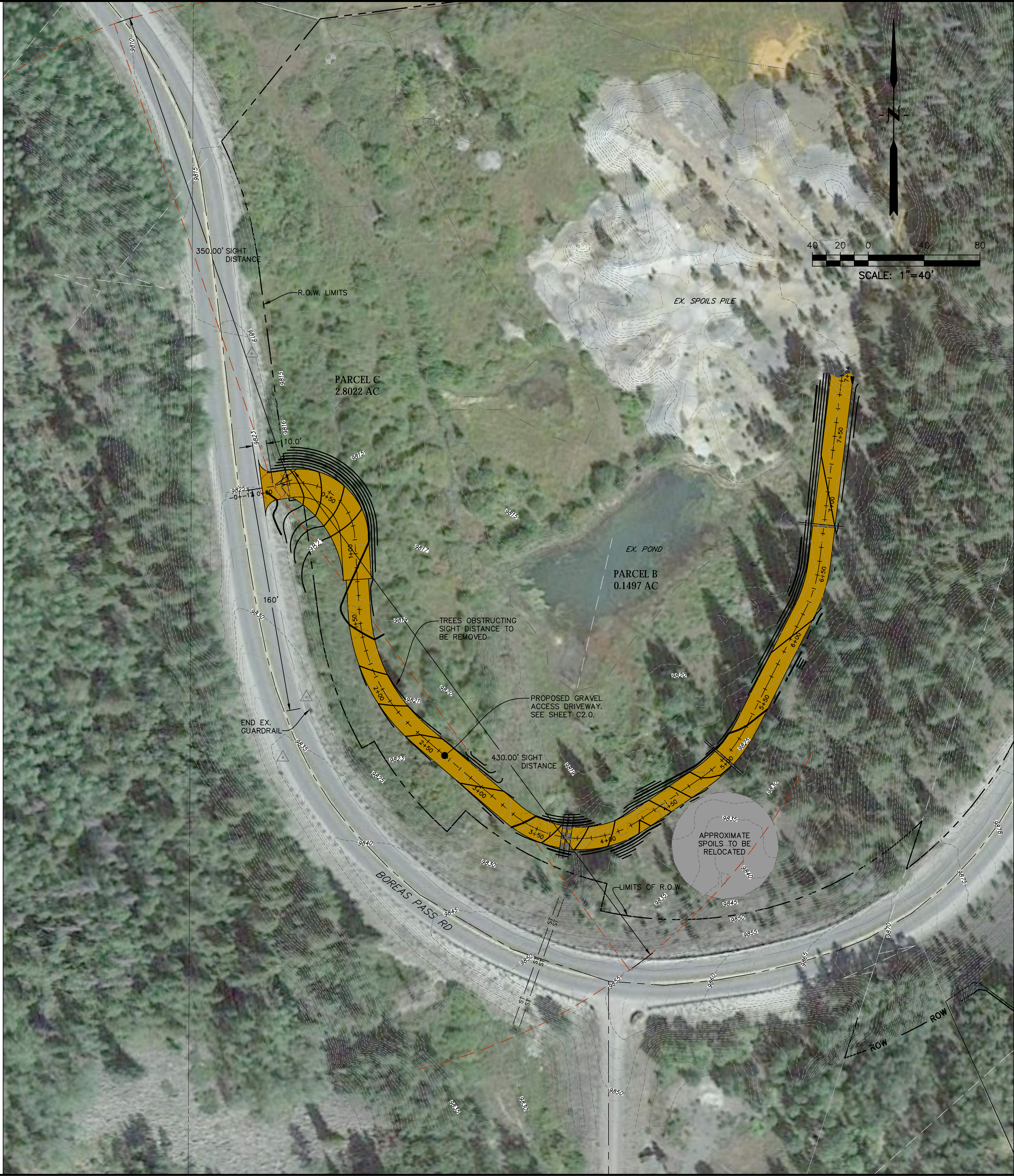
Equipment such as submersible electric pumps, which cannot be disassembled for cleaning, will be cleaned by circulating a laboratory-grade, detergent and potable water solution through the assembly, followed by clean potable water from a municipal supply, and then by distilled or deionized water. Equipment cleaning methods will be recorded on the Surface Water Sampling Record.

3.2 Records Review

The Project Manager or designated QA reviewer will check and verify that documentation has been completed and filed per this procedure.

SURFACE WATER SAMPLING RECORD					LOCATION ID: _____			
Date: _____ Time: _____ Weather: _____ Page _____ of _____								
Weather Past 48 hours: _____					Personnel: _____			
Location Description: _____								
Water Body Type: _____					UTM (NAD83): _____			
QUALITY ASSURANCE								
Sampling Equipment: 0.45 µm filter, Masterflex C-flex LS-15 tubing, Geopump, _____								
Decontamination: _____								
Method of Sampling: _____								
FIELD PARAMETER INSTRUMENTS								
pH Meter: Model: _____ Calibration: _____ Slope: _____								
After Calibration Meter Read: _____								
Conductivity Meter: Model: _____ Calibration: _____								
After Calibration Meter Read: _____								
Temperature Meter: Model: _____								
Dissolved Oxygen Meter: Model: _____ Calibration: _____								
Turbidity Kit: Model: HACH 2100P Turbidity Meter; Calibration: Purified Water Blank, Formazin (20, 100 and 800 NTU); Calibrated: _____								
SAMPLING MEASUREMENTS								
Sample Collection Time	Depth (ft)	pH	Specific	Conductance	Temp. (°C)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Comments (color, odor, etc.)
			(µmhos/cm)					
			@ Field Temp.	@ 25 °C				
SAMPLE INVENTORY								
Sample Type (circle one): Primary Sample (-01) Duplicate (-02) Equipment Rinsate Blank (-03)								
SAMPLE ID: _____								
Sample Processing		Container Type	Volume (mL)	Number of Bottles	Filtered	Preservative	Analysis	Comments
Date	Time							
MAP / COMMENTS						FORMATION ENVIRONMENTAL , LLC		
SIGNATURE: _____								

APPENDIX C
DESIGN DRAWINGS AND TECHNICAL
SPECIFICATIONS



REVIEW ONLY

NOT FOR CONSTRUCTION
DATE 10/21/2020



Know what's below.
Call before you dig.

PREPARED BY:



The Sanitas Group
801 MAIN STREET, SUITE 225
LOUISVILLE, CO 80027
303.481.2710
PROJECT CONTACT:
CURTIS C. STEVENS, P.E.

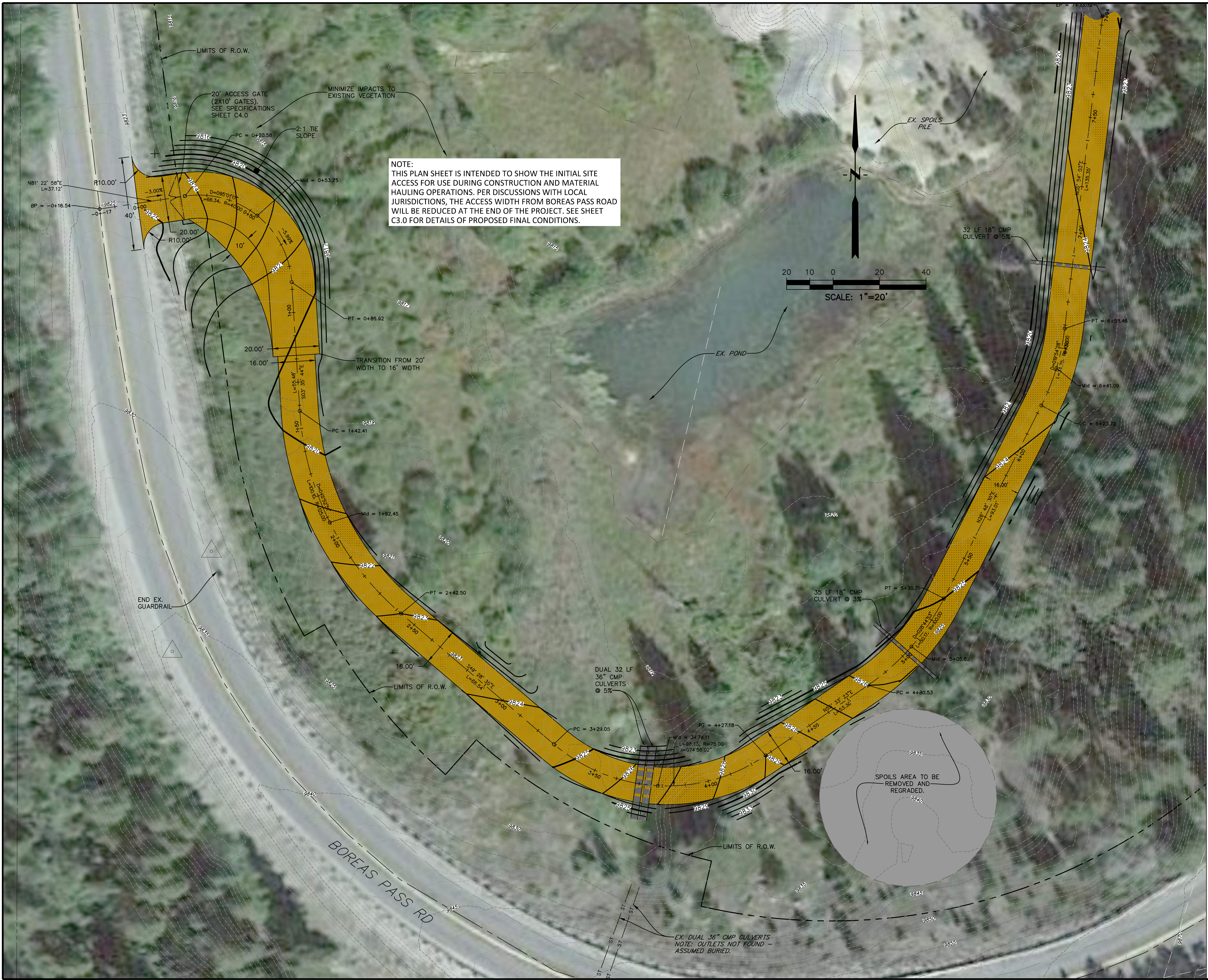
PREPARED FOR:

FORMATION ENVIRONMENTAL, LLC
2500 55TH STREET, SUITE 200
BOULDER, CO 80301
CONTACT: BRIAN HANSEN
303.442.0267

DRAFT DOCUMENTS FOR:

**ILLINOIS GULCH
REMOVAL ACTION**
TOWN OF BRECKENRIDGE, SUMMIT COUNTY
STATE OF COLORADO

ISSUE	DATE
DRAFT PLAN	10/21/2020
DESIGNED BY:	CCS
DRAWN BY:	TSG
CHECKED BY:	
DRAWING SCALE: HORIZONTAL: 1" = 40' VERTICAL: NONE	
DRAFT OVERALL ACCESS PLAN	
PROJECT NO. B1333	
C1.0	
SHEET:	1 OF 6



NOTE:
THIS PLAN SHEET IS INTENDED TO SHOW THE INITIAL SITE ACCESS FOR USE DURING CONSTRUCTION AND MATERIAL HAULING OPERATIONS. PER DISCUSSIONS WITH LOCAL JURISDICTIONS, THE ACCESS WIDTH FROM BOREAS PASS ROAD WILL BE REDUCED AT THE END OF THE PROJECT. SEE SHEET C3.0 FOR DETAILS OF PROPOSED FINAL CONDITIONS.

PROGRESS PRINT
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DATE 10/21/2020

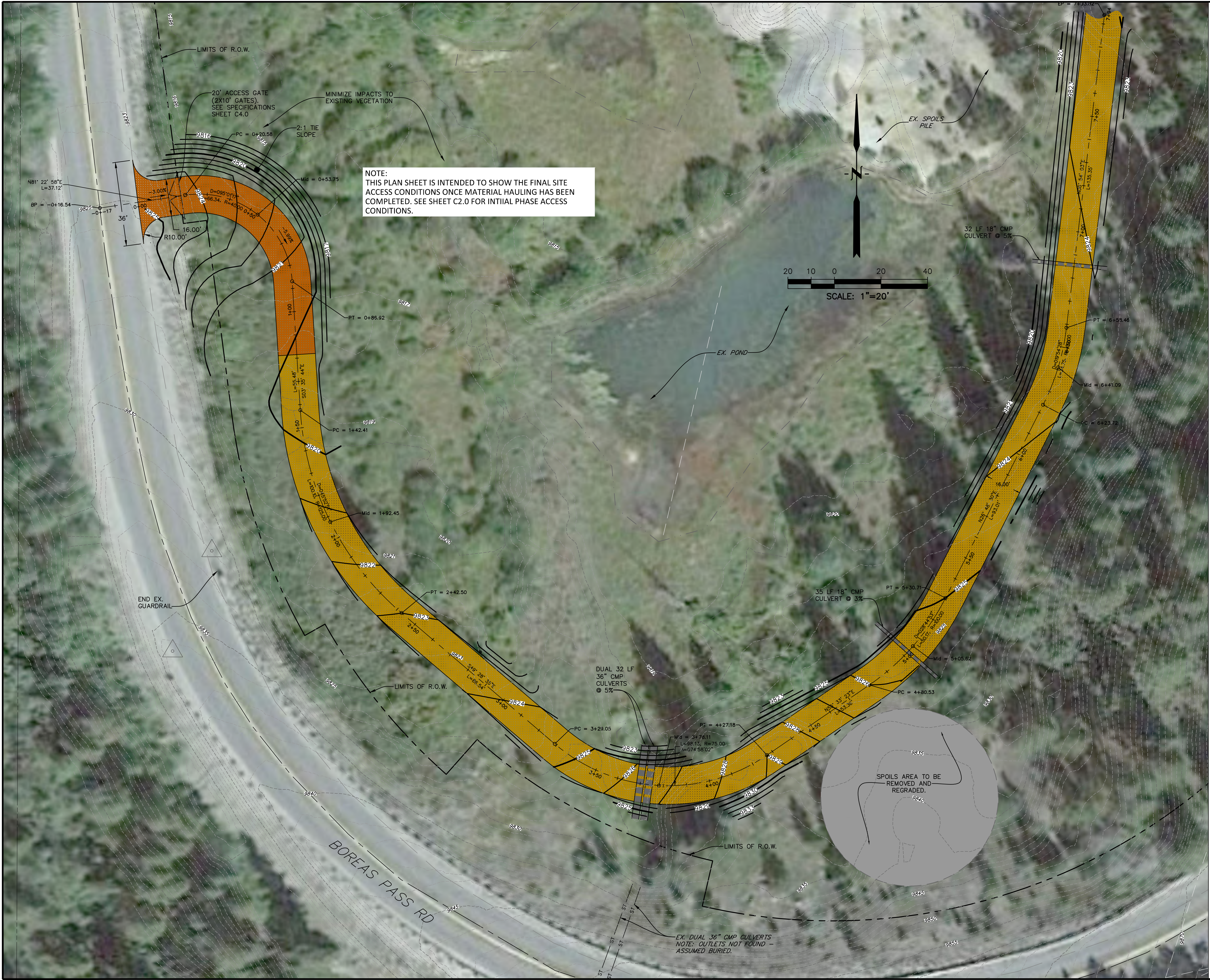
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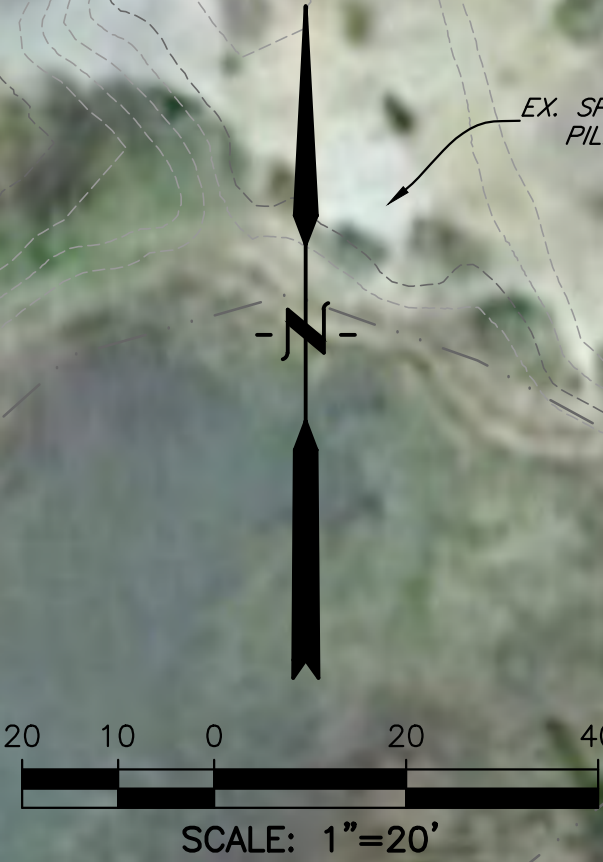
PREPARED FOR:
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BOULDER, CO 80301
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DRAFT DOCUMENTS FOR:
ILLINOIS GULCH
REMOVAL ACTION
TOWN OF BRECKENRIDGE, SUMMIT COUNTY
STATE OF COLORADO

ISSUE	DATE
DRAFT PLAN	10/21/2020
DESIGNED BY:	CCS
DRAWN BY:	TSG
CHECKED BY:	
DRAWING SCALE: HORIZONTAL: 1" = 20' VERTICAL: NONE	
DRAFT ACCESS DETAILS INITIAL PHASE	
PROJECT NO. B1333	
C2.0	
SHEET: 2 OF 6	




NOTE:
THIS PLAN SHEET IS INTENDED TO SHOW THE FINAL SITE
ACCESS CONDITIONS ONCE MATERIAL HAULING HAS BEEN
COMPLETED. SEE SHEET C2.0 FOR INITIAL PHASE ACCESS
CONDITIONS.



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DATE 10/21/2020

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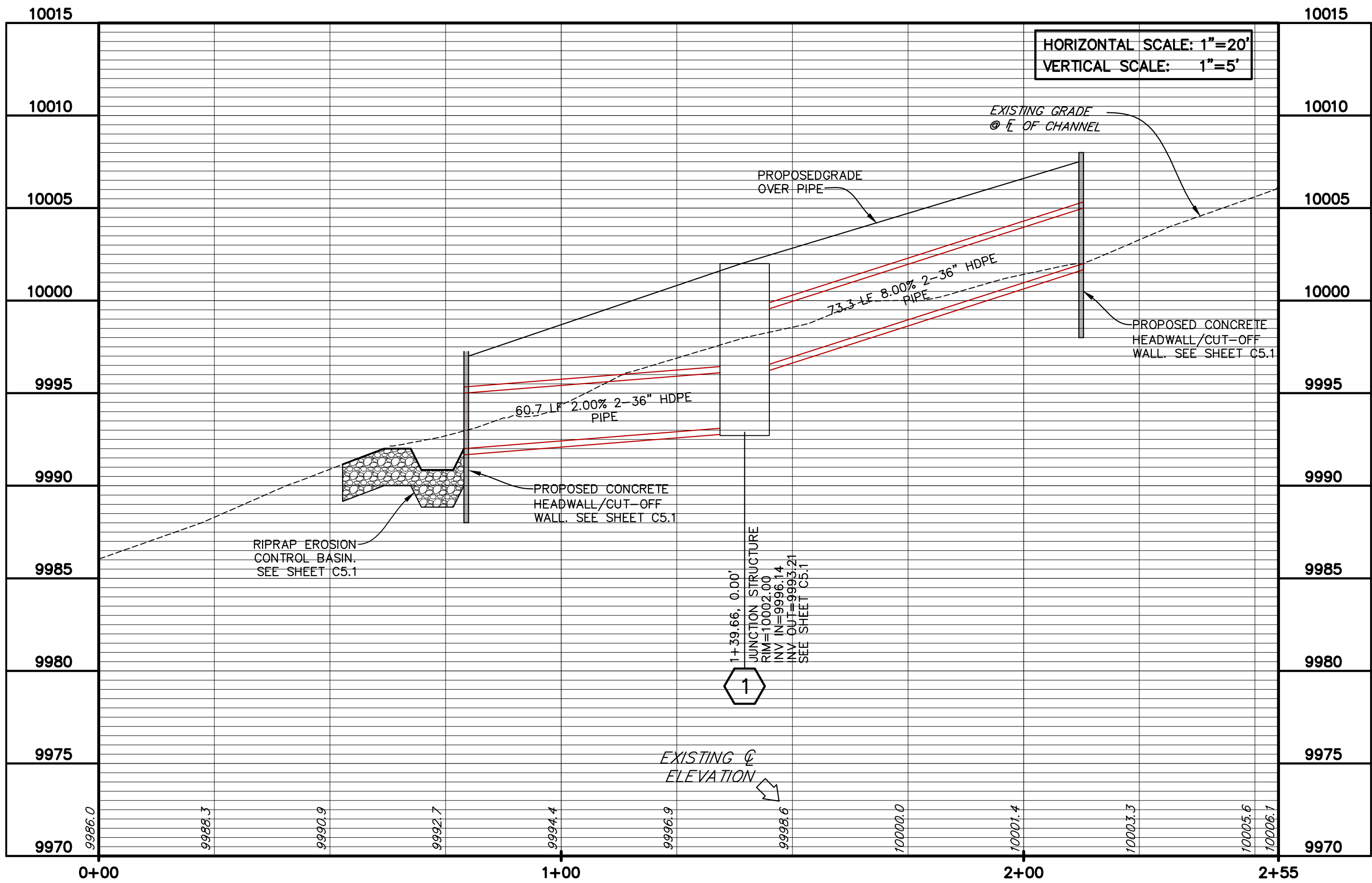
PREPARED FOR:

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303.442.0267

DRAFT DOCUMENTS FOR:


**ILLINOIS GULCH
REMOVAL ACTION**
TOWN OF BRECKENRIDGE, SUMMIT COUNTY
STATE OF COLORADO

ISSUE	DATE
DRAFT PLAN	10/21/2020
DESIGNED BY:	CCS
DRAWN BY:	TSG
CHECKED BY:	
DRAWING SCALE: HORIZONTAL: 1" = 20' VERTICAL: NONE	
DRAFT ACCESS DETAILS FINAL PHASE	
PROJECT NO. B1333	
C3.0	
SHEET: 3 OF 6	



REVIEW ONLY
NOT FOR CONSTRUCTION
DATE 10/21/2020

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DRAFT DOCUMENTS FOR:

**ILLINOIS GULCH
REMOVAL ACTION**
TOWN OF BRECKENRIDGE, SUMMIT COUNTY
STATE OF COLORADO

ISSUE	DATE
DRAFT PLAN	10/21/2020
DESIGNED BY:	CCS
DRAWN BY:	TSG
CHECKED BY:	
DRAWING SCALE: HORIZONTAL: 1" = 20' VERTICAL: 1" = 5'	
CONCEPT WATER MANAGEMENT PLAN & PROFILE	
PROJECT NO. B1333	
C4.0	
SHEET: 4 OF 6	

GENERAL NOTES:

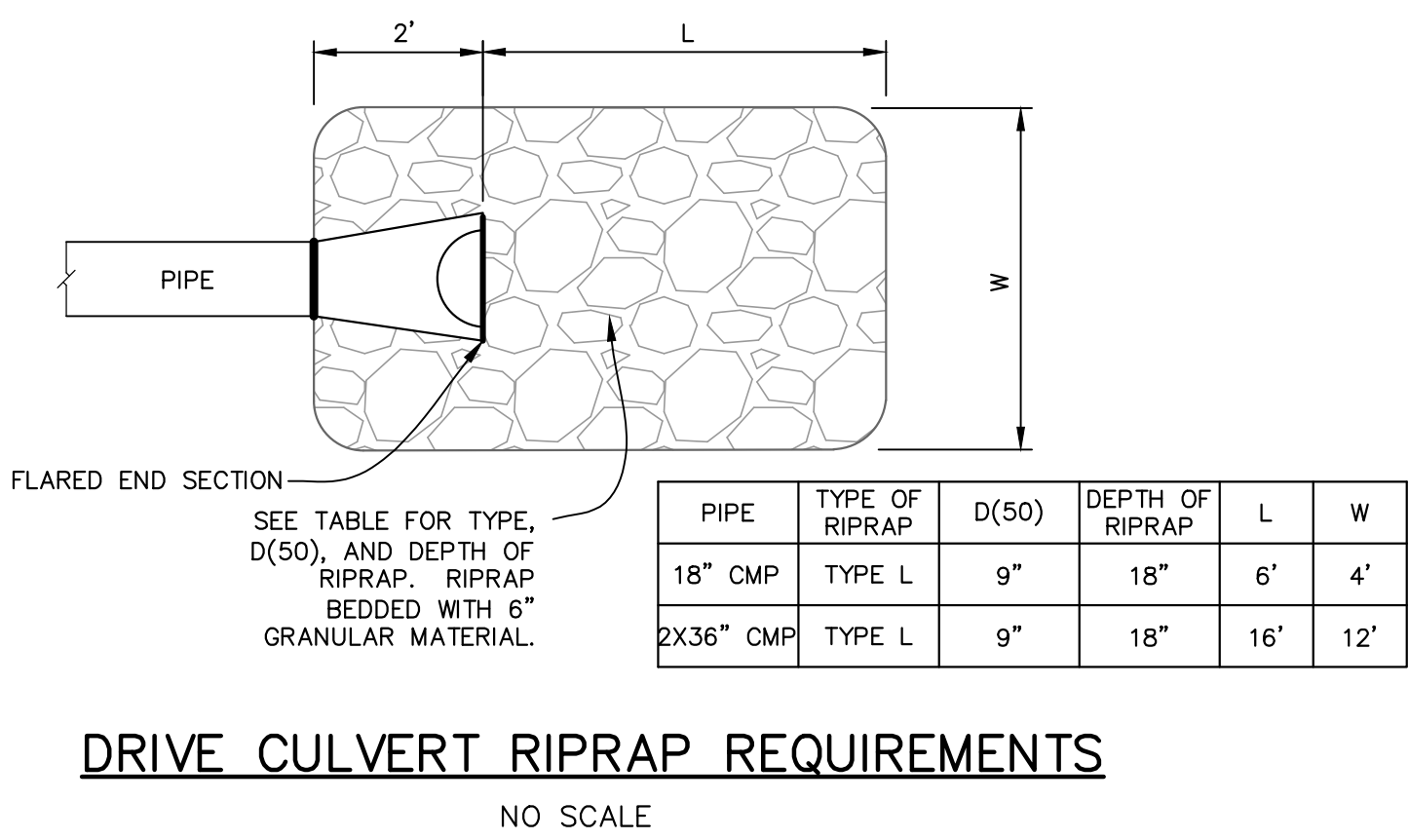
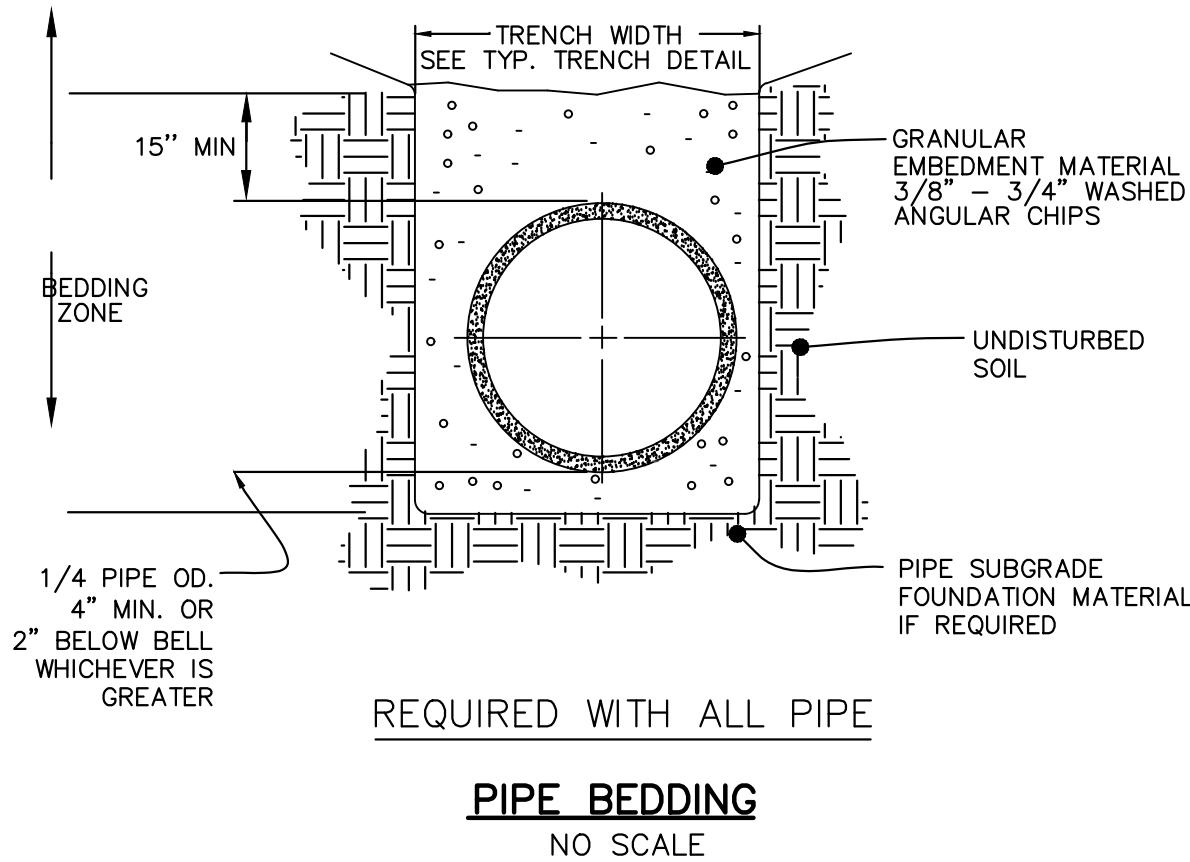
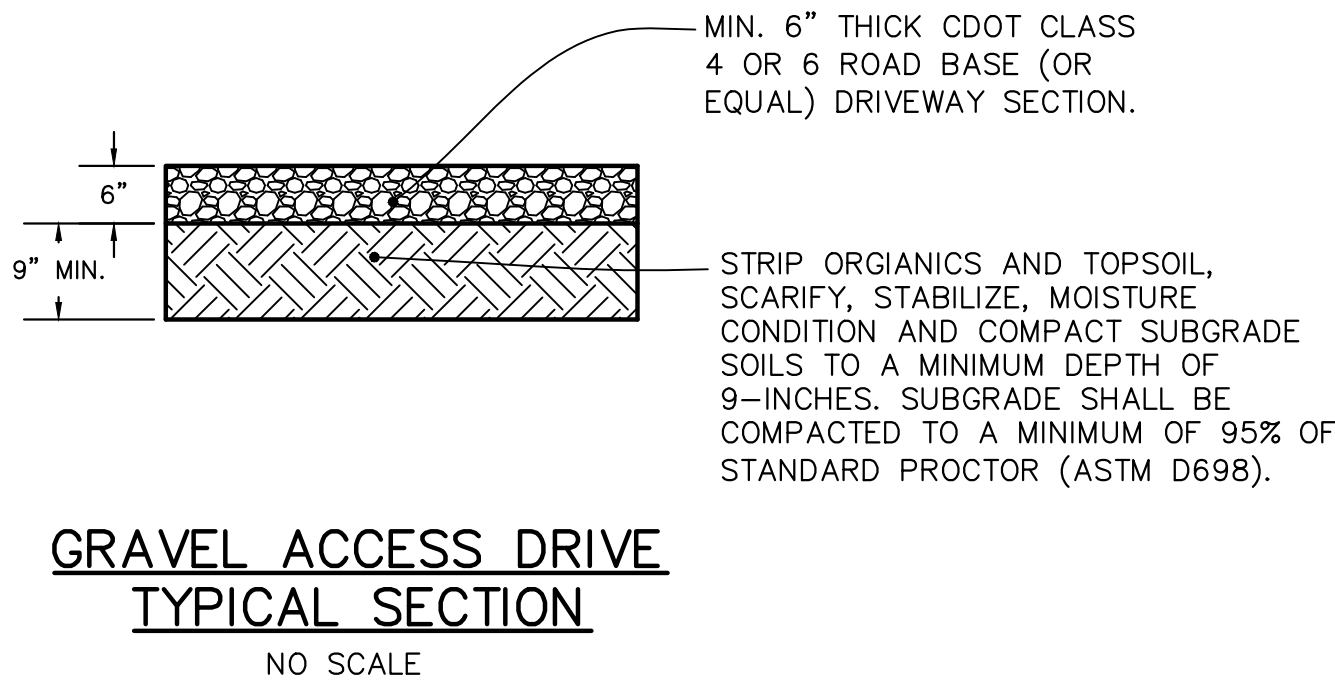
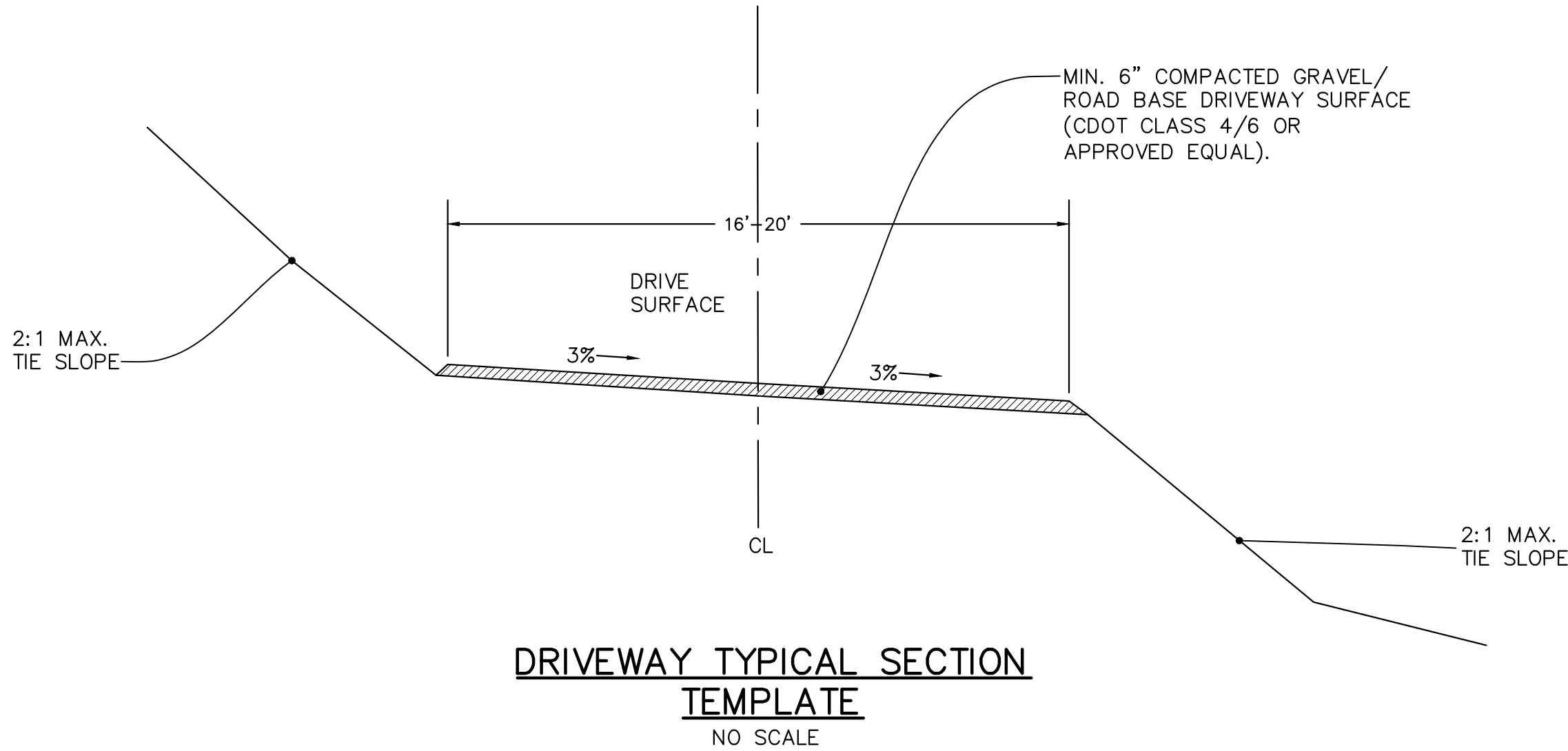
1. ALL WORK SHALL COMPLY WITH TOWN OF BRECKENRIDGE AND SUMMIT COUNTY STANDARDS AND SPECIFICATIONS, AS WELL AS ALL APPLICABLE FEDERAL, STATE AND LOCAL CODES.
2. ALL CONTRACTORS UTILIZING THESE PLANS ARE CAUTIONED TO COMPLY WITH THE REQUIREMENTS OF COLORADO CODE TITLE 9, ARTICLE 1.5, AS AMENDED, CONCERNING THE PROTECTION OF EXISTING UNDERGROUND FACILITIES FROM DAMAGE DUE TO EXCAVATIONS. THE LOCATION OF EXISTING UTILITIES AND FACILITIES ARE SHOWN BASED ON INFORMATION AVAILABLE, AND COMPLETENESS IS NOT GUARANTEED. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO STARTING WORK. THE CONTRACTOR SHALL CONTACT THE UTILITY NOTIFICATION CENTER AT 811 TWO DAYS IN ADVANCE OF STARTING WORK, AS REQUIRED BY COLORADO CODE.
3. CONTRACTOR SHALL VERIFY THE DEPTH AND LOCATION OF ALL UTILITIES AND FACILITIES PRIOR TO STARTING WORK. HAND EXCAVATION MAY BE REQUIRED. WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARDS OF THE UTILITY COMPANIES WHOSE FACILITIES ARE IN THE PROXIMITY OF THE WORK.
4. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS INCLUDING ALL DIMENSIONS AND INVERTS PRIOR TO THE START OF THE WORK. CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY OF ANY VARIATIONS BETWEEN THESE PLANS AND THE ACTUAL FIELD CONDITIONS.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR TO ANY EXISTING IMPROVEMENTS DISTURBED OR DAMAGED BY CONSTRUCTION ACTIVITIES.
6. CONTRACTOR SHALL MAINTAIN AND PROTECT VEHICULAR AND PEDESTRIAN TRAFFIC IN PROXIMITY OF THE WORK.
7. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND SUBMITTAL APPROVALS PRIOR TO THE BEGINNING OF WORK.
8. ALL UTILITY DESIGN LOCATIONS REFER TO CENTERLINE OF UTILITY, UNLESS OTHERWISE NOTED ON THE PLANS.

DEMOLITION & RESTORATION NOTES:

1. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL CONSTRUCTION DEBRIS IN A LAWFUL MANNER.
2. CONTRACTOR SHALL PROTECT FROM DAMAGE ALL EXISTING IMPROVEMENTS ADJACENT TO THE PROJECT LIMITS AND ALL EXISTING IMPROVEMENTS DESIGNATED TO REMAIN WITHIN THE PROJECT LIMITS.
3. EXISTING TREES TO BE REMOVED SHALL BE VERIFIED IN THE FIELD WITH THE OWNER OR OWNER'S REPRESENTATIVE PRIOR TO REMOVAL. EXISTING TREES NOT IDENTIFIED FOR REMOVAL SHALL BE PROTECTED DURING CONSTRUCTION, INCLUDING ROOT STRUCTURE.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR TO ANY EXISTING IMPROVEMENTS DISTURBED OR DAMAGED BY CONSTRUCTION ACTIVITIES TO A MINIMUM OF THEIR ORIGINAL CONDITION.
5. THE CONTRACTOR SHALL RESTORE ANY EXISTING VEGETATION AND/OR SURFACE IMPROVEMENTS BEYOND THE PROJECT LIMITS DISTURBED OR DAMAGED DURING CONSTRUCTION.
6. NATURAL LANDSCAPE AREAS SHALL BE RESEDED WITH AN APPROVED NATIVE GRASS SEED MIX PROVIDED BY THE CLIENT.

STORM SEWER NOTES:

1. HDPE STORM SEWER PIPE LOCATED ON ILLINOIS GULCH SHALL BE ADS N-12 DUAL WALL PIPE OR APPROVED EQUAL MEETING AASHTO M252/ASTM F2306 WITH SMOOTH INTERIOR (MANNING'S VALUE OF 0.012). JOINTS SHALL BE WATERTIGHT MEETING ASTM D3212.
2. STORM CULVERTS TO BE LOCATED UNDER PROPOSED ACCESS DRIVE SHALL AT A MINIMUM BE CORRUGATED METAL PIPE (CMP) AKA CORRUGATED STEEL PIPE MEETING AASHTO M218/ASTM A929 AND SHALL BE MANUFACTURED PER AASHTO M36/ASTMA760. COUPLING BANDS SHALL BE OF THE SAME MATERIAL AS THE PIPE AND SHALL BE MIN. 18-GUAGE.
3. PROVIDE METAL FLARED END SECTIONS (F.E.S) AT ALL CMP CULVERT ENDS.
4. STORM SEWER SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS FOR HIGHWAY LOADING.



REVIEW ONLY
NOT FOR CONSTRUCTION
DATE 10/21/2020

PREPARED BY:


The Sanitas Group
801 MAIN STREET, SUITE 225
LOUISVILLE, CO 80027
303.481.2710
PROJECT CONTACT:
CURTIS C. STEVENS, P.E.

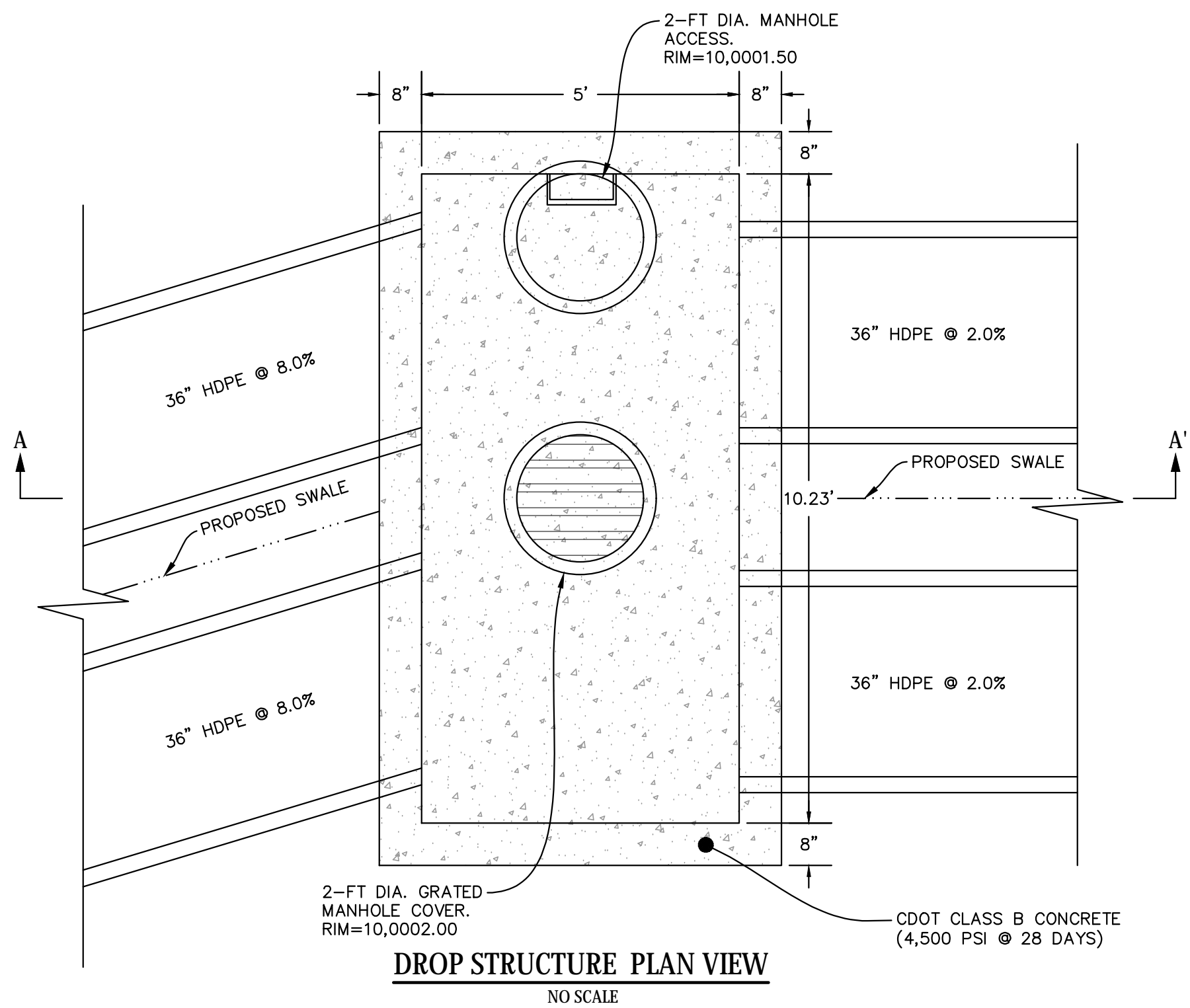
PREPARED FOR:

FORMATION ENVIRONMENTAL, LLC
2500 55TH STREET, SUITE 200
BOULDER, CO 80301
CONTACT: BRIAN HANSEN
303.442.0267

DRAFT DOCUMENTS FOR:

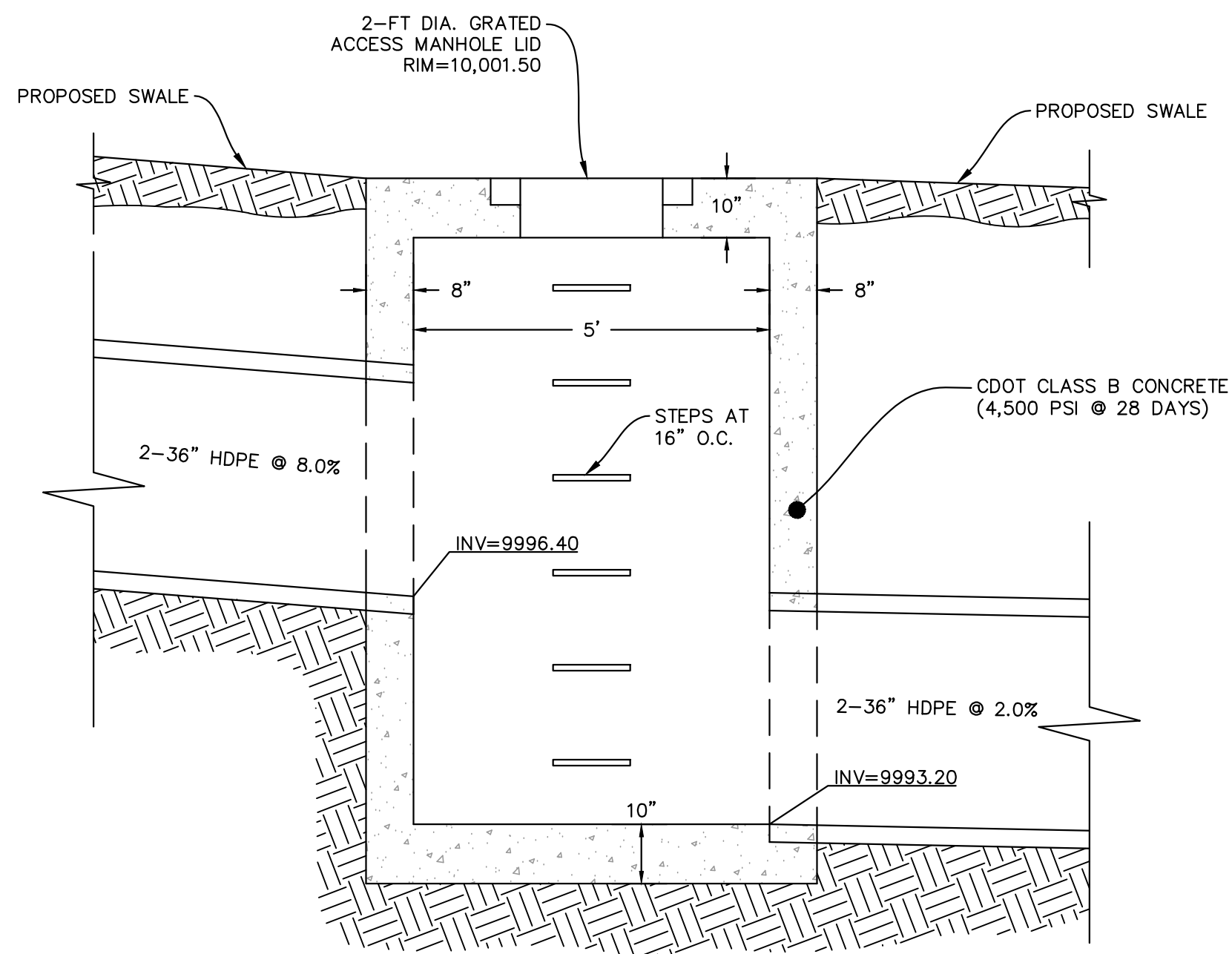
ILLINOIS GULCH
REMOVAL ACTION
TOWN OF BRECKENRIDGE, SUMMIT COUNTY
STATE OF COLORADO

ISSUE	DATE
DRAFT PLAN	10/21/2020
DESIGNED BY:	CCS
DRAWN BY:	CCS
CHECKED BY:	TSG
DRAWING SCALE:	
HORIZONTAL:	N/A
VERTICAL:	N/A
CIVIL SPECIFICATIONS & DETAILS	
PROJECT NO. B1333	
C5.0	
SHEET: 5 OF 6	

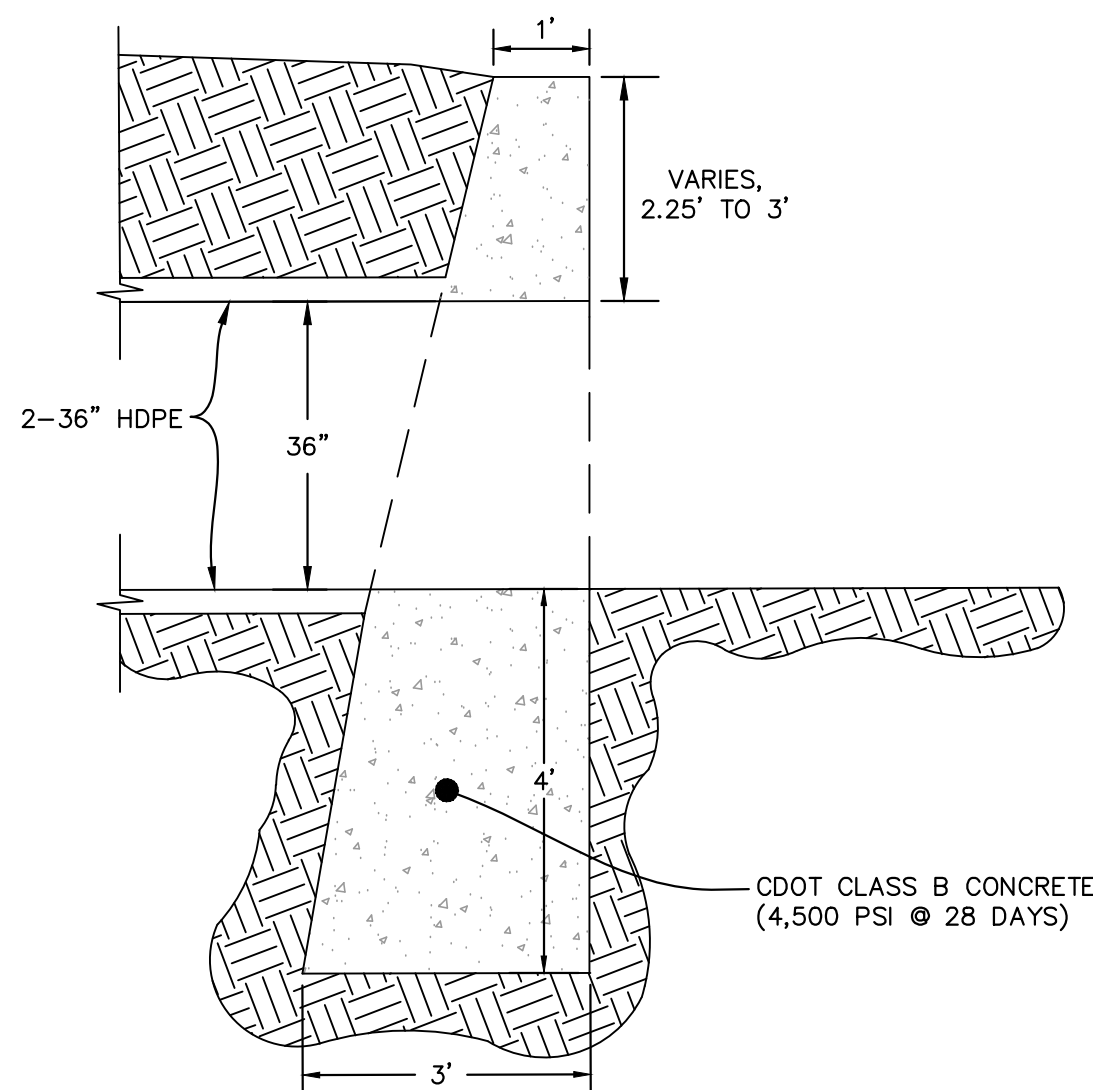


DROP STRUCTURE PLAN VIEW
NO SCALE

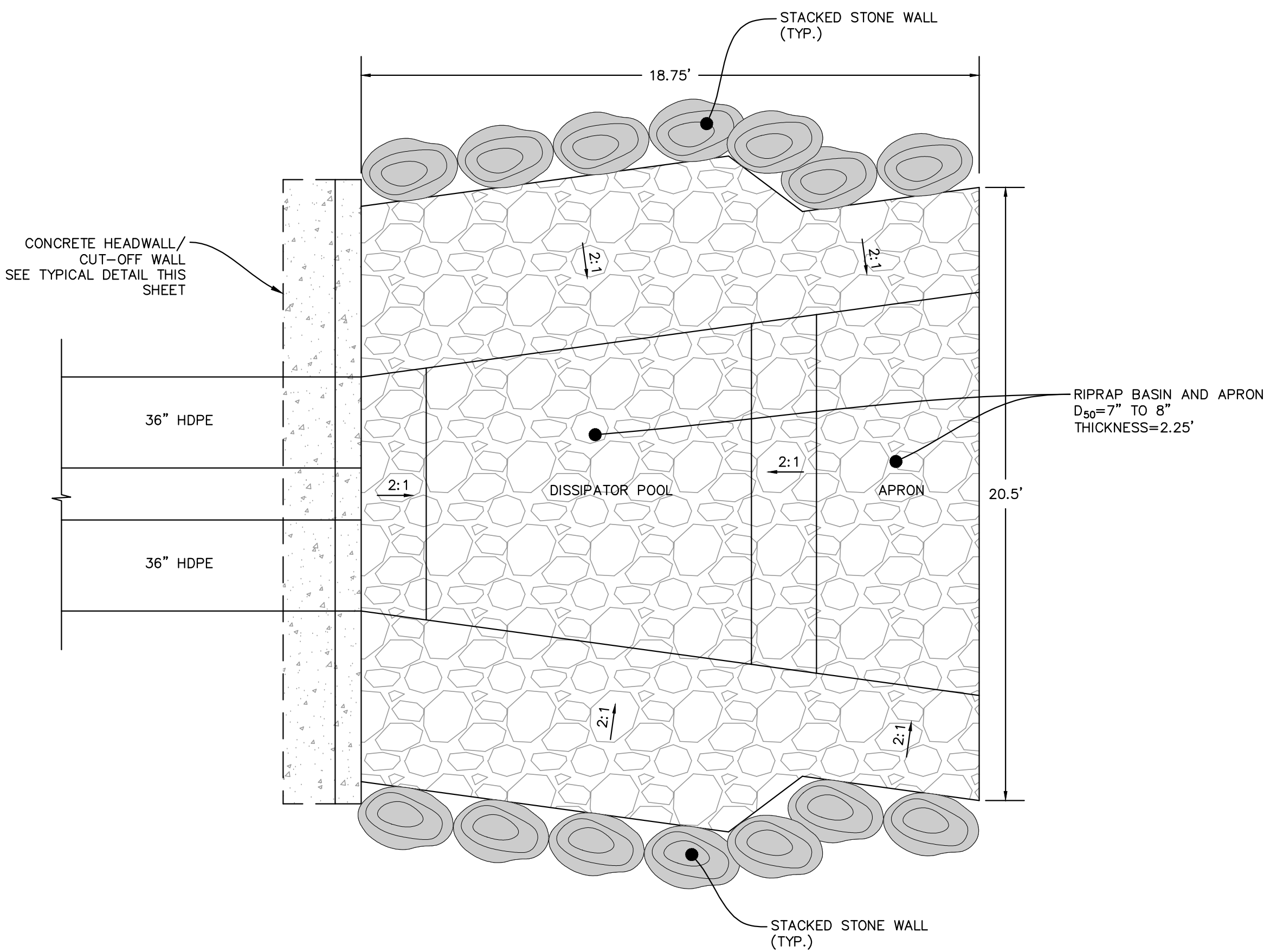
REINFORCEMENT NOTE:
DROP STRUCTURE SHALL
BE REINFORCED WITH TWO
MATS OF #4 REBAR @
12" BOTH WAYS. #4 BARS
SHALL BE PROVIDED
AROUND PIPE AND GRATE
OPENINGS PER STANDARD
CDOT METHODS.



DROP STRUCTURE SECTION A-A'
NO SCALE



TYPICAL CONCRETE HEADWALL
UPSTREAM & DOWNSTREAM END



RIPRAP BASIN AND APRON

REVIEW ONLY
NOT FOR CONSTRUCTION
DATE 10/21/2020

PREPARED BY:



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PREPARED FOR:

FORMATION ENVIRONMENTAL, LLC

2500 55TH STREET, SUITE 200
BOULDER, CO 80301

CONTACT: BRIAN HANSEN
303.442.0267

DRAFT DOCUMENTS FOR:

ILLINOIS GULCH
REMOVAL ACTION
TOWN OF BRECKENRIDGE, SUMMIT COUNTY
STATE OF COLORADO

ISSUE DATE

DRAFT PLAN 10/21/2020

DESIGNED BY: CCS

DRAWN BY: CCS

CHECKED BY: TSG

DRAWING SCALE:

HORIZONTAL: N/A

VERTICAL: N/A

CHANNEL PIPING
DETAILS

PROJECT NO. B1333

C5.1

SHEET: 6 OF 6

APPENDIX D
TECHNICAL MEMORANDUM – DRAINAGE ANALYSIS

21 October 2020

Technical Memorandum – Drainage Analysis

RE: Drainage Analysis – Illinois Gulch
Puzzle Extension Shaft Site
Summit County, Colorado

SG: B1333

To Whom It May Concern,

The Sanitas Group is providing this technical memorandum as a summary of our drainage analysis in support of the lining of a section of Illinois Gulch adjacent to the puzzle extension shaft.

The puzzle extension shaft site is located on the west side of Illinois Gulch Road approximately 1,130 feet southeast of Boreas Pass Road in Summit County, Colorado. USGS StreamStats was used to delineate the drainage basin and estimate peak runoff rates at the puzzle extension shaft site. StreamStats uses regional regression equations for estimation of various streamflow statistics. The USGS, in cooperation with the Colorado Water Conservation Board and the Colorado Department of Transportation, developed the regional regression equations used in Colorado, as documented in USGS Scientific Investigations Report 2009-5136 *“Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado”*. The StreamStats generated drainage basin area tributary to the puzzle extension shaft site is 2.47 square-miles and the peak runoff rates at the site are summarized in the table below.

Design Storm	Peak Flow Rate [cfs]	Standard Error of Prediction [%]
2 Year	32.5	49
5 Year	47.3	44
10 Year	57	41
25 Year	70.3	40
50 Year	83.8	39
100 Year	93.6	36
200 Year	102	36
500 Year	120	33

The proposed channel lining system consists of dual 36-inch HDPE storm sewer piping that will be designed to convey the 500-year flow rate of 120 cfs with a maximum headwater/depth ratio of 2.0. Concrete cutoff walls extending a minimum of 4-ft below the channel will be constructed at both the upstream and downstream ends of the lining system.

Technical Memorandum – Drainage Analysis
Illinois Gulch – Puzzle Extension Shaft Site
Summit County, Colorado
21 October 2020

As an additional design safety factor, the channel lining system will be designed to convey the 500-year flow plus the Standard Error of Prediction (33%), or 160 cfs. A roadside swale above the storm pipe will be used as a secondary conveyance element in the event overtopping occurs at the upstream headwall. The extents of the channel lining system including the cutoff wall locations will be determined after subsequent discussions with the design team and reviewing agencies.

If you have any questions or comments regarding the above, please feel free to contact me at 720.346.1656 or email me at cstevens@thesanitasgroup.com.

Sincerely,

The Sanitas Group, LLC



Curtis C. Stevens, P.E., CFM
Principal/Civil Engineer

Cc:

Attachments: StreatStats Reference

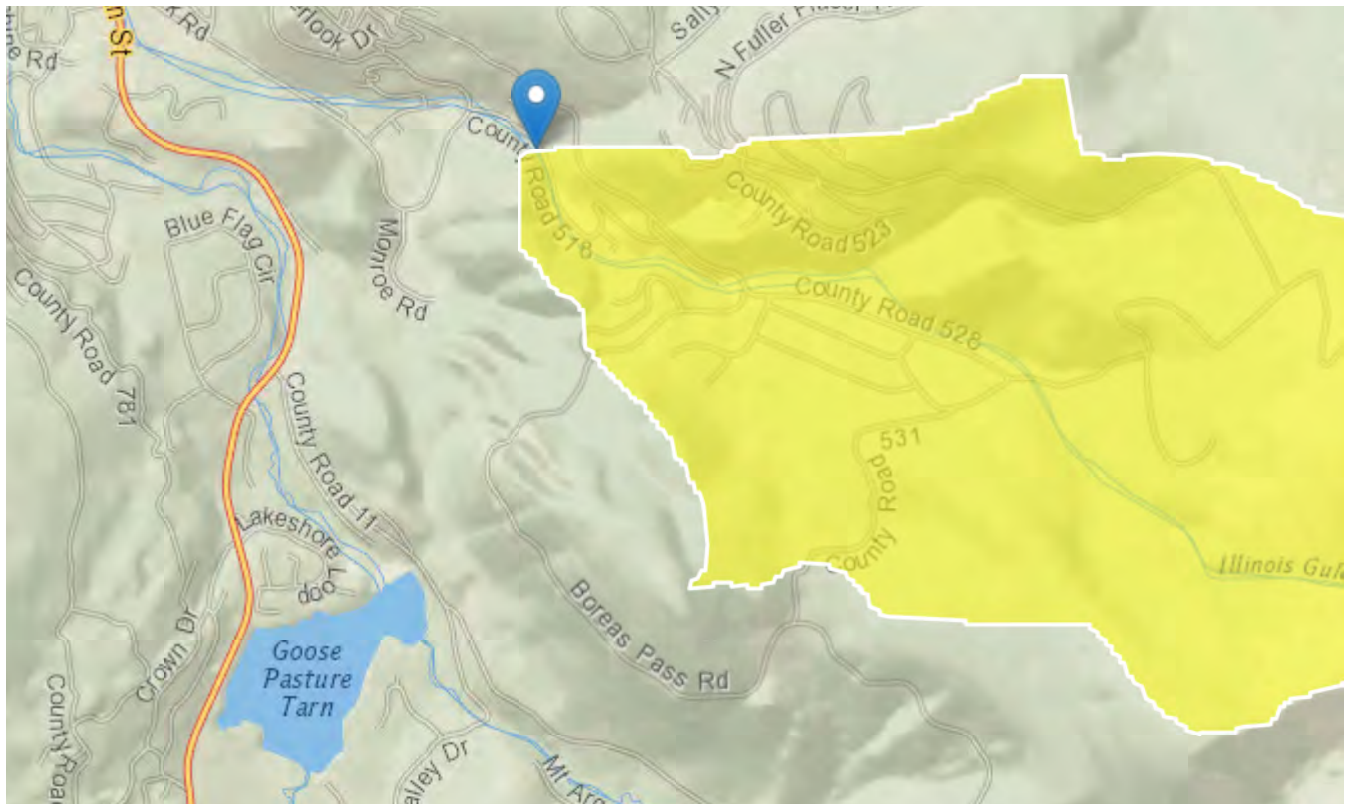
StreamStats Report

Region ID: CO

Workspace ID: C020200811225952563000

Clicked Point (Latitude, Longitude): 39.46935, -106.02395

Time: 2020-08-11 17:00:09 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	2.47	square miles
BSLDEM10M	Mean basin slope computed from 10 m DEM	27	percent
PRECIP	Mean Annual Precipitation	27.19	inches
TOC	Time of concentration in hours	1.57	hours

Peak-Flow Statistics Parameters[Mountain Region Peak Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.47	square miles	1	1060
BSLDEM10M	Mean Basin Slope from 10m DEM	27	percent	7.6	60.2
PRECIP	Mean Annual Precipitation	27.19	inches	18	47
Peak-Flow Statistics Flow Report ^[Mountain Region Peak Flow]					
PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)					
Statistic		Value	Unit	SEp	
2 Year Peak Flood		32.5	ft^3/s	49	
5 Year Peak Flood		47.3	ft^3/s	44	
10 Year Peak Flood		57	ft^3/s	41	
25 Year Peak Flood		70.3	ft^3/s	40	
50 Year Peak Flood		83.8	ft^3/s	39	
100 Year Peak Flood		93.6	ft^3/s	36	
200 Year Peak Flood		102	ft^3/s	36	
500 Year Peak Flood		120	ft^3/s	33	
Peak-Flow Statistics Citations					
Capesius, J.P., and Stephens, V. C.,2009, Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado: U. S. Geological Survey Scientific Investigations Report 2009-5136, 32 p. (http://pubs.usgs.gov/sir/2009/5136/http://pubs.usgs.gov/sir/2009/5136/)					

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

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such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

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Application Version: 4.4.0

APPENDIX E
HEALTH AND SAFETY PLAN (HASP)

DRAFT

Health and Safety Plan

Illinois Gulch Site Time Critical Removal Action

Summit County, Colorado

October 2020

Prepared for:

TABR Realty Services, LLC
6300 C Street SW
Cedar Rapids, IA 52944

Prepared by:



Formation Environmental, LLC
2500 55th Street, Suite 200
Boulder, CO 80301

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Attachments

- 1 HASP Addenda
- 2 Heat Stress Education Poster
- 3 Wind Chill Chart
- 4 Safety Compliance Agreement Form
- 5 Tailgate Safety Meeting Form

LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
CPR	Cardiopulmonary Resuscitation
EPA	Environmental Protection Agency
F	Fahrenheit
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Health and Safety Association
PPE	Personal Protective Equipment
SPF	Sun Protection Factor
TCRA	Time Critical Removal Action
UV	Ultraviolet

1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been prepared by Formation Environmental (Formation) in support of Time Critical Removal Action (TCRA) efforts at the Illinois Gulch Site and surrounding area (hereafter referred to as “the Site”). The Site is located in Summit County, Colorado, outside of the town of Breckenridge. Site features are shown on Figure 1.

1.1 Safety Policy and HASP Scope

Formation is committed to performing its work in a manner that is protective of the safety and health of its employees, contractors, and the public, and to the prevention of harm to assets, property, and the environment. We are committed to providing a safe work environment, constantly improving our safety practices and management, and adopting “Best Practices” wherever possible. Safety is more important than project costs, schedule, or productivity. All on-Site project-related personnel, including contractors, shall be informed of the Site emergency response procedures, any potential health or safety hazards associated with the Site, and the safe work practices described in this HASP. This HASP must be reviewed and an agreement to comply with the requirements must be signed by all Formation personnel prior to performing field work at the Site.

Safety is a corporate as well as an individual responsibility. Our expectation is that every person involved with this project will:

- Accept the philosophy that all incidents are preventable;
- Take the time to do their work safely;
- Become familiar with and abide by the requirements of this HASP;
- Take personal responsibility for their role to contribute to the success of the safety program; and
- Exercise their authority to stop work on any task they deem to be unsafe.

This HASP will be present and readily available during all on-Site activities and a copy of the plan will be made available to all personnel, contractors, and authorized visitors that may enter work areas. All personnel working on or visiting work areas at the Site shall be briefed on the HASP and adhere to provisions of this plan. However, each organization and employer shall be fully responsible for the health and safety of its own employees and compliance with all applicable health, safety and environmental regulations. Non-Formation personnel will be responsible for conducting work under their own health and safety programs which shall, at a minimum, comply with the requirements of this HASP. Alternatively, non-Formation personnel may adopt and use this HASP.

1.2 Purpose of the Health and Safety Plan

The purpose of this HASP is to identify and communicate the potential hazards associated with field work on the project; prescribe procedures that reduce health, safety and environmental risks as low as reasonably practicable; specify measures that mitigate remaining risk to acceptable levels; and describe training requirements, monitoring requirements, record keeping and emergency response procedures.

This plan has been developed using the information and data available, and the current understanding of the planned work tasks for the Project. As additional information is collected or new tasks are added, this HASP may be updated to reflect new hazard analysis and new health and safety program requirements. In addition, this HASP provides for procedures to recognize and address changing conditions that may arise during field activities.

1.3 Site Description and Project Overview

The Site is located southeast of the town of Breckenridge in Summit County, Colorado. The Site includes historical mining features located within the Iron Springs Gulch and Illinois Gulch watersheds near the intersection of Boreas Pass Road (County Road 10) and Illinois Gulch Road. Mining-related features at the site include two collapsed, flowing mine adits (Willard No. 1¹ and Willard No. 2); the Willard waste rock pile; the Cally waste rock pile; the Puzzle Extension Shaft and waste rock pile; and private residences where soil chemistry may have been affected by the Site (Figure 1). Additionally, metals concentrations in surface water associated with the Site have been measured at levels which may be hazardous to aquatic wildlife. The elevation of the Site is approximately 9,800 feet above mean sea level. Site winters are typically severe, with heavy snowfall may limit construction activities to the late spring through fall time frames each year.

Surface water in Iron Springs Gulch and Illinois Gulch flows to the northwest to their confluence approximately 1,500 feet downstream of the Willard waste rock pile. Groundwater discharging from the Willard No. 1 and Willard No. 2 adits contribute to flow in Iron Springs Gulch and generally degrade its water quality. Illinois Gulch flows approximately ¾-mile west-northwest from the Iron Springs Gulch confluence to join the Blue River, which flows approximately 6.5 miles northward to Dillon Reservoir, a water supply for the Denver, Colorado metropolitan area.

Work at the Site will consist of construction of access roads, geotechnical investigations, consolidation and reclamation of waste rock piles, plugging of a mine shaft, construction of a holding pond, soil sampling, and installation of a creek lining system.

¹ The Willard No. 1 adit is also called the Willard Tunnel of the Puzzle Mine.

S:\Jobs\067-001-IronSprings\HASP\IronSpringsHASP_2020.doc

1.4 General Health, Safety Procedures, and Plan Revision

This HASP supplements Formation's Corporate Health and Safety Program (Formation 2018). The Project Manager and Site Safety Officer, identified in **Section 2.0**, have the right and responsibility to amend this HASP as necessary to meet the safety needs of any field task required to complete the project work.

The procedures presented herein are intended to serve as guidelines. Field work conditions may unexpectedly change as the project progresses. As such, procedures herein are not a substitute for on-site personnel exercising sound judgement and responsible safety practices. Prompt notification of changing work conditions requiring possible modification of this plan is the responsibility of the Field Supervisor. The Project Manager will update this HASP, as necessary, to reflect current project working conditions and safety needs. Additional field tasks with unique hazards or risks may also require changes to this plan. In addition, procedures and equipment specified in this plan will be reviewed and updated as new technologies and equipment are developed. In any event, no changes to this plan will be implemented without prior approval of the Project Manager.

HASP Attachment 1 will be reserved for HASP addenda. The addenda will be identified by number and will refer to the latest current revision of the plan (e.g., the first addendum to this plan will be Addendum 1). Each person with a copy of this HASP will be provided with each addendum. A list of those persons who have a copy of this plan will be kept by the Field Supervisor.

2.0 SITE PERSONNEL AND SAFETY RESPONSIBILITIES

Field work will be performed by Formation, a removal action construction contractor retained by TABR, and subcontractors of Formation and the construction contractor. The names and contact information of key project personnel are shown in Table 1. Additional emergency assistance information and phone numbers are provided in **Section 7.0**.

Table 1: Key Project Personnel

Key Personnel	Name	Affiliation	Email	Phone
Project Manager/ Engineer	Brian Hansen, P.E.	Formation Environmental	bhansen@formationenv.com	O: 303-396-0734 M: 720-635-6911
Field Supervisor/ Site Safety Officer	TBD	TBD	TBD	TBD
	TBD	TBD	TBD	TBD
Corporate Health and Safety Officer	Len Mason, P.G.	Formation Environmental	LMason@formationenv.com	O: 970-642-5078 M: 512-638-6464

2.1 Project Manager

The Project Manager will coordinate all Site activities for the project. The Project Manager will have the responsibility to interface with EPA and State of Colorado regulatory agency personnel and to ensure that appropriate reporting occurs.

The Project Manager's responsibilities include the following:

- Coordinating the work with TABR and its removal action construction contractor and serving as the primary point of contact for the work;
- Overseeing project implementation;
- Making decisions regarding additions/changes to the HASP; and
- Coordinating with the Field Supervisor/Site Safety Officer on project health and safety requirements.

2.2 Field Supervisor/Site Safety Officer

The Field Supervisor/Site Safety Officer will be designated as the person responsible for oversight of the project implementation, including all health and safety activities. The Field Supervisor will have the responsibility for implementation of the HASP during actual field operations. Responsibilities include the following:

- Conducting the pre-entry briefing with field personnel and work area visitors and providing all Project personnel with access to a copy of the HASP;

- Conducting the pre-entry briefing with field personnel and work area visitors and providing all Project personnel with access to a copy of the HASP;
- Acting as the Site Emergency Coordinator and implement the emergency response procedures including informing personnel of the proper procedures during emergencies, coordinating emergency procedures, evacuation routes, and calling the appropriate emergency contacts;
- Immediately reporting any unusual or unsafe conditions to the Project Manager;
- Verifying that all employees under his or her leadership work in a safe manner according to this HASP;
- Assuring that appropriate personnel and work area monitoring is conducted in accordance with the HASP;
- Inspecting field attire and make sure it is appropriate for the job;
- Inspecting Personal Protective Equipment and verify its use;
- Observing work party members and authorized visitors to assure they are fit for duty and for indications of impaired health due to contaminant exposure, heat stress, or other hazards;
- Conducting daily tailgate safety meetings;
- Performing Site audits to verify adherence to the requirements of the HASP;
- Evaluating whether Site conditions or changed conditions present hazards not previously predicted or expected, and modifying health and safety equipment or procedures based on data gathered at the Site;
- Making any updates or changes based on experience at the Site or new data gathered;
- Investigating and reporting all accidents, incidents, and infractions of safety rules and requirements to the Project Manager and Corporate Health and Safety Manager; and
- Suspending work or modifying work practices for safety reasons and dismissing individuals from Site work whose conduct on site endangers the health and safety of others.

2.2.1 Corporate Health and Safety Officer

The Corporate Health and Safety Officer will be responsible for supervising for the corporate health and safety program as it relates to project implementation. Specific responsibilities include:

- Establishing and overseeing the corporate health and safety program and ensuring compliance with this program and applicable federal, state and local guidelines;
- Verifying that all Formation employees participate in appropriate safety training and maintain employee records for these programs;
- Overseeing, participating in, and reviewing accident/incident and near miss reporting and investigations;

- Reporting Occupational Health and Safety Association (OSHA) reportable accidents;
- Overseeing awards and incentive program as well as enforcement and disciplinary actions for violations of Formation health and safety policy and programs;
- Reviewing and interpreting this HASP - proposed modifications that may result in less stringent precautions cannot be undertaken without approval of the Corporate Health and Safety Manager; and
- Ensuring participation of the appropriate personnel in the development of the HASP and any subsequent modifications.

2.2.2 Project Staff Responsibilities

Specific responsibilities for all field personnel involved with the Project include:

- Reviewing the HASP and attending daily safety briefings;
- Complying with the HASP and the instructions of the Site Safety Officer, and asking for clarification of any procedures regarding which he/she has questions;
- Advising the Site Safety Officer of any perceived deficiency in the HASP;
- Only doing work and using equipment or personnel protective equipment that they have been adequately trained to safely use/perform;
- Immediately reporting any unsafe conditions, or any changes in conditions or work scope not covered by the HASP;
- Immediately stopping any work they deem unsafe, and vacating any areas they deem unsafe, and reporting these conditions immediately to the Site Safety Officer; and
- Administering necessary precautions to minimize injury or exposure to themselves or other personnel;
- Notifying an office-based colleague on a daily basis, and throughout the day if working at multiple sites, where field staff are located; and
- Notifying the Field Supervisor or Health and Safety Officer of unsafe or potentially unsafe conditions, as well as of any accidents or injuries.

2.2.3 Contractors

Contractors shall bear the ultimate responsibility for all matters dealing with safety in the performance of their work. This responsibility includes the safety of all persons and property and any and all employees of contractors that may perform work on their behalf. This requirement will apply continuously regardless of time or place and will in no way be altered because Formation personnel provide general directions as to the location where work should be performed and/or samples taken. The contractor, their employees, and any and all employees of subcontractors that may perform work on their behalf may be required to work in potentially hazardous conditions. The Field Supervisor will, to the best of his or her ability, inform contractors or their representatives of any potential contaminant, electrical, fire,

explosion, health, or other safety hazards that have been identified during operations. Access to a copy of this HASP will be made available to all contractors performing project-related work at the Site.

3.0 HAZARD ANALYSIS

The major goal of the procedures defined in this HASP is to protect the workers from physical and chemical hazards that may be encountered during implementation of the work. The sections below discuss the hazards that could potentially be encountered during the course of the project.

3.1 Job Hazard Analysis and Controls

A hazard analysis of the work activities that have the potential for physical and/or chemical hazards is provided in the subsequent Table 2. Table 2 provides a step-by-step analysis of the potential hazards associated with each planned project task, and the associated measures to mitigate or control those hazards. References are provided to more detailed descriptions of the hazard mitigation measures contained elsewhere in this HASP. The applicable portions of this table should be reviewed during the daily Tailgate Safety Meetings conducted for the project.

Table 2: Job Hazard Analysis

Task	Potential Hazards	Measures to Eliminate Danger from Hazards
General Site Hazards Common to All Tasks	Unsafe conditions or practices by others	Daily tailgate safety meetings; Pre-job work area inspections; coordination of work activities between Site personnel; buddy system
	Slip, trip, fall	Wear proper footwear; watch for uneven ground, soft ground and burrows; add floodlights for night work; good housekeeping
	Heat stress	Wear appropriate attire; drink plenty of fluids; follow work/rest cycles; monitor for heat stress.
	Sunburn	Wear hat with brim or sun visor; apply sunscreen; wear sunglasses as needed
	Cold Stress	Wear appropriate attire; drink plenty of fluids; stay dry; take rests in heated vehicles; monitor for cold stress
	Native wildlife such as rodents, ticks, snakes, feral animals	Wear permethrin treated clothing in tick infested areas; at least 20% DEET insect repellent on exposed skin; avoid wildlife or feral animals if possible; perform first aid and seek medical attention in case of animal bite
Mobilization/ Demobilization	Vehicle accidents when driving to/from site	Follow safe driving practices
	Mobile Equipment (collisions, struck-by, pinning)	Physical isolation of work area; line of sight communication with drivers; use of spotters in tight quarters; backup alarms.
	Fall (from truck beds)	Use trucks with beds 4' high or less; use lift gate, use three -point stance when mounting / dismounting.

Task	Potential Hazards	Measures to Eliminate Danger from Hazards
Drilling/Geotechnical Boring	Items falling from vehicle	Inspect vehicle prior to mobilization and demobilization to make sure all equipment is securely stowed; tie down/strap equipment as appropriate.
	Strain from heavy lifting	Use proper lifting technique; share heavy loads.
	Hazards during mobilization to drill site	Drill rig tower is lowered; equipment of rig is properly secured; seatbelts are worn while rig is in motion
	Physical hazards from heavy equipment -	Wear proper field attire and personal protective equipment (PPE) such as steel-toed boots, safety glasses, and hard hats; physical isolation of work area; set up signs, signals, and barricades as needed; line of site communication; use of spotters in tight quarters; backup alarms
	Drill rig and tool failure	Complete daily inspection of drill rig and tooling prior to use; wear hard hat, steel toe boots, and safety glasses
	Buried utilities	Contact Colorado811 (811) for utility marking; contact local utility companies for location/information on buried utilities; clear boring using hand auger in questionable areas
	Overhead utilities	Utilize safe operating practices, maintain minimum clearances
	Noise from equipment	Use hearing protection as needed
	Strain from heavy lifting	Use proper lifting technique; share heavy loads; use pullies on rig to lift heavy objects
	Turning equipment	Un-necessary personnel to remain clear of work area; avoid loose clothing and jewelry; keep hands and limbs clear of turning equipment; locate emergency shut-off switch (kill switch) and confirm it is operational and drilling crew knows how to use
	Crushing and pinning injuries	Un-necessary personnel to remain clear of work area; wear hard hat, steel toe boots, leather gloves; identify work zones; keep safe distance from equipment; emergency brake set and wheels chocked; work area upslope of rig when working on slopes
	Contusion from portable tools	Use proper technique; wear gloves
	Exposure to chemical hazards	Wear proper PPE including nitrile gloves; practice good hygiene; avoid eating, drinking, or smoking in work areas
	Electrocution	Properly ground drill rig; suspend drilling during lightning; maintain minimum clearances for overhead utilities
	Fire	At least one 10-pound ABC fire extinguisher should be at rig and verified to be charged

Task	Potential Hazards	Measures to Eliminate Danger from Hazards
Construction	Release of dust	Work upwind of dust; use water to keep dust down as needed
	Mobile Equipment (collisions, struck-by, pinning)	Physical isolation of work area; line of sight communication with drivers; use of spotters in tight quarters; backup alarms.
	Physical hazards from heavy equipment	Wear proper field attire and PPE such as steel-toed boots, safety glasses, and hard hats; physical isolation of work area; set up signs, signals, and barricades as needed; line of site communication; use of spotters in tight quarters; backup alarms
	Buried utilities	Contact Colorado811 (811) for utility marking; contact local utility companies for location/information on buried utilities; clear boring using hand auger in questionable areas
	Overhead utilities	Utilize safe operating practices, maintain minimum clearances
	Noise from equipment	Use hearing protection as needed
	Exposure to chemical hazards	Wear proper PPE including nitrile gloves; practice good hygiene; avoid eating, drinking, or smoking in work areas
	Turning equipment	Un-necessary personnel to remain clear of work area; avoid loose clothing and jewelry; keep hands and limbs clear of turning equipment; locate emergency shut-off switch (kill switch) and confirm it is operational and drilling crew knows how to use
	Open excavations	Barricade open excavation with cones and caution tape; proper sloping, benching, shoring for open excavations greater than 5 feet that need to be entered; use of ladders or steps for exit of trenches greater than 4 feet deep
	Waste rock removal	Avoid digging at base of piles; barricade work areas as needed; wear proper PPE
	Contusion from portable tools	Use proper technique; wear gloves
	Electrocution	Properly ground drill rig; suspend drilling during lightning; maintain minimum clearances for overhead utilities
	Fire	At least one 10-pound ABC fire extinguisher should be at rig and verified to be charged
	Release of dust	Work upwind of dust; use water to keep dust down as needed
Soil Sampling	Exposure to chemical hazards	Wear proper PPE including nitrile gloves; practice good hygiene; avoid eating, drinking, or smoking in work areas
	Physical injuries	Wear proper PPE including gloves and eye protection
	Strain from heavy	Use proper lifting technique; share heavy loads

Task	Potential Hazards	Measures to Eliminate Danger from Hazards
	lifting	
	Crushing and pinching injuries	Wear leather gloves, keep hands and limbs free of moving equipment

3.2 Physical Hazards and Controls

Injuries that may result from physical hazards can range from simple scrapes or contusions to casualties, including fatalities due to moving heavy equipment or electrocution. Injuries resulting from physical hazards can be avoided through the adoption of safe work practices and employing caution when working with or near machinery. At the start of each day, the Field Supervisor shall inform the Project Manager of the locations and nature of the planned work. All field personnel shall be conscious of their work environment, and especially changes in conditions, and should notify the Field Supervisor or other appropriate supervisory personnel of any unsafe conditions. The Field Supervisor will be responsible for informing all workers of any physical hazards related to the Site. All field personnel should also familiarize themselves with other contractors' safety procedures. The protective measures to be implemented during completion of field activities are also identified under Section 4.0, Personal Protective Equipment.

3.2.1 Heavy Equipment

Operation of heavy equipment (tractors, graders, trucks, and dozers) presents a potential physical hazard to personnel. All PPE must meet or exceed the relevant standards set by NIOSH (National Institute for Occupational Safety and Health), ASTM (American Society for Testing and Materials), or ANSI (American National Standards Institute) for safety hard-toed boots, safety glasses or safety sunglasses, and hard hats, all of which should be worn whenever such equipment is present. Personnel should at all times be aware of the location and operation of heavy equipment and take precautions to avoid getting in the way of their operation. High visibility vests are required in areas subject to heavy equipment operation. When approaching the operator of any heavy equipment, be sure to make and maintain a clear line-of-sight contact and ensure that the operator has acknowledged the presence of personnel in his vicinity.

3.2.2 Trenching/Excavation

Trenches and excavations may pose a physical hazard to Site personnel during the collection of samples for geotechnical and/or laboratory analysis or other field work activities. All trenching and excavation work shall comply with the requirements of 29 CFR 1926, Subpart P. No worker shall enter an excavation without ensuring that the excavation and procedures comply with 29 CFR 1926. Some, but not all, requirements for safe trenching are:

- Whenever possible, workers will avoid entry into trenches or excavations.
- Any excavations and/or trenches exceeding five (5) feet in depth, and for which entry by personnel may be required, must be sloped, shored, braced or otherwise supported. Sloping angles and/or shoring/bracing requirements shall be determined after an inspection of the soils and conditions by a competent individual. The water content of the soil, the soil type, the degree of compaction, superimposed loads and vibration can affect the stability of a trench excavation. Support systems shall be planned and designed by a qualified person with previous experience successfully planning and designing safe support systems.
- Excavations and trenches will be inspected by a competent person before workers enter them. Furthermore, daily inspections shall be made and trenches shall be reinspected after every rainstorm or other potentially hazard-increasing event.
- Excavated materials (spoils) shall be stored at least two feet from the edge of the excavation, or otherwise retained, in order to prevent this material from falling into the excavation.
- When employees are required to be in trenches four (4) feet deep or more, an adequate means of exit, such as a ladder or steps, will be provided and located no more than 25 feet from any work area.
- When soil will be disturbed by heavy equipment or vehicles, wet the soil before disturbing it and continuously wet it while digging to keep dust levels down.
- Remain up wind from any dust generation.

3.2.3 Heat Stress

When personnel are working in hot environments, the Field Supervisor and all field personnel shall be trained to recognize the symptoms of heat stress and to provide initial first aid treatment if required until more qualified personnel take over. Heat stress occurs when the rate of heat gain is greater than the body's ability to remove it. It is important to understand the factors that cause overheating and mechanisms to control those factors. A heat stress education poster is included as HASP Attachment 2.

Heating of the body occurs from three sources:

- Radiant heating from heat sources or sunlight;
- Convective heating from contact with a warmer object or liquid; and
- Metabolic heating caused by activity.

Cooling occurs through three mechanisms:

- Respiration: Exhaled air is warm. As the body overheats, respiration becomes more rapid;
- Radiation: Heat is released at the surface of the skin. As the body overheats, the surficial blood vessels dilate and allow more heat to be lost; and

- Evaporation: Perspiration is released to the skin surface and evaporates. The skin is cooled by evaporative cooling.

Employee Education

Heat stress symptoms and treatment are described in Table 3.

Effects of PPE

Heat stress may occur with or without the use of PPE, which adds layers of clothing that insulate the wearer from cooling air. Chemical protective clothing generally has a vapor barrier to keep out chemical vapors. The vapor barrier also prevents evaporative cooling of perspiration. In short, PPE increases the potential for heat stress on workers.

Practical Methods to Reduce Heat Stress

These methods will be discussed during safety meetings:

- Become acclimated to heat for several days whenever possible.
- Schedule the hardest physical tasks for the coolest part of the day.
- If possible, use a portable canopy to provide shade to work or rest under.
- Wear cool clothing suitable for hot conditions. Loose fitting clothes allow for air to pass over skin to help cooling. Light colored clothing reflects heat. Large-brimmed hats worn on hot sunny days provide shade for head, face, and neck area.
- Perform Site preparations before the field team dresses out. Instrument calibrations, equipment preparation, and planning for the workday, etc., should be performed before dressing in PPE.
- Personnel should wear sunscreen containing a minimum sun protection factor (SPF) of 15 when working outdoors in the sun. Sunscreens are commonly rated and labeled with an SPF that measures the fraction of sunburn-producing UV rays that reach the skin. Sunscreen should be applied prior to beginning work and reapplied frequently.
- Take frequent breaks and consume at least one pint of cool fluid every hour. Replenish electrolytes through the consumption of diluted drinks. The body loses more water than electrolytes. Concentrated salt, electrolyte, or juices can increase susceptibility to heat stress.

Avoid beverages with caffeine, which make the body lose water and increase risk for heat illnesses.

Table 3: Heat Stress Symptoms and Treatment

CONDITION	COMMON SYMPTOMS	TREATMENT
Slightly elevated body temperature	Body temperature between 99 and 101° F Headache	Drink cool fluids. Rest in cool place until temperature and pulse are below 99° F and 110 beats per minute respectively.
Heat rash	Rash mainly on back	Shower at the end of the shift. Observe for signs of heat exhaustion.
Heat cramps	Muscle cramps or twitching often starting in abdominal area. Pain in hands, feet, and abdominal areas.	Remove from field work. Take off PPE. Encourage consumption of cool fluids designed to replenish electrolytes (e.g., Gatorade). Observe for signs of heat exhaustion.
Heat exhaustion	Body temperature between 99 and 102° F Headache, weakness Elevated pulse Profuse sweating Pale skin Cool wet/clammy skin Lethargic Nausea Dizziness	Act immediately. Remove to a cool shaded area. Take off PPE. Drink cool fluids, about a cup every 15 minutes unless sick to the stomach. Spray with a cool mist of water or apply wet cloth to skin. Treat as a medical emergency if the person does not feel better in a few minutes. No field work for at least 48 hours.
Heat stroke LIFE THREATENING	Temperature greater than 102° F Hot, dry pale skin with no sweating Flushed skin Irritability, confusion, seizures, unconsciousness. Rapid pulse	Treat as a medical emergency. Remove from field work. Remove PPE. Spray with a cool water mist, or apply cool wet cloth to skin, not cold water. Place ice packs under armpits and groin area until emergency medical services arrive. Written release from doctor required to return to work.

3.2.4 Ultraviolet (UV) Radiation (Sun Exposure)

Health effects regarding UV radiation are confined to the skin and eyes. Overexposure can result in adverse skin conditions, including erythema (redness or sunburn), photoallergy (skin rash), phototoxicity (extreme sunburn acquired during short exposures to UV radiation while on certain medications), premature skin aging, and numerous types of skin cancer.

Acute overexposure of UV radiation to the eyes may lead to photokeratitis (inflammation of the cornea), also known as snow blindness. Symptoms include redness of the eyes and a gritty feeling, which progresses to pain and an inability to tolerate any kind of light. This condition can also occur when working in or around water and other UV radiation reflectors. In addition, long-term exposure to sunlight is thought to cause cataracts or clouding of the lens of the eye.

Limit Exposure Time

- If possible, rotate staff to tasks with decreased sun exposure so the same personnel are not exposed all of the time.
- Try to limit exposure time when UV radiation is at peak levels (approximately 2 hours before and after the sun is at its highest point in the sky).
- Avoid exposure to the sun or take extra precautions when the UV index rating is high.

Provide Shade

- Try to take lunch and breaks in shaded areas.
- If possible, create shade or shelter through the use of umbrellas, tents, and canopies.
- Use fabrics such as canvas, sailcloth, awning material and synthetic shade cloth that create good UV radiation protection.
- Check the UV protection of the materials before buying them. Seek protection levels of 95 percent or greater and check the protection levels for different colors.

Clothing

- Reduce UV radiation damage by wearing proper clothing such as long-sleeved shirts with collars and long pants. The fabric should be closely woven.
- Head protection should be worn to protect the face, ears, and neck. Wide-brimmed hats with a neck flap or "Foreign Legion"-style caps offer added protection.
- Wear UV-protective sunglasses or safety glasses. These should fit closely to the face. Wrap-around style glasses provide the best protection.

Sunscreen

- Apply sunscreen generously to all exposed skin surfaces at least 20 minutes before exposure, allowing time for it to adhere to the skin.

- Re-apply sunscreen at least every 2 hours, and more frequently when sweating or performing activities where sunscreen may be wiped off.
- Choose a sunscreen with a high SPF. Most dermatologists advocate SPF 30 or higher when subjected to significant sun exposure.
- Select waterproof sunscreens for use in or near water, and by those who perspire sufficiently to wash off non-waterproof products.
- Check for expiration dates because most sunscreens are only good for about 3 years.
- Store in a cool place out of the sun.

Remember that no sunscreen provides 100% protection against UV radiation. Other precautions must be taken to avoid overexposure.

3.2.5 Cold Stress

Personnel are subject to cold stress when working outdoors in conditions of low temperatures, especially at or below 40° Fahrenheit (F), wet conditions, and/or wind speed of 5 miles per hour or higher, and/or with lack of water, previous cold injuries, use of tobacco, fatigue and low activity. Exposure to extreme cold for a short time causes severe injury to the surface of the body. Areas of the body which have high surface area-to-volume ratio such as fingers, toes, feet, and ears are the most susceptible.

Two factors influence the development of a cold injury: ambient temperature and wind velocity. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. A wind chill chart is shown in HASP Attachment 3.

Frostbite

Local injury resulting from cold is included in the generic term frostbite. Frostbite of the extremities can be categorized as:

- "Frost nip or incipient frostbite" which is characterized by sudden whitening of skin;
- "Superficial frostbite" which is characterized by skin with a waxy or white appearance and is firm to the touch, but tissue beneath is resilient; and
- "Deep frostbite" which is characterized by tissues that are cold, pale, and solid.

Hypothermia

Hypothermia is most likely to occur at very cold temperatures but it can occur even at cool temperatures if an individual becomes chilled from rain or sweat. Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

- Shivering, exhaustion;

- Apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95° F;
- Unconsciousness, glassy stare, slow pulse, and respiratory rate;
- Freezing of the extremities; and
- Death.

Field activities shall be terminated by Field Supervisor if initial signs of frostbite or hypothermia exist and activities may be terminated if equivalent wind chill temperature is below 0° F. All affected personnel shall be kept warm and receive immediate medical care.

Additional notes to remember:

- Do not rub the frostbitten part;
- Do not use ice, snow, gasoline or anything cold on the frostbitten area;
- Do not use heat lamps or hot water bottles to rewarm the part; and
- Provide a warm drink - not coffee, tea, or alcohol.

3.2.6 Inclement Weather

It is Formation's policy that field work be conducted under safe conditions. Rain, thunderstorms, and/or high wind conditions may occur during a scheduled work activity. Protective clothing for wet conditions will be utilized as necessary. Heavy rains, high winds, or other weather conditions may result in the cessation of work activities, at the discretion of the Project Manager or Field Supervisor.

Outdoor operations will be suspended when lightning is within a 30-second count of the Site (i.e., the time difference between seeing a lightning strike and hearing the sound). Equipment operators shall stop their equipment and park it safely before heading for shelter. No personnel will be left on the ground in an exposed location. Preferred shelter during thunderstorms is a permanent building. Personnel may also take shelter in trailers or low-profile rubber-tired equipment (e.g., pickups). Avoid driving pickups or any other equipment, except to help evacuate personnel.

Thunderstorms always have the potential for down bursts and hail. Weather forecasts should be monitored frequently for changing weather conditions. Work may resume after a 30-minute period without lightning occurring within the specified 30-second count.

The Field Supervisor will ensure that a dedicated watch is posted during periods of tornado watch or warning. Personnel will be evacuated to permanent structures when necessary.

3.2.7 Noise

Personnel working around large construction equipment and loud, congested areas can be exposed to excessive noise causing temporary or permanent damage to hearing. The effects of noise can include:

- Workers being startled, annoyed, or distracted;
- Physical damage to the ear; and
- Communication difficulties that may increase potential hazards.

All personnel shall wear hearing-protective devices (i.e., either ear plugs or muffs) when noise levels interfere with normal speech. Hand signals will be established by on-site personnel, as appropriate, to facilitate communications while involved in high-noise activities.

3.2.8 Dangerous Animals, Insects, and Plants

Moose are present within the dense vegetation of the project area from time to time. Their behavior is unpredictable and they may attack humans even if unprovoked. If moose are observed, workers that are not protected within vehicles or construction equipment should suspend work and leave the project area until the moose have departed.

Animal bites and insect stings are usually nuisances (i.e., localized swelling, itching, and minor pain) that can be handled with first-aid treatments. The bites of certain snakes and spiders contain sufficient poison to warrant medical attention. There are diseases that can be transmitted by insect and animal bites. Examples are Rocky Mountain spotted fever and Lyme disease (tick), and West Nile virus and equine encephalitis (mosquito). Other stinging and biting insects likely to be found at the worksite include yellowjackets and chiggers. The greatest hazard and most common cause of fatalities from animal bites, particularly from bees, wasps, and spiders, is a sensitivity reaction. Anaphylactic shock due to stings can lead to severe reactions in the circulatory, respiratory, and central nervous systems, which can also result in death. The Site Safety Officer should be made aware of any known insect sting allergies and verify that an Epi-pen is available for any personnel with a severe allergy.

Venomous snakes may be present in the area. Use good judgment when walking in vegetated areas where snakes may be harder to see. Look and listen before stepping through bushes. To care for someone bitten by a venomous snake, the wound should be immediately washed, immobilized, and kept lower than the heart, if possible. Keep the calm and remove any constricting clothing or jewelry before swelling starts. Immediate medical attention shall be sought (call 911). A bite by a nonvenomous snake should be treated as a first aid case using routine procedures. If unsure whether the bite was from a venomous or nonvenomous snake, treat it as a bite from a venomous snake. Anyone that is bitten must seek medical help immediately for treatment using anti-venom. DO NOT "CUT AND SUCK" as this may make the snake bite worse and transfer poison to the person aiding the victim.

The project site is located in a geographic area where Rocky Mountain spotted fever, Lyme disease, and other tickborne infections are possible. Rocky Mountain spotted fever and Lyme disease are spread primarily by ticks. While Lyme disease is predominantly spread by the deer tick, Rocky Mountain spotted fever can be spread by many types of ticks. Ticks can be found near wooded areas, tall grass brush, and in leaf litter. Rocky Mountain spotted fever is caused by the bacterium *Rickettsia rickettsia* and is potentially fatal. Symptoms of Rocky Mountain spotted fever include fever, headache, muscle pain, nausea, vomiting, and loss of appetite. A rash often appears on the wrists, forearms, palms and/or soles of feet. Rocky Mountain spotted fever is best treated by using a tetracycline antibiotic. Although Lyme disease is rarely fatal, it can cause flu-like symptoms, arthritis, heart arrhythmias, facial palsy, severe headaches, and loss of sensation. A “bull’s eye” rash that may appear days to weeks after the bite, flu-like symptoms, swelling and pain in joints and, less commonly, heart arrhythmia, weakness in legs, facial paralysis and numbness. If employees feel they may have contracted either Rocky Mountain spotted fever or Lyme disease, they must notify the Site Safety Officer immediately.

Protection against the tick consists of wearing clothing that covers the whole body, tucking pant legs into boots or socks and tucking a long-sleeve shirt into pants. Use of repellents containing DEET is also effective. It is also important to frequently check for ticks, which can be as small as the size of a period on this page.

The most dangerous toxic effects from plants are due to ingestion of nuts, fruits, or leaves. Consequently, personnel are prohibited from eating any fruits, nuts, or other plant material, which may grow on the Site. Of more concern to response personnel are certain plants including poison ivy, poison oak, and poison sumac, which produce adverse effects from direct contact. The usual effect is dermatitis, an inflammation of the skin. The protective clothing and decontamination procedures used for chemicals reduce the exposure risk to the plant toxins. Cleaning the skin thoroughly with soap and warm water immediately after contact will reduce risk of significant adverse effects.

3.2.9 Manual Lifting

Activities may require personnel to move large, heavy objects by hand. The human body is subject to severe damage in the forms of back injury and hernia if caution is not observed when handling, lifting, or moving large heavy objects.

General rules for manual lifting include:

- Ensure secure footing;
- Place feet about one shoulder width apart;
- Bend at knees to grasp weight;
- Keep the back straight; and
- Get a good hold on the object to be lifted.

3.2.10 Slip, Trip, and Fall Hazards

Protection from slip, trip and fall hazards will be provided through standard safety procedures including good housekeeping. Removing equipment and debris and taking general precautions during Site operations will be standard operating procedures. Workers will be apprised of any potential trip hazards through regularly scheduled health and safety meetings. Whenever possible, trip and fall hazards will be eliminated or clearly identified with yellow “caution” tape. Impalement hazards to workers will be neutralized as soon as they are identified.

3.2.11 Overhead Utilities

Before Site activities begin, all overhead utilities will be identified and field verified. As necessary, utilities will be deactivated, or operational procedures and project logistics will be established to avoid overhead lines. This will be the responsibility of the Field Supervisor. The contractor(s) will be responsible for operation of equipment in a safe manner and follow the relevant regulations of 29 CFR 1926.952. These regulations include, but are not limited to:

- All electrical equipment shall be de-energized;
- Assume that all overhead lines are energized unless de-energized by the person owning the line or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.
- No hoisted loads shall be left unattended.

These regulations require all operating equipment to be maintained at minimum safe operating distances from overhead power transmission lines as given in 29 CFR 1926.950 (Table 4). For high-voltage transmission lines, the utility company should be contacted for proper clearance.

Table 4: Minimum Safe Working Distances (Alternating Current)

Voltage Range (phase to phase) (kilovolt)	Minimum Working and Clear Hot Stick Distance (Stick Distance)
2.1 to 15	2 feet 0 inches
15.1 to 35	2 feet 4 inches
35.1 to 46	2 feet 6 inches
46.1 to 72.5	3 feet 0 inches
72.6 to 121	3 feet 4 inches
138 to 145	3 feet 6 inches
161 to 169	3 feet 8 inches
230 to 242	5 feet 0 inches
345 to 363	7 feet 0 inches ¹
500 to 552	11 feet 0 inches
700 to 765	15 feet 0 inches

The deactivation of utilities, when necessary, should be certified by the proper utility company personnel and the certification record retained.

3.2.12 Underground Utilities

Before excavation activities begin, all utilities (i.e., electrical lines, fiber optic lines, natural gas lines, water lines, sewer lines, etc.) should be identified, marked, and deactivated as needed. Colorado 811 (<https://colorado811.org/>) must be notified for utility mapping prior to any digging or excavation. The location of field work should be adjusted to avoid active underground utilities, if possible. The deactivation of utilities, when necessary, should be certified by the proper utility company personnel and the certification record retained. Location of the utilities and any deactivation will be the responsibility of the Field Supervisor.

3.2.13 Fire Prevention

Fire extinguishers (Class ABC) shall be provided in all field vehicles and shall be available on-site. All extinguishers will be inspected, serviced, and maintained. Inspections shall be recorded on the inspection tag attached to each extinguisher.

In the event of a fire, work will cease. Small fires may be extinguished by trained site personnel. If the fire cannot be extinguished, the area will be evacuated, and the local fire response team immediately notified. Only trained, experienced fire fighters will be allowed to extinguish substantial fires at the Site. Site personnel will not attempt to fight fires, unless properly trained and equipped to do so.

3.2.14 Traffic and Vehicle Operation

Vehicle traffic will maintain a safe speed while operating on the Site. Occupants of any vehicle shall wear seatbelts at all times. Cell phones use is prohibited while the vehicle is in motion. Vehicles and equipment will be equipped with the safety procedures outlined in 30 CFR Subparts H and M and, as applicable, 29 CFR 1926.601. Precautions will be made to warn foot traffic or other vehicles as necessary.

Operating a vehicle after a full day of work or when fatigued drastically decreases focus and response time and increases the risk of being involved in a vehicle accident which could result in property damage, injury, or death. Avoid driving more than 8 hours in one workday. If the number of hours driving to/from a jobsite combined with the number of hours to be worked on the site will equal more than 14 total hours, alternate arrangements should be arranged. Workers should be aware of fatigue levels while driving and should stop to rest if feeling overly tired.

3.2.15 Coronavirus

Coronavirus disease (COVID-19) is an infectious disease caused by a novel virus (i.e., one that has not been seen before). Since being identified in Wuhan, China, the disease has spread globally resulting in a pandemic. The virus that causes COVID-19 appears to spread easily and sustainably in a community (“community spread”). It is thought that individuals are most contagious when they are symptomatic; however, it appears that the individuals may be also be contagious before they display symptoms. The virus appears to be spread primarily between persons who are in close contact (within about 6 feet) through respiratory droplets that land in the mouths or noses of people nearby or are inhaled into the lungs. It is also possible that the virus is spread by touching surfaces that have the virus and then touching one’s mouth, nose, or eyes.

Formation has developed a protocol to limit the risk of transmission of COVID-19 while engaging in necessary field work. Prior to engaging in field work the Project Manager should consult the following local and state resources to determine if there are safety guidance that should be followed or restrictions that may impact and/or prevent field work being performed:

- <https://www.cdc.gov/coronavirus/2019-ncov/index.html>
- <https://covid19.colorado.gov/>
- <https://summitcountyco.gov/1306/Coronavirus>

The best way to prevent the coronavirus disease is by avoiding exposure; however, there are indications that the virus can be transmitted by individuals who are asymptomatic (i.e., not experiencing symptoms). Sudden loss of taste and smell may indicate someone is carrying the virus while asymptomatic. The following are a list of symptoms of coronavirus disease:

- Fever
- Cough
- Shortness of breath.

Field personnel should avoid contact with individuals experiencing any of the above symptoms or who have been diagnosed as being infected with COVID-19. Additionally, field personnel should take care to practice social distancing by maintaining at least 6 feet of distance from other individuals and by the use of facemask and gloves, as practical. The state of Colorado currently has a mandate requiring all individuals to wear face masks or cloth face coverings in indoor public spaces. As of September 29, 2020, Summit County officials have implemented an order that requires a mask to be worn in all indoor public spaces, and outdoors if physical distancing of 6 feet or more is not possible. Additionally, individuals must maintain a distance of at least 6 feet when interacting with members of the public outside their immediate household. (Detailed ordinance information can be found at <https://summitcountyco.gov/1326/Public-Health-Orders-Business-Protocols>). Formation requires that all employees abide by public health orders when working at the Site. Field personnel should also do the following to protect themselves and others:

- Wash hands often with soap and water for at least 20 seconds
- If soap and water are not available, use hand sanitizer with at least 60% alcohol to disinfect hands
- Do not greet others with any form of physical contact (i.e., handshakes, hugs, etc.)
- Avoid touching one's face, eyes, mouth and nose
- Cover cough and sneeze with one's elbow
- Regularly disinfect commonly touched surfaces (e.g., vehicle interiors, steering wheel, door handles, etc.) with isopropanol (70% or greater), quaternary ammonium, hydrogen peroxide, etc. (a list of EPA-approved disinfectants for COVID-19 can be found at: <https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2>)
- Disinfect hotel/lodging rooms with above referenced disinfectants
- Personnel should shower thoroughly as soon as possible following completion of field activities
- New clothing should be daily, any re-worn clothing should be laundered using the warmest water setting
- Avoid dine-in eating (take-out only) and utilize food delivery or drive-through when possible
- Wear facemask and gloves when fueling vehicles
- Pay for fuel using the pump-based credit card machine if possible
- Disinfect hands after pumping fuel or entering stores/public spaces.

Consistent with the current national advisory, employees are required to wear face masks or other face coverings (e.g., bandana, buff, etc.) unless it has the potential to cause a health and safety hazard or can be demonstrated to not provide a benefit (e.g., when working at a significant distance from others). The use of mask decreases the risk of a potentially infected person for transmitting the virus to others. Ideally masks or face coverings should be worn when coming into close contact (within 6 feet) of others. This would include driving in a shared vehicle, when working in close proximity, or when entering businesses or other public spaces.

All Formation field personnel and contractors are required to be symptom free for 14 days prior to engaging in field work. Additionally, personnel who have been in close contact with someone who has 1) been exposed, 2) experienced symptoms within the last 14 days, and/or 3) has been diagnosed with coronavirus disease should not engage in field work until they have been asymptomatic for at least 14 days since their last contact with the individual and been verified to not be carrying the coronavirus by a medical professional. Personnel with compromised immune systems, underlying health conditions, or over the age of 60 should not engage in field work for during the current pandemic unless cleared with Formation's Corporate Health and Safety Officer.

If a Formation employee or contractor begins to experience any symptoms of coronavirus disease (loss of taste and/or smell, fever, cough, shortness of breath) they should immediately stop field work and self-isolate. Additionally, the following should be completed:

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- Individual will contact their medical provider via phone/virtual visit to determine if they need to seek immediate medical care (Formation employees can utilize the 'virtual visit' feature offered by United Healthcare
[\[https://www.uhc.com/individual-and-family/member-resources/health-care-tools/virtual-visits\]](https://www.uhc.com/individual-and-family/member-resources/health-care-tools/virtual-visits))
- Individual will notify the Field-Team Lead
- Field-Team Lead will immediately notify the Project Manager
- Project Manager will immediately notify:
 - Managing Partners
 - Client representative
 - Local/county health authorities
 - Lodging management where field team is staying
- Field-Team lead will communicate (via phone) with individual to determine what they require immediately (i.e., food, medicine, etc.) and get them supplies
- Field-Team Lead will inquire if they need help communicating with their immediate family
- Field-Team Lead will notify the hotel/lodging about field member
- Field-Team Lead should frequently (at least twice per day) check in with the individual to make sure:
 - Their situation/symptoms have not changed/become worse
 - That they are comfortable
 - That they have what they need
- Partners, Project Manager, and Field-Team lead will develop a plan to:
 - Determine if other team members need to self-isolate
 - Support individual until they can be safely demobilized
 - Safely demobilize the individual.

If a Formation employee is asked to participate in fieldwork that is deemed essential, a written letter, specific to the employee (i.e. the letter will include the name of the employee for specific permission), will be drafted and made available to the employee. The employee will keep this letter on hand in case he or she is questioned by law enforcement.

3.3 Chemical Hazards

Results from previous sampling performed at the Site indicate that contaminant hazards may be encountered at the Site during field activities. In general, chemical substances in gaseous, liquid, or solid form can enter the unprotected worker by inhalation, skin absorption, ingestion, or through a puncture wound (injection). A contaminant can cause damage at the point of contact or can act systemically in different parts of the body.

In general, chemical exposure by inhalation is a concern since the lungs are extremely vulnerable to chemical agents. In addition, substances can pass through lung tissue into the

bloodstream and onto other susceptible areas of the body. Since some toxic chemicals are not detectable by human senses, their toxic effects may not produce any immediate symptoms. Respiratory protection is therefore extremely important if there is a possibility that the worksite atmosphere may contain such hazardous substances.

The skin and eyes also represent important routes of exposure. Some chemicals directly affect the skin, while others may pass through the skin into the bloodstream where they can be transported to other vulnerable organs. Skin absorption is enhanced by abrasions, cuts, heat, and moisture. The eye is particularly vulnerable because airborne chemicals can dissolve on its moist surface and be carried to the rest of the body via capillaries located very close to the surface of the eye. Protection against skin and eye contact may be provided by:

- Wearing protective equipment (i.e., Tyvek coverall suits);
- Wearing protective safety glasses or goggles;
- Avoiding the use of contact lenses in contaminated atmospheres since they may trap chemicals against the eye surface;
- Keeping hands away from the face; and
- Minimizing contact with liquid and solid chemicals.

Inadvertent ingestion can occur as a result of personal habits such as chewing gum or tobacco, drinking, eating, smoking cigarettes, and applying cosmetics. These practices may provide a route of entry for chemicals and are restricted.

Potential chemical hazards related to field sampling activities are relatively minor. The data collection activities will include sampling of surface water, groundwater, soil, and vegetation (possibly) that may contain elevated concentrations of metals, salts, and other chemicals. Hazards can be minimized through practicing good hygiene and through protection from PPE. For example, protection against skin and eye contact may be provided by:

- Wearing protective equipment (i.e., nitrile or latex gloves);
- Wearing protective safety glasses or goggles;
- Keeping hands away from the face; and
- Minimizing contact with liquid and solid chemicals.

Inadvertent ingestion can occur as a result of personal habits such as chewing gum or tobacco, drinking, eating, smoking cigarettes, and applying cosmetics. These practices may provide a route of entry for chemicals.

The primary chemical hazards at the Site are metals in soil, sediment, and surface water. Concentrations of some contaminants have been reported at levels which may be hazardous to human health per EPA standards. Metals which have been detected in laboratory analyses

above background concentrations include aluminum, antimony, arsenic, cadmium, cobalt, copper, iron, lead manganese, mercury, gold, thallium, and zinc.

Other contaminants may be encountered during the course of the Site activities. If unusual odors or conditions are encountered, personnel should suspend work activities and contact the Field Supervisor for guidance before proceeding.

4.0 PERSONAL PROTECTIVE EQUIPMENT

4.1 Personal Protective Equipment Levels

The following sections describe the various levels of personal protection for field work at the Site. Workers engaged in field work, including support workers (i.e., supervisors, observers, etc.) will wear modified Level D protection.

The level of personal protection worn by field personnel will be defined, controlled, and implemented by the Field Supervisor. Protection may be upgraded or downgraded by the Project Manager, as deemed necessary throughout the project. Required PPE items include the following: hardhats, hard-toed boots, safety glasses, and hearing protection (when needed). Recommended safety items to be maintained in each vehicle include, but are not limited to: chock blocks, cones, spill kit, fire extinguisher, and first aid kit. Other PPE and safety items may be required depending on conditions and safety procedures.

4.1.1 Modified Level D Personal Protection

Modified Level D personal protective equipment may include the following:

- Blue jeans or natural fiber pants;
- Work gloves (disposable nitrile or cotton, depending on task);
- Approved NIOSH safety hard-toe work boots (conforming to ANSI Standard Z 41.1);
- Hard hat (conforming to ANSI Standard Z 89.1);
- Safety glasses or sunglasses (conforming to ANSI Standard Z 87.1);
- High-visibility vest;
- Hearing protection (when excessive noise greater than 85 decibels is present); and
- Disposable Tyvek coveralls, if appropriate (exchanged when heavily soiled or after breaks, at least once per work day)
- Long hair restrained; and
- No loose-fitting clothing, dangling earrings, necklaces or other jewelry.

5.0 DECONTAMINATION PROCEDURES

Decontamination and maintenance of personal protective equipment is required for proper functioning of the equipment. At a minimum, nitrile gloves and Tyvek coveralls shall be replaced daily or after breaks; if they become damaged, they shall be replaced immediately.

The decontamination areas will be established prior to initiation of field activities, and the exact decontamination procedures will be established at that time based on field conditions, space considerations, etc. In general, dry equipment doffing procedures will be used (i.e., protective equipment will be removed and containerized without water washing). Equipment should be cleaned of gross amounts of soil by brush or scraper before leaving the site. Staff should always wash hands before eating and drinking, and at the end of the workday.

6.0 EMERGENCY RESPONSE

6.1 Emergency Coordinators and Contacts

Table 5: Emergency Contacts

Emergency Assistance Agency	Phone Number
Police, Fire or Ambulance Emergency	911
Poison Control Center	800-222-1222
Breckenridge Police Department	970-453-2941
Red, White and Blue Fire Protection District	970-453-2474
Summit County Sherriff's Office	970-453-2232
St. Anthony Breckenridge Mountain Clinic	970-453-1010

6.2 Emergency Procedures

Table 6: Emergency Procedures

<i>Emergency Communication</i>	Communication will be maintained among all field personnel at all times using line of sight, cell phones and/or walkie-talkies. In addition, an emergency may be signaled by three sustained blasts of the car horn. Field personnel will be notified of the emergency and required actions.
<i>Assembly Area Location</i>	For each work site, an emergency muster point will be established. In the event of an emergency, all field personnel will respond to the person signaling the emergency or gather at the designated muster point, depending on the nature of the emergency. If evacuation is required, all personnel will drive from the site in an orderly fashion to the assembly area, which should be designated during the tailgate safety meeting. At this location personnel will assess the need for further action.
<i>Evacuation Procedures</i>	<p>During an evacuation, personnel will turn off generators or operating equipment that can be quickly turned off, leave their equipment and proceed immediately in an orderly fashion to the field vehicles and then to the assembly area. Headcounts will be taken at the field vehicles and/or at the assembly area. If personnel are not accounted for, the Emergency Coordinator will notify emergency services and first responders.</p> <p>Evacuation shall take place in an orderly fashion along existing dirt roads, if possible. In the event of fire, drive in a direction away from the fire.</p> <p>Personnel will wait in the assembly area for further instructions or until they are advised they can return to work.</p>

6.3 Locations of Emergency Centers

The field work areas are located southeast of Breckenridge, Colorado. The emergency facility nearest to the Site is St. Anthony Breckenridge Mountain Clinic. Driving directions are provided from Boreas Pass Road and Illinois Gulch Road to this facility.

<i>Hospital Name and Address</i>	St. Anthony Summit Medical Center, 340 Peak One Drive, Frisco, Colorado 80433 970-668-3300
<i>Driving Directions from Boreas Pass Road and Illinois Gulch Road Intersection to St. Anthony Summit Medical Center</i>	<ol style="list-style-type: none">1. Head southwest on Boreas Pass Road (1.1 miles).2. Turn right on South French Street (1 miles).3. Turn right on North Main Street (0.3 miles).4. Follow Colorado Highway 9N to Peak One Drive in Frisco (7 miles).5. Turn left onto Peak One Drive (0.4 miles).6. Take first left (75 feet)7. Take first right (367 feet)8. Destination is on right. <p>Total Distance: 9.7 miles Estimated Driving Time: 17 minutes</p>



Figure 2. Directions to Nearest Emergency Facility.

6.4 Emergency Equipment Locations

The following emergency supplies and equipment will be available at the Site.

Table 7: Emergency Equipment Locations

Equipment	Quantity and Location
Cell Phone	One in each field vehicle and at the work area
First Aid Kit	One carried by each field crew and one in each vehicle when mobilizing to a work location. First aid kits will be stored and maintained at the Boulder office.
Fire Extinguisher (10-pound, Type A, B, C)	One in each field vehicle.

6.5 Fire

Limited fires may be extinguished by trained field personnel using water or fire extinguishers. In the event of fire or explosion, personnel should contact the local fire department immediately by dialing 9-1-1. When representatives of the fire department arrive, the Site Emergency Coordinator, or designated representative, should be available to advise the commanding fire officer of the location of the fire and the nature and location of any hazardous materials associated with Formation work at the site.

6.6 Injury and First Aid

If an incident or injury occurs, work will be temporarily halted until an assessment can be made of whether it is safe to continue work. The Site Safety Officer will make the decision regarding the safety of continuing work. The Site Safety Officer will conduct an investigation to determine the cause of the incident and steps to be taken to prevent recurrence in accordance with Formation requirements. In the event of an injury, the extent and nature of the victim's injuries will be assessed and first aid rendered as appropriate. If necessary, the individual may be transported to a nearby hospital. The mode of transportation and the eventual destination will be based on the nature and extent of the injury, and, if emergency services are contacted, consultation with emergency medical personnel. The Site Safety Officer must accompany the injured personnel and provide information to medical personnel as requested. In the event of a life-threatening emergency, the injured person will be given immediate first aid and emergency medical services will be contacted by dialing 911. The individual rendering first aid will follow directions given by emergency medical personnel via telephone. A person certified in first

aid/cardiopulmonary resuscitation (CPR) techniques will be present at all times during field activities. Table 8 shows treatment for common illness/injury that might occur.

Table 8: Injury Response Procedures

Type of Injury	Action Required
Heat stress	Cool the body by applying a wet cloth around the neck and move the person to a cooler environment for rest as soon as possible. Provide fluids and apply additional water for cooling as needed. Assess the severity of the heat exposure and demobilize the person, transport them to a medical facility for evaluation, or contact emergency services as appropriate.
Leg injury – e.g., twisted or broken leg or ankle	Render first aid as needed. Provide assistance to move the person to the field vehicle. Remove weight from the injured limb. If necessary, drive the field vehicle to the person to pick them up. Transport to a medical facility or contact emergency services as appropriate.
Head injury	Evaluate for potential neck injury. If potential for neck injury is suspected, do not attempt to move the person and immobilize the neck and head until emergency response personnel arrive. Control bleeding. Transport to a medical facility or contact emergency services as appropriate.
Puncture wound, contusion or laceration	Render first aid as needed. Control bleeding. If necessary, drive the field vehicle to the person to pick them up. Transport to a medical facility or contact emergency services as appropriate.

7.0 SAFETY TRAINING

Employees of Formation and their subcontractors will not participate in field activities unless they have been trained to the level required by their job function and responsibility. The specific types of training required vary with project activity. Table 9 describes the safety-related training will be required for participation in this project.

All personnel performing work must have received the Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training (29 CFR 1910.120). HAZWOPER training certificates will be maintained by the Health and Safety Officer. Those personnel must be involved in the communication and understanding of potential chemical hazards through a Hazard Communication Program in accordance with the provisions of the OSHA Regulations 29 CFR 1910.120.

Table 9: Required Safety Training

Worker Category	Assigned Individuals	Required Training
All site workers	Training conducted by Site Safety Officer	<ul style="list-style-type: none"> • Review of and familiarity with HASP and emergency response procedures; • Participation in project kickoff or induction meeting; • Participation in daily tailgate safety meetings for every day on site; and. • Familiarity with SDS for any chemicals handled during the work.

All employees of Formation will receive a copy of the HASP. They will agree to read the HASP and comply with all the health and safety requirements contained therein. All employees of Formation will sign a Safety Compliance Agreement Form, acknowledging that they have received a copy of the HASP and have read and agree to comply with the HASP. The Safety Compliance Agreement Form is included as HASP Attachment 4.

7.1.1 Safety Meetings

7.1.1.1 Daily Tailgate Meeting

Daily safety meetings will be held each morning and documented on separate field safety meeting forms included in Attachment 5. Impromptu safety meetings will be held if

unanticipated hazards are encountered or personnel require clarification on safe work procedures. Topics for discussion may include, but are not limited to:

- Discussion of current work activities and associated Job Safety Analyses for various major project tasks;
- Review of available analytical or relevant process data which relates to worker exposure;
- Review of the type and frequency of environmental and personal monitoring (if any) to be performed;
- Task-specific levels of protection and anticipated potential for upgrading;
- Identification of the closest hospital and review of the fastest route to the hospital;
- Identification of an assembly area location;
- Identification of an area to meet emergency responders;
- Review of emergency procedures; and
- Review of existing or new health and safety issue.

7.2 Fit for Duty

The Site Safety Officer has the responsibility to ensure that each individual signing the Tailgate Safety Meeting Form is fit for duty. Consumption of alcohol, use of illegal or controlled substances or certain prescription or over-the-counter medicines, altered mental state, personal injury, or fatigue can affect the fitness of an individual and interfere with the legitimate business interests of Formation at the Site. Any individual found to be unfit for duty will be prevented from entering/working at the Site for the duration of the project. The Site Safety Officer will complete a Loss/Near Loss Investigation Report Form for any individual that is found to be unfit for duty and inform the PM of the incident. Contractors who have personnel unfit for duty will be notified and provided with the opportunity to replace the impaired individuals at the Site.

8.0 HEALTH AND SAFETY PLAN REFERENCES

Formation Environmental, LLC., January 2018. Formation Environmental, LLC Health and Safety Program.

**ATTACHMENT 1
HASP ADDENDA**

**ATTACHMENT 1
HASP ADDENDA**

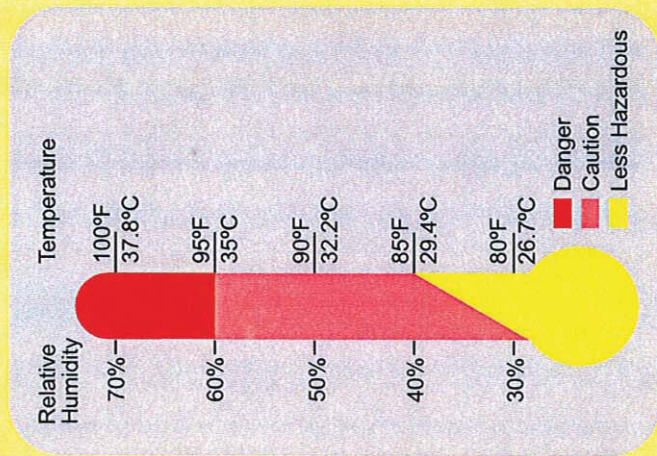
ATTACHMENT 2
HEAT STRESS EDUCATION POSTER



The Heat Equation

HIGH TEMPERATURE + HIGH HUMIDITY
+ PHYSICAL WORK = HEAT ILLNESS

When the body is unable to cool itself through sweating, **serious** heat illnesses may occur. The most severe heat-induced illnesses are heat exhaustion and heat stroke. If left untreated, **heat exhaustion** could progress to **heat stroke** and possible **death**.



Heat Exhaustion

What are the symptoms?

HEADACHES; DIZZINESS OR LIGHTEADEDNESS; WEAKNESS; MOOD CHANGES SUCH AS IRRITABILITY, CONFUSION, OR THE INABILITY TO THINK STRAIGHT; UPSET STOMACH; VOMITING; DECREASED OR DARK-COLORED URINE; FAINTING OR PASSING OUT; AND PALE, CLAMMY SKIN

What should you do?

- Act immediately. If not treated, heat exhaustion may advance to heat stroke or death.
- Move the victim to a cool, shaded area to rest. Don't leave the person alone. If symptoms include dizziness or lightheadedness, lay the victim on his or her back and raise the legs 6 to 8 inches. If symptoms include nausea or upset stomach, lay the victim on his or her side.
- Loosen and remove any heavy clothing.
- Have the person drink cool water (about a cup every 15 minutes) unless sick to the stomach.
- Cool the person's body by fanning and spraying with a cool mist of water or applying a wet cloth to the person's skin.
- Call 911 for emergency help if the person does not feel better in a few minutes.

Heat Stroke—A Medical Emergency

What are the symptoms?

DRY, PALE SKIN WITH NO SWEATING; HOT, RED SKIN THAT LOOKS SUNBURNED; MOOD CHANGES SUCH AS IRRITABILITY, CONFUSION, OR THE INABILITY TO THINK STRAIGHT; SEIZURES OR FITS; AND UNCONSCIOUSNESS WITH NO RESPONSE

What should you do?

- Call 911 for emergency help immediately.
- Move the victim to a cool, shaded area. Don't leave the person alone. Lay the victim on his or her back. Move any nearby objects away from the person if symptoms include seizures or fits. If symptoms include nausea or upset stomach, lay the victim on his or her side.
- Loosen and remove any heavy clothing.
- Have the person drink cool water (about a cup every 15 minutes) if alert enough to drink something, unless sick to the stomach.
- Cool the person's body by fanning and spraying with a cool mist of water or wiping the victim with a wet cloth or covering him or her with a wet sheet.
- Place ice packs under the armpits and groin area.

How can you protect yourself and your coworkers?

- Learn the signs and symptoms of heat-induced illnesses and how to respond.
- Train your workforce about heat-induced illnesses.
- Perform the heaviest work during the coolest part of the day.
- Build up tolerance to the heat and the work activity slowly. This usually takes about 2 weeks.
- Use the buddy system, with people working in pairs.
- Drink plenty of cool water, about a cup every 15 to 20 minutes.
- Wear light, loose-fitting, breathable clothing, such as cotton.
- Take frequent, short breaks in cool, shaded areas to allow the body to cool down.
- Avoid eating large meals before working in hot environments.
- Avoid alcohol or beverages with caffeine. These make the body lose water and increase the risk for heat illnesses.

What factors put you at increased risk?

- Taking certain medications. Check with your health-care provider or pharmacist to see if any medicines you are taking affect you when working in hot environments.
- Having a previous heat-induced illness.
- Wearing personal protective equipment such as a respirator or protective suit.

**ATTACHMENT 3
WIND CHILL CHART**

Wind Chill Factor

Actual air temperature °F

calm

40

30

20

10

0

-10

-20

-30

-40

Apparent temperature

Wind speed (mph)

10

34

21

9

-4

-16

-28

-41

-53

-66

20

30

17

4

-9

-22

-35

-48

-61

-74

30

28

15

1

-12

-26

-39

-53

-67

-80

40

27

13

-1

-15

-29

-43

-57

-71

-84

50

26

12

-3

-17

-31

-45

-60

-74

-88

60

25

10

-4

-19

-33

-48

-62

-76

-91

Frostbite times:



30
minutes



10
minutes



5
minutes

ATTACHMENT 4
SAFETY COMPLIANCE AGREEMENT FORM

SAFETY COMPLIANCE AGREEMENT FORM

Formation Environmental LLC

Personnel Form

PROJECT TITLE: Illinois Gulch Site Time Critical Removal Action

PROJECT NUMBER: 067-001

PROJECT TASK:

I have received a copy of the Site Health and Safety Plan (the "HASP") for the above referenced project. I have read the HASP and agree to comply with all the health and safety requirements contained therein. I understand that I may be prohibited from working on the project for violating any of the HASP requirements.

SIGNATURE: _____ **DATE:** _____

NOTE: This form must be submitted to the Field Supervisor and filed in the project files prior to beginning work onsite.

ATTACHMENT 5
DAILY TAILGATE SAFETY MEETING FORM

DAILY SAFETY MEETING ATTENDANCE FORM
Formation Environmental

Project Name: _____

Date: _____ Time: _____

Project Number: _____

Presented by: _____

Check the Topics/Information Reviewed:

- | | | |
|---|---|---|
| <input type="checkbox"/> Safety glasses, hard hat, safety boots | <input type="checkbox"/> Slips, trips, and falls | <input type="checkbox"/> Daily work scope |
| <input type="checkbox"/> Site safety plan review and location | <input type="checkbox"/> Directions to hospital/first aid | <input type="checkbox"/> Emergency protocol |
| <input type="checkbox"/> Equipment and machinery familiarization | <input type="checkbox"/> Anticipated visitors | <input type="checkbox"/> Parking and lay down |
| <input type="checkbox"/> Employee Right-To-Know/MSDS | <input type="checkbox"/> Electrical ground fault | <input type="checkbox"/> Hot work permits |
| <input type="checkbox"/> Site hazards, open pits, and excavations | <input type="checkbox"/> Public safety and fences | <input type="checkbox"/> Strains and sprains |
| <input type="checkbox"/> Vehicle safety and driving/road conditions | <input type="checkbox"/> Caution around heavy equip | <input type="checkbox"/> Noise hazards |
| <input type="checkbox"/> Portable tool safety and awareness | <input type="checkbox"/> Orderly site and housekeeping | <input type="checkbox"/> No horseplay |
| <input type="checkbox"/> Overhead utility locations and clearance | <input type="checkbox"/> Smoking in designated areas | <input type="checkbox"/> Heat and cold stress |
| <input type="checkbox"/> First aid, safety, and PPE location | <input type="checkbox"/> Leather gloves for protection | <input type="checkbox"/> Backing up hazards |
| <input type="checkbox"/> Sharp object, rebar, and scrap metal hazards | <input type="checkbox"/> Effects of the night before | <input type="checkbox"/> Accidents are costly |
| <input type="checkbox"/> Safety is everyone's responsibility | <input type="checkbox"/> Vibration related injuries | <input type="checkbox"/> Dust/vapor control |
| <input type="checkbox"/> Inner gloves/outer gloves | <input type="checkbox"/> Fire extinguisher locations | <input type="checkbox"/> Refueling procedures |
| <input type="checkbox"/> Eye wash station locations | <input type="checkbox"/> confined space entry | |
| <input type="checkbox"/> Decontamination procedures | <input type="checkbox"/> Safety Is No Accident | |
| <input type="checkbox"/> Location and operation of kill switch | | |

Discussion/Comments/Follow-up Actions:

NAME	SIGNATURE	COMPANY

Instructions:

- Conduct a daily safety meeting prior to beginning each day's site activities.
- Complete form, obtain signatures, and file with the Daily Summary.
- Follow-up on any noted items and document resolution of any action items.