



**MEETING OF THE BOARD OF COUNTY COMMISSIONERS
BOULDER COUNTY
AGENDA**

Tuesday, July 2, 2024, 9:30 a.m.

Tuesday, July 2, 2024, 1:00 p.m.

Third Floor Hearing Room

County Court House

1325 Pearl Street, Boulder

This agenda is subject to change. Please call ahead to confirm an item of interest (303-441-3500). In-person meetings are held in the Third Floor Hearing Room, County Courthouse, 1325 Pearl Street, Boulder. Public comments are taken at meetings designated as Public Hearings. Meetings and hearings on this agenda are open to the public.

For special assistance, contact our ADA Coordinator (303-441-3525) at least 72 hours in advance.

To view a two-week forecast agenda of the commissioners' schedule, visit the Commissioners' [Advance Agenda](#).

All commissioners' public hearings and meetings will now be offered in a hybrid format where attendees can join through Zoom or in-person at the Boulder County Courthouse, 3rd Floor, 1325 Pearl Street, Boulder. To sign up for in-person public comment, please use the link in this agenda for each respective hearing. There will also be a kiosk located in the lobby of the 3rd Floor to sign up for in-person public comment. For questions regarding in-person hearings call 303-441-3500.

Pages

1. Call to Order
2. 9:30 a.m. Business Meeting
 - [Virtual Attendee Link](#)
 - Call-in information: 1-833-568-8864, Webinar ID: 160 599 0917
 - Registration Required
 - [In-Person Comment Registration Link](#)
3. Commissioners' Consent Items
 - 3.a [Community Planning & Permitting - 201382 Muller Engineering Company Inc. Amendment \(\\$1,388,939\)](#)

Amendment to adjust scope of work and add contract funds. Original contract for final design of the CO 52 Bike Path Extension, CO 119 Underpass near 2nd Avenue in Niwot, and Bike Path Connection across BNSF railroad at Ogallala Rd.; Preliminary and final design of the 63rd Street Overpass and Fourmile Canyon Creek Redesign; CMGC coordination, meetings, and design modifications; and Engineering support during construction.

- **Staff Contact:** Stacey Proctor, Community Planning & Permitting

3.b County Attorney's Office - Resolution 2024-044 (LU-24-0004: Tuck ADU and Agricultural Structures) 11

Resolution 2024-044, conditionally approving Boulder County Community Planning & Permitting Docket LU-24-0004: Tuck ADU and Agricultural Structures.

3.c Human Services - 2024-25 Funding Agreement with Imagine! (\$2,529,478.75) 20

This Funding Agreement was awarded through an RFA process to increase programs that will sustain or increase the availability and access to community social activities, community recreational opportunities and direct services supports for persons living with Intellectual and Developmental Disabilities (IDD), Autism, and/or Brain Injury (BI).

3.d Human Services - Funding Agreement with A&I Avenues (\$1,511,473) 44

This Funding Agreement supports Case Management Agency (CMA) functions under the health and well-being pillar, and more specifically, ensures Boulder County residents with an Intellectual and Developmental Disability (IDD)/Developmental Disability (DD), Autism, and/or Brain Injury (BI) has (have) access to information and referral and independent living skills training. This Contract will also support access to crisis management services to mitigate emergencies, emergency placements, and unmet needs for persons with IDD/DD, Autism and/or BI that results in a disability. The Parties further acknowledge Recipient provides a continuum of services to persons experiencing an IDD/DD, Autism, and/or BI that results in a disability which may limit their ability to live an independent life in Boulder County.

3.e Parks & Open Space - Prince Lake No 1 Dam Rehabilitation Project IGA with Town of Erie 74

Boulder County proposes to enter into an Intergovernmental Agreement with Town of Erie related to the rehabilitation of Prince Lake No.1 Reservoir and dam which is owned by the County.

- **Staff Contact:** Obadiah Broughton, Parks & Open Space

3.f Parks & Open Space - Sunny Belle Purchase Agreement 79

The purchase of the Sunny Belle property was approved by the BOCC at the June 11, 2024 public hearing. The Purchase Agreement formalizes the intent to purchase and is needed for the closing.

- **Staff Contact:** Tina Burghardt, Parks and Open Space

3.g	<u>Public Works - Award Recommendation SOQ-062-24 - Asphalt/Paving Continuing Services (NTE \$1,000,000.00)</u>	95
	<p>The evaluation committee recommends awarding SOQ-062-24, Asphalt/Paving Continuing Services, to both vendors who submitted a proposal: Brannan Sand and Gravel Company, LLC and EVH Enterprises, LLC. An additional procurement will be issued in July to attempt to find more shortlisted vendors for these services. Not to exceed: \$1,000,000.00 per year.</p> <ul style="list-style-type: none"> • Staff Contact: Anthony Amaya, Public Works 	
4.	Commissioners' Discussion Items	
4.a	<u>Commissioners' Office - Emergency Services Grant Program Advisory Committee Funding Recommendations: Spring 2024 Funding for Search & Rescue and Recreation/Trail Safety Service Providers in Boulder County</u>	97
	<p>The Emergency Services Grant Program Advisory Committee (ESGPAC) has recommended allocating \$721,703.39 in funding for eight search and rescue and recreation/trail safety service providers in Boulder County. This funding is part of the second grant round of the Emergency Services Ballot Measure (ESBM) approved in 2022. Seventeen proposals totaling \$1,330,097.46 were evaluated, with recommendations based on criteria such as the impact on emergency response and public safety. The proposed funding will support various projects, including communication upgrades, safety equipment, and training initiatives for organizations like Boulder Emergency Squad and Rocky Mountain Rescue Group.</p> <ul style="list-style-type: none"> • Presenter(s): Barb Halpin, Commissioners' Office (In Person) • Action Requested: Decision 	
4.b	<u>Commissioners' Office - Resolution 2024-049: Setting the Days and Hours for County Seat</u>	101
	<ul style="list-style-type: none"> • Presenter(s): Natalie Springett, Commissioners' Office • Action Requested: Decision 	
4.c	<u>County Attorney's Office - Garland v VanDerStok - Amicus Brief Supporting the Federal Gun Control Act</u>	103
	<p>Requesting ratification of Boulder County's participation in an amicus brief, to be filed on July 2 in <i>Garland v. VanDerStok</i> (No. 23-852), a Supreme Court case involving ghost guns and the scope of the federal Gun Control Act.</p> <p>As background, ghost guns are partially complete firearm frames and/or receivers that can be purchased online without a background check and quickly assembled into a fully functional, untraceable firearm. The question presented in <i>VanDerStok</i> is whether a recent ATF regulation—which clarifies that ghost guns are “firearms” for purposes of the Gun Control Act, meaning they are subject to existing rules and regulations related to background checks, serialization, record-keeping, licensing requirements, and the like—is consistent with the federal Gun</p>	

Control Act. The amicus brief focuses on the importance of the regulation, in light of the significant public safety threat ghost guns pose to our communities.

- **Presenter:** David Hughes, County Attorney Office (In Person)
- **Action Requested:** Ratification

4.d County Attorney's Office - National Opioid Settlement of Kroger Co. 155

Requesting approval for participation in a nationwide settlement agreement that would resolve the legal claims of states and local political subdivisions against regional supermarket pharmacy Kroger Co. related to alleged misconduct related to opioids.

- **Presenter:** David Hughes, County Attorney Office (In Person)
- **Action Requested:** Approval

4.e Human Resources - New Full-Time Employees for Community Planning and Permitting and Parks & Open Space (\$237,214) 159

Parks & Open Space and Community Planning and Permitting are requesting two (2) new FTEs for a Water Resources Maintenance and Fuels Mitigation Specialist (POS) and a Wildfire Mitigation Specialist (CPP). The Water Resources Maintenance and Fuels Mitigation Specialist (POS) coordinates maintenance and mitigation activities for water resources infrastructure and irrigation ditches, collaborates with various stakeholders, and oversees contractors and field crews, while also extending efforts to private lands and conducting outreach under the supervision of the Water Program Supervisor. The Wildfire Mitigation Specialist (CPP) is primarily a field position with Wildfire Partners responsible for regulatory and voluntary Home Ignition Zone assessments, inspections and field visits with homeowners, and support for community mitigation efforts. These positions will be funded by the Wildfire Mitigation Tax (150) at a cost of \$237,214.

- **Presenter(s):** Joseph Magoffe, Human Resources (Virtual); Jim Webster, Community Planning and Permitting (In Person)
- **Action Requested:** Decision

4.f Parks & Open Space - Bid Waiver Request for WSP USA Inc (\$397,916) 163

Boulder County Bid Waiver request for the Procurement process in favor of WSP USA Inc in the amount not to exceed \$397,916 for IRFP NO 4080-24; Boulder County Cardinal Mill Water Treatment System Design and Installation Project.

- **Presenter:** Sharla Benjamin, Parks and Open Space (In-Person)
- **Action Requested:** Decision

5. Confirmation of Executive Session Topics

Confirming Executive Session topics noticed at the June 26th, 2024, Regular Meeting were discussed as scheduled.

- **Action Requested:** Note for the Record
- **Presenter(s):** Natalie Springett, Commissioners' Office (In Person)

6. Authorization for Executive Session

Authorization for the Board of County Commissioners to go into Executive Session for Legal Advice at 11 a.m. on Wednesday, July 3rd, 2023 at 11 a.m. with Ben Pearlman, County Attorney.

- **Action Requested:** Decision

7. Scheduling & Communications

7.a [CANCELLED] Docket EP-24-0002: Hennigh Taylor Exemption Plat

The Community Planning & Permitting Department Docket EP-24-0002: Hennigh Taylor Exemption Plat scheduled for a public hearing on Today, July 2, 2024 at 9:30 a.m., after this Business Meeting, has been cancelled. The application is being reviewed administratively.

- **Action Requested:** Note for the Record
- **Presenter(s):** Matt Ramos, Commissioners' Office (In Person)

8. 1:00 p.m. Public Comment Session and Public Hearing on Marshall Mesa Mitigation and Trailhead Earthwork

- **Virtual Attendee Link**
- **Call-in information:** 1-833-568-8864, Webinar ID: 161 247 7768
- **Registration Required**
- **In-Person Comment Registration Link**

8.a General Public Comment Session

Commissioners' Office: This meeting will be for the purpose of taking public comment for any matter not being discussed in another current public hearing process. Each speaker (up to 10 people) will be able to give public comment to the commissioners for 3 minutes each. No pooled speaking is available for this meeting. Participants will not be able to screen-share but can bring printed materials in person. Opportunity for live virtual and in-person public comment will be available, and written comments can be emailed to the commissioners.

- **Action Requested:** Public Testimony – No Action Taken.
- **Staff Contact:** Brianna Barber, Commissioners' Office
- **Location:** Hybrid (Hearing Room and Zoom Webinar)

8.b Public Hearing for Community Planning & Permitting Docket LU-24-0009: Marshall Mesa Mitigation and Trailhead Earthwork

168

Limited Impact Special Use Review to permit 364,000 cubic yards of earthwork for subsurface coal fire mitigation and redevelopment of the Marshall Mesa trailhead. The application is submitted by City of Boulder, c/o Adam Gaylord (owner/applicant). The subject property is in the Business (B) and Agricultural (A) zoning districts at 1842 S. Foothills Highway, at the southeast corner of the intersection of SH 170 and SH93 in Section 21, Township 1S, Range 70W.

- **Presenter(s):** Sam Walker, Community Planning & Permitting (In Person)
- **Action Requested:** Decision

BOCC CONTRACT AMENDMENT

AMENDMENT SUMMARY	
This amendment makes changes to the following terms:	
<input checked="" type="checkbox"/> Contract Amount <input type="checkbox"/> Contract Dates <input checked="" type="checkbox"/> Scope of Work	
Amendment	
Amendment Number	7
Contract Identification from Original Contract	
Vendor Legal Name	Muller Engineering Company, Inc.
Vendor Contact Name	Matthew Andrews
Vendor Contact Email	mandrews@mullereng.com
Office or Department	Community Planning and Permitting
Division /Program	Transportation Planning
Oracle Contract Number	201382 Version Number 8
Contract Amount	
<u>Not to Exceed</u> Amount of current contract, including all amendments	\$ 3,576,517.00
Amendment Amount	\$ 1,388,939.00
New Cumulative <u>Not to Exceed</u> Amount	\$ 4,965,456.00
Contract Dates	
Amendment Effective Date	
New End Date	
Scope of Work	
Does this amendment remove any portion of the current scope of work?	Yes
Does this amendment add new requirements to the scope of work?	Yes
Are the fees and rates listed on the previous schedule changing?	Yes
<i>Changes to the scope of work require a insurance requirements review. Is an updated insurance review attached as Exhibit A?</i>	Yes
<p>Scope of Work Changes: Describe the changes to scope of work in this box and, if needed, attach an Exhibit B with the details of the changes to the scope of work, including updated fee and rate sheets, if applicable:</p> <p>Scope of work has been expanded to include final design of the CO 52 Bike Path Extension, CO 119 Underpass near 2nd Avenue in Niwot, and Bike Path Connection across BNSF railroad at Ogallala Rd.; Preliminary and final design of the 63rd Street Overpass and Fourmile Canyon Creek Redesign; CMGC coordination, meetings, and design modifications; and Engineering support during construction.</p>	

Approved for use October 2023

All changes and modification request must be reviewed by the Boulder County Attorney's Office

Additional Contract Documents	
Check all that apply:	
<input type="checkbox"/> Exhibit A: Insurance Requirements <input checked="" type="checkbox"/> Exhibit B: Scope of Work and Fee Schedule <input type="checkbox"/> Exhibit C: Boulder County Data and Cyber Security Requirements (not required if previously included) <input type="checkbox"/> Exhibit D: _____ <input type="checkbox"/> Exhibit E: _____ <input type="checkbox"/> Exhibit F: _____	
County Internal Use Only	
Purchasing Details	
Project #	7173-21
Does this amendment change the purchasing process the contract must follow due to an increase in amount or timeframe?	No
Bid Process Used	Bid Number Provided (award info attached in supporting documents)
Is a new bid waiver required on this contract?	No
Accounting Details	

This AMENDMENT (“Amendment”) to the above-referenced Original Contract (“Contract”) is entered into between the Board of County Commissioners of Boulder County on behalf of the County of Boulder, State of Colorado, a body corporate and politic, for the benefit of Community Planning and Permitting _____ (“County”) and Muller Engineering Company, Inc. _____ (“Contractor” or “Vendor”).

1. INCORPORATION OF AMENDMENT SUMMARY

The **Amendment Summary** and **Additional Contract Documents**, if any are listed, are incorporated into the Contract by reference.

2. EFFECTIVE DATE AND ENFORCEABILITY

This Amendment is effective and enforceable on the later of (a) the date it is fully executed by both parties or (b) the **Amendment Effective Date** (if any).

Approved for use October 2023

All changes and modification request must be reviewed by the Boulder County Attorney’s Office

3. LIMITS OF EFFECT

The Contract and all prior amendments, if any, remain in full force and effect except as specifically modified by this Amendment.

4. MODIFICATIONS

The Contract Documents are updated to include any Additional Contract Documents where the corresponding box is checked above.

The Contract is also modified to the extent that a corresponding box is checked below:

Contract Term. The term of the Contract is extended through the New End Date identified in the Amendment Summary.

Contract Amount. The Contract Amount is amended to include the Amendment Amount identified in the Amendment Summary. The total cost of all work performed is not to exceed the **New Cumulative Not to Exceed Amount** identified in the Amendment Summary.

Scope of Work. The Scope of Work is amended as indicated under Scope of Work Changes in the Amendment Summary and Exhibit B if indicated and new insurance requirements, if any, are identified in Exhibit A to this Amendment.

[SIGNATURE PAGE TO FOLLOW]

IN WITNESS WHEREOF, the Parties have executed and entered into this Amendment as of the latter day and year indicated below.

SIGNED for and on behalf of Board of County Commissioners of Boulder County	SIGNED for and on behalf of Muller Engineering Company, Inc.
Signature:	Signature:
Name:	Name:
Title:	Title:
Date:	Date:
↓↓ <i>For Board-signed documents only</i> ↓↓	
Attest Signature:	<i>Initial of EO/DH</i>
Attestor Name:	
Attestor Title:	

Approved for use October 2023

All changes and modification request must be reviewed by the Boulder County Attorney's Office

RESOLUTION 2024-044

A resolution conditionally approving Boulder County Community Planning & Permitting Docket LU-24-0004: Tuck ADU and Agricultural Structures

Recitals

A. Lucy and Adrian Tuck (the “Applicants”) applied to Boulder County for Limited Impact Special Use Review under Articles 4-601 and 4-516 of the Boulder County Land Use Code (the “Code”) to relocate and replace an existing nonconforming Agricultural Worker Accessory Dwelling Unit (“ADU”) with a new one. The Applicants also applied for Site Plan Review under Article 4-800 of the Code to construct 1,306 square feet of new agricultural structures and a 400-square-foot carport on an approximately 45-acre parcel.

B. The subject property is located at 7705 N. 95th Street, located west of N. 95th Street approximately 0.15 miles south of its intersection with Oxford Road, in Section 29, Township 2 North, Range 69 W, in an Agricultural zoning district in unincorporated Boulder County.

C. Although the proposal was tied to the parcel identified as 7705 N. 95th Street (Parcel No. 131529000025), a second adjacent parcel at 0 N. 95th Street (Parcel No. 131529000023) held under the same ownership is also included in the application materials as it is intended to host part of the proposed agricultural use.

D. Both parcels are encumbered by a county-held conservation easement that restricts most physical construction to a building envelope located in the northeastern corner of the 7705 N. 95th Street parcel. All proposed structures will be located within the building envelope area.

E. The Boulder County Assessor’s record identifies approximately 7,000 square feet of residential floor area on the subject property, including a primary residence and ADU. It is unclear if the primary residence identified in the Assessor’s record is the one that previously existed on the property before its deconstruction in 2022, or the new residence that was approved via SPR-21-0106, permitted under BP-22-1458, and was actively under construction at the time of the staff site visit for the subject proposal. The Applicants intend to replace the existing ADU with a new one as part of this proposal. The existing ADU’s floor area is noted as residential in the Assessor’s record, but if approved, the new ADU will be calculated as agricultural floor area per the Code. The proposed carport will be closely clustered with and is intended for use by the occupants of the new ADU, but its floor area will be exempted from the calculated residential floor area per the Code.

F. The Assessor’s record also identifies approximately 12,900 square feet of existing agricultural structures on the subject property, including two large agricultural barns, a smaller historic barn, and a small loafing shed. The Applicants proposed to supplement these structures

with two additional agricultural buildings, namely a greenhouse and a farm stand totaling approximately 1,386 square feet of new agricultural floor area.

G. Historic aerial photography indicates that the subject property has hosted agricultural uses since at least 1977.

H. The Boulder County Comprehensive Plan indicates that the entirety of the subject property is located within Agricultural Lands of both National and Statewide Importance.

I. Because of the existing and planned expansion of agricultural uses on the subject property, the Applicants assert that they need the assistance of an additional household on-site and the construction of several new structures.

J. The above-described request was processed and reviewed as Boulder County Community Planning & Permitting Docket LU-24-0004 (the “Docket”), as further described in the memorandum and written recommendation to the Board of County Commissioners (the “Board”) by Boulder County Community Planning & Permitting Department planning staff dated June 4, 2024, together with its attachments (the “Staff Recommendation”). The Staff Recommendation found that the Docket could meet the criteria for approval with recommended conditions, and therefore, recommended that the Board conditionally approve the Docket.

K. At a public hearing on the Docket held on June 4, 2024 (the “Public Hearing”), as further reflected in the official record of the Public Hearing, the Board considered the Staff Recommendation, as well as documents and testimony presented by County Community Planning & Permitting Department planning staff. The Board also heard testimony from the Applicants and their agent, Jim Kadlecsek. One member of the public spoke at the Public Hearing.

L. Based on the Public Hearing, the Board finds that the Docket meets the criteria for Limited Impact Special Use approval for an Agricultural Worker ADU as set forth in Articles 4-601.A and 4-516.H.6 of the Code, subject to the conditions stated below.

M. The Board further finds that the Docket meets the criteria in Article 4-806 of the Code for Site Plan Review approval for the proposed agricultural structures, subject to the conditions stated below.

N. Therefore, the Docket can be approved, subject to the conditions stated below.

Therefore, the Board resolves:

Docket LU-24-0004 is approved on the basis and terms set forth in this Resolution, above, and subject to the following conditions:

1. The development is subject to the requirements of the Boulder County Building Safety and Inspection Services Team and adopted County Building Codes, as outlined in the referral comments, including, but not limited to, required fire suppression, ignition resistant materials and defensible space, and the BuildSmart energy efficiency and sustainability requirements.

2. A deconstruction permit is required for the removal of the existing ADU. The deconstruction permit must be completed and closed before a Certificate of Occupancy can be issued for the new ADU.

3. The property owner shall submit an annual report to the Community Planning & Permitting Department indicating that the inhabitant of the ADU continues to live on-site and that the unit continues to be occupied in accordance with the Docket.

4. The accessory dwelling shall only be used as an Agricultural Worker Unit. Any changes to this use shall be considered a substantial modification of this approval and will require that the unit be decommissioned.

5. Prior to issuance of a building permit for the Agricultural Worker Unit, the Applicant shall record with the Boulder County Clerk and Recorder a signed affidavit recognizing the conditions of approval for the Docket.

6. The ADU shall be limited to a maximum of 1,755 square feet, with a maximum of 455 square feet of attached covered porch area.

7. At building permit for any approved structure, the Applicants shall submit plans that demonstrate proposed driveways that are compliant with the Boulder County Multimodal Transportation Standards (“MMTS”).

Prior to issuance of a Certificate of Occupancy or at final inspection, the Community Planning & Permitting Department must verify that the new access or driveway has been constructed to comply with the MMTS.

8. The development is subject to the requirements of the Boulder County Public Health Department, as outlined in the referral comments, including, but not limited to, removal of the existing Onsite Wastewater Treatment System (“OWTS”) tied to the existing ADU, and installation, inspection, and approval of the new OWTS prior to the issuance of a Certificate of Occupancy for the new ADU.

9. The sizes of the proposed accessory structures are approved as listed below:

- a. Agricultural Worker ADU – maximum 1,755 square feet of enclosed floor area and maximum 455 square feet of covered porch.

- b. Carport – maximum 400 square feet, measured from the dripline of the structure.
- c. Farm Stand – approximately 306 square feet.
- d. Greenhouse – approximately 1,080 square feet.

10. At building permit, the plans must include revised elevations showing that the carport is unenclosed on at least two sides.

11. At building permit, the Applicant shall submit a SWQP or a SWQP Exception Form. The SWQP or SWQP Exception Form must be issued prior to any work beginning on this project.

Prior to any grading or site disturbance, appropriate perimeter control measures such as sediment control logs shall be installed downslope and parallel to contours for all disturbed areas including staging areas. The location and types of perimeter control shall be shown on site plans submitted for building permit approval.

12. The locations shown on the submitted site plan dated January 30, 2024, are approved as proposed.

13. The heights of the proposed accessory structures are approved as listed below:

- a. Agricultural Worker ADU – approximately 24 feet above existing grade.
- b. Carport – approximately 12 feet above existing grade.
- c. Farm Stand – approximately 12 feet above existing grade.
- d. Greenhouse – approximately 18 feet above existing grade.

14. The submitted elevations included with the application materials are approved as proposed, with the exception of the carport.

15. When artificial lights are being used in the greenhouses, a light deprivation system using opaque curtains is required to block the lights from the greenhouses and must remain operational in perpetuity. To mitigate visual impacts and maintain the rural character of the area, the light-blocking system must completely prevent light from escaping the structure interior.

At building permit submittal, plans for the greenhouse must include a light deprivation system that will block light from within the greenhouse to be approved by staff.

At the final inspection, the full installation of the approved light deprivation must be installed, and the installation must be inspected by the Community Planning & Permitting Department.

16. The following exterior color and material choices are approved as proposed in the sample sheet included with the application materials:

- a. New ADU – tan and cream stone and stucco siding, grey standing-seam metal roofing.
- b. Carport – natural color hardie-board siding and matte charcoal gray standing-seam metal roofing.
- c. Farm Stand – medium gray asphalt shingle or painted metal roofing, white fiber cement board siding and trim.
- d. Greenhouse – transparent polycarbonate and white metal siding and roofing.

Prior to issuance of a Certificate of Occupancy or at the time of final inspection, the Community Planning & Permitting Department must inspect and verify that the approved color samples are used on each of the new structures.

17. Prior to issuance of building permits, the Applicants shall submit to the Community Planning & Permitting Department for review and approval a lighting plan that includes the placement of all exterior lighting fixtures and cut sheets for each fixture.

Down lighting is required, and all bulbs must be fully shielded to prevent light emissions above a horizontal plane drawn from the bottom of the fixture. All exterior light fixtures must conform to Articles 7-1600 and 18-162.A of the Code.

Prior to the final inspection or issuance of a Certificate of Occupancy, the Community Planning & Permitting Department must inspect and approve the full installation of the approved lighting plan.

18. Prior to the issuance of any building permits, the Applicants shall submit a revised earthwork fact sheet for Community Planning & Permitting staff approval. The amended fact sheet must include calculations for all foundational and non-foundational earthwork to be performed during construction of the proposed accessory structures and any access roads.

19. Prior to issuance of building and grading permits, the Applicants shall submit to the Community Planning & Permitting Department for review and approval a plan depicting the routing of all utility services. The utility routing plan shall be included as part of the building plan set required at the time of permit application. To minimize disturbances to the site, all utility service lines shall be routed underground (*see* Article 7-1200 of the Code) and should be located in areas already disturbed or proposed to be disturbed (e.g., along the driveway).

At the time of building inspections, the Community Planning & Permitting Department must inspect and confirm full installation of the utilities per the approved plan.

20. At building or grading permit submittal, the Applicants shall submit a Revegetation Plan for approval. This plan should include native grass species to be used, an explanation of how topsoils will be stockpiled, mapped delineation of all disturbance areas (including deconstructed

structure locations, construction staging areas, driveway, utility lines, and septic system), locations of all erosion control measures, and matting requirements, if necessary.

Prior to issuance of a Certificate of Occupancy, the Community Planning & Permitting Department must inspect and approve the full installation of the approved Revegetation Plan. If weather is not conducive to seeding or if adequate revegetation efforts have not occurred and vegetation is not adequately established at the time of final inspection request, an irrevocable letter of credit or monies deposited into a County Treasurer account will be required to assure the success of revegetation. The Applicants should consider the following well in advance of the revegetation inspection:

- a. Whether applying for a Certificate of Occupancy, final inspection, or the return of funds held in escrow for completion of revegetation, some level of germination and growth of grass seed is required.
- b. Steeper slopes and dryer soil require greater attention to establish a level of germination adequate to obtain revegetation approval.
- c. Areas of disturbance found at inspection not included on the Revegetation Plan are still subject to reseeding and matting.
- d. Incomplete revegetation is the leading cause for delays in obtaining a Certificate of Occupancy.

21. The Applicants shall be subject to the terms, conditions, and commitments of record and in the file for Docket LU-24-0004: Tuck ADU and Agricultural Structures.

A motion to approve the Docket was made by Commissioner Marta Loachamin, seconded by Commissioner Claire Levy, and passed by a 3-0 vote.

[Signature Page to Follow]

ADOPTED as a final decision of the Board on this _____ day of July 2024.

The signatures below indicate approval of the text of the Resolution but are not necessarily reflective of the votes taken at the Public Hearing.

**BOARD OF COUNTY COMMISSIONERS
OF BOULDER COUNTY:**

Ashley Stolzmann, Chair

Marta Loachamin, Vice Chair

Claire Levy, Commissioner

ATTEST:

Clerk to the Board

Accessibility Report

Filename: Resolution 2024-044 Tuck ADU and Agricultural Structures (LU-24-0004).pdf

Report created by: [Enter personal and organization information through the Preferences > Identity dialog.]

Organization:

Summary

The checker found problems which may prevent the document from being fully accessible.

- Needs manual check: 2
- Passed manually: 0
- Failed manually: 0
- Skipped: 1
- Passed: 28
- Failed: 1

Detailed Report

Document

Rule Name	Status	Description
Accessibility permission flag	Passed	Accessibility permission flag must be set
Image-only PDF	Passed	Document is not image-only PDF
Tagged PDF	Passed	Document is tagged PDF
Logical Reading Order	Needs manual check	Document structure provides a logical reading order
Primary language	Passed	Text language is specified
Title	Failed	Document title is showing in title bar
Bookmarks	Passed	Bookmarks are present in large documents
Color contrast	Needs manual check	Document has appropriate color contrast

Page Content

Rule Name	Status	Description
Tagged content	Passed	All page content is tagged
Tagged annotations	Passed	All annotations are tagged
Tab order	Passed	Tab order is consistent with structure order
Character encoding	Passed	Reliable character encoding is provided
Tagged multimedia	Passed	All multimedia objects are tagged
Screen flicker	Passed	Page will not cause screen flicker
Scripts	Passed	No inaccessible scripts
Timed responses	Passed	Page does not require timed responses
Navigation links	Passed	Navigation links are not repetitive

Forms

Rule Name	Status	Description
Tagged form fields	Passed	All form fields are tagged
Field descriptions	Passed	All form fields have description

Alternate Text

Rule Name	Status	Description
Figures alternate text	Passed	Figures require alternate text
Nested alternate text	Passed	Alternate text that will never be read
Associated with content	Passed	Alternate text must be associated with some content
Hides annotation	Passed	Alternate text should not hide annotation
Other elements alternate text	Passed	Other elements that require alternate text

Tables

Rule Name	Status	Description
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Rows	Passed	TR must be a child of Table, THead, TBody, or TFoot
TH and TD	Passed	TH and TD must be children of TR
Headers	Passed	Tables should have headers
Regularity	Passed	Tables must contain the same number of columns in each row and rows in each column
Summary	Skipped	Tables must have a summary

Lists

Rule Name	Status	Description
List items	Passed	LI must be a child of L
Lbl and LBody	Passed	Lbl and LBody must be children of LI

Headings

Rule Name	Status	Description
Appropriate nesting	Passed	Appropriate nesting

[Back to Top](#)

Funding Agreement

Human Services
Intellectual and Developmental Disability Grant Program

SUMMARY	
Contract Identification	
Oracle Number	303744
Agreement Name	Imagine!-HS-PASA
County Information	
Office or Department	Department of Human Services
Division/Program	Partnerships, Contracts and Services Division
Mailing Address	PO BOX 471, Boulder, CO 80306
Project Manager Name and Email	Rebecca Seiden rseiden@bouldercounty.gov
Other Contact Name and Email	Jahlia Daly jdaly@bouldercounty.gov
Recipient Information	
Legal Entity Name	Developmental Disabilities Center
Recipient d/b/a (if any)	Imagine!
Mailing Address	1400 Dixon Avenue, Lafayette, CO 80026
Signer Name and Email	Jodi Walters jwalters@imaginecolorado.org
Other Contact Name and Email	Robin Grey rgrey@imaginecolorado.org
Term	
Start Date	July 1, 2024
Expiration Date	June 30, 2025
Amount	
Funding Amount (not to exceed)	\$2,529,478.75
Agreement Documents	
Exhibit A - Use of Funds, Payment Schedule, and Administrative Requirements	

THIS FUNDING AGREEMENT ("**Agreement**") is entered into by and between the Board of County Commissioners on behalf of the County of Boulder, State of Colorado, a body corporate and politic, for the benefit of Department of Human Services ("**County**") and Developmental Disabilities Center ("**Recipient**"). County and Recipient are each a "**Party**," and collectively the "**Parties**."

RECITALS

A. The Developmental Disabilities property tax (the "**Tax**") was approved by voters in 2002 to supplement an existing mill levy to support developmental disabilities programs in Boulder County.

B. The County sets aside 2/3 of the revenues received from the Tax for funding services in the community that help people of all ages with cognitive and developmental disabilities, autism, and brain injury (BI) live fuller, more satisfying and independent lives (the “**Grant Program**”).

C. Recipient submitted a Grant Program application to the County, which application was reviewed and evaluated by the County and determined by the County to merit an award under the Grant Program.

Recipient has been awarded funding under the Grant Program.

AGREEMENT

1. Incorporation into Agreement: The **Summary, Recitals, and Agreement Documents** are incorporated into this Agreement by reference.

2. Use of Funds: Recipient must use the **Funding Amount** for the purposes, and pursuant to the terms, set forth in the Agreement Documents and in accordance with the Grant Program requirements.

3. Term of Agreement: The **Term** begins on the **Start Date** and expires on the **Expiration Date**, unless terminated sooner. The Funding Amount must be used during the Term.

4. Payment of Grant Funding: Subject to the terms contained herein, County will pay to Recipient an amount not to exceed the Funding Amount in accordance with the **Agreement Documents**.

5. Indemnity: Recipient will be liable for any damages to persons or property caused by or arising out of the actions, obligations, or omissions of Recipient, its employees, agents, representatives or other persons acting under Recipient's direction or control in performing or failing to perform its obligations under this Agreement. Recipient will indemnify and hold harmless County, its elected officials and appointed department heads, and its employees, agents and representatives (the "indemnified parties"), from any and all liability, claims, demands, actions, damages, losses, judgments, costs or expenses, including attorneys' fees, which may be made or brought or which may result against any of the indemnified parties as a result or on account of the actions or omissions of Recipient, its employees, agents or representatives, or other persons acting under Recipient's direction or control. This indemnification obligation will extend to claims based on Recipient's unauthorized use or disclosure of confidential information and intellectual property infringement. County will not be obligated to indemnify or defend Recipient under any circumstances. Recipient's obligations under this provision shall survive expiration or termination of this Agreement. Nothing contained in this Agreement is intended to limit or restrict the indemnification rights or obligations of any Party under this provision, or damages available for breaches of the obligations herein.

6. Nondiscrimination: Recipient will comply with the letter and spirit of the Colorado Anti-Discrimination Act, C.R.S. § 24-34-401, et seq., as amended, and all applicable local, State and Federal laws concerning discrimination and unfair employment practices. County prohibits unlawful discrimination on the basis of race, color, religion, gender, gender identity, national origin, age 40 and over, disability, socio-economic status, sexual orientation, genetic information, or any other status protected by applicable Federal, State or local law. Recipient must require that its subcontractors, if any, similarly comply with all applicable laws concerning discrimination and unfair employment practices.

7. Information and Reports: Recipient will provide to authorized County, State, and Federal government representatives all information and reports that may be required for any purpose authorized by law. Recipient will permit access to such representatives to Recipient's facilities, books, records, accounts, and any other relevant sources of information. Where information required by a representative is in the exclusive possession of a person or entity other than Recipient, Recipient must so certify to the County and explain what efforts it has made to obtain the information.

8. Independent Contractor: Recipient is an independent contractor for all purposes. Recipient is not an employee of the County for any purpose, including the Federal Insurance Contribution Act, the Social Security Act, the Federal Unemployment Tax Act, the provisions of the Internal Revenue Code, the Colorado Workers' Compensation Act, the Colorado Unemployment Insurance Act, and the Public Employees Retirement Association. Accordingly, County will not withhold or pay any income tax, payroll tax, or retirement contribution of any kind on behalf of Recipient or Recipient's employees. Recipient will exercise complete authority over its personnel and agents and will be fully responsible for their actions.

9. Termination for Breach: Either Party's failure to perform any of its material obligations under this Agreement, in whole or in part or in a timely or satisfactory manner, will be a breach. The institution of proceedings under any bankruptcy, insolvency, reorganization or similar law, by or against Recipient, or the appointment of a receiver or similar officer for Recipient or any of its property, which is not vacated or fully stayed within thirty (30) days after the institution of such proceeding, will also constitute a breach. In the event of a breach, the non-breaching Party may provide written notice of the breach to the other Party. If the notified Party does not cure the breach, at its sole expense, within thirty (30) days after delivery of notice, the non-breaching Party may exercise any of its remedies provided under this Agreement or at law, including immediate termination of this Agreement.

10. Termination for Convenience: County may terminate this Agreement, in whole or in part, for any reason and without penalty, upon thirty (30) days' advance written notice to Recipient.

11. Remedies for Non-Compliance: If Recipient fails to perform any of its obligations under this Agreement, County may, at its sole discretion, and in addition to any remedies available at law or in equity, require Recipient to repay to County all or any part of the Funding Amount.

12. Notices: All notices provided under this Agreement must be in writing and sent by Certified U.S. Mail (Return Receipt Requested), electronic mail, or hand-delivery to the other Party's **Contact** at the address specified in the Summary. For certified mailings, notice periods will begin to run on the day after the postmarked date of mailing. For electronic mail or hand-delivery, notice periods will begin to run on the date of delivery.

13. Statutory Requirements: This Agreement is subject to all statutory requirements that are or may become applicable to counties or political subdivisions of the State of Colorado generally, including but not limited to: C.R.S. § 38-26-107, which requires withholding funds where the County receives a claim for payment from a supplier or subcontractor of Recipient upon notice of final settlement (required for public works contracts that exceed \$150,000); C.R.S. § 8-17-101 et seq.; C.R.S. § 18-8-301, et seq.; and C.R.S. § 18-8-401, et seq.

14. Entire Agreement/Binding Effect/Amendments: This Agreement represents the complete agreement between the Parties and is fully binding upon them and their successors, heirs, and

assigns, if any. This Agreement terminates any prior agreements, whether written or oral in whole or in part, between the Parties relating to the subject matter hereof. This Agreement may be amended only by a written agreement signed by both Parties.

15. Assignment/Subcontractors: This Agreement may not be assigned or subcontracted by Recipient without the prior written consent of the County. If Recipient subcontracts any of its obligations under this Agreement, Recipient will remain liable to the County for those obligations and will also be responsible for subcontractor's performance under, and compliance with, this Agreement.

16. Governing Law/Venue: The laws of the State of Colorado govern the construction, interpretation, performance, and enforcement of this Agreement. Any claim relating to this Agreement or breach thereof may only be brought exclusively in the Courts of the 20th Judicial District of the State of Colorado and the applicable Colorado Appellate Courts.

17. Breach: The failure of either Party to exercise any of its rights under this Agreement will not be deemed to be a waiver of such rights or a waiver of any breach of the Agreement. All remedies available to a Party in this Agreement are cumulative and in addition to every other remedy provided by law.

18. Severability: If any provision of this Agreement becomes inoperable for any reason but the fundamental terms and conditions continue to be legal and enforceable, then the remainder of the Agreement will continue to be operative and binding on the Parties.

19. Third-Party Beneficiary: Enforcement of the terms and conditions and all rights and obligations of this Agreement are reserved to the Parties. Any other person receiving services or benefits under this Agreement is an incidental beneficiary only and has no rights under this Agreement. Notwithstanding, where the beneficiary **Department** is led by an Elected Official, such Elected Official shall be considered a third-party beneficiary.

20. Colorado Open Records Act: County may disclose any records that are subject to public release under the Colorado Open Records Act, C.R.S. § 24-72-101, et seq.

21. Conflict of Provisions: If there is any conflict between the terms of the main body of this Agreement and the terms of any of the Agreement Documents, the terms of the main body of the Agreement will control.

22. Governmental Immunity: Nothing in this Agreement shall be construed in any way to be a waiver of the County's immunity protection under the Colorado Governmental Immunity Act, C.R.S. § 24-10-101, et seq., as amended.

23. Representations and Warranties: Recipient represents and warrants the following:

- a. Execution of this Agreement and performance thereof is within Recipient's duly authorized powers;
- b. The individual executing this Agreement is authorized to do so by Recipient; and
- c. Recipient is authorized to do business in the State of Colorado and is properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over the Recipient.

24. Legal Compliance: Recipient assumes full responsibility for obtaining and maintaining any permits and licenses required to carry out its obligations hereunder. Recipient's performance under this Agreement will comply with all Federal, State, and local laws, regulations, ordinances and codes.

25. Delegation of Authority: The Parties acknowledge that the Board of County Commissioners has delegated authority to the Department Head or Elected Official that leads the beneficiary Department and their designees to act on behalf of the County under the terms of this Agreement, including but not limited to the authority to terminate this Agreement.

26. Publicity Releases: Recipient will not refer to this Agreement or the County in commercial advertising without prior written consent of the County. This provision shall survive expiration or termination of this Agreement.

27. Execution by Counterparts; Electronic Signatures: This Agreement may be executed in multiple counterparts, each of which will be deemed an original, but all of which will constitute one agreement. The Parties approve the use of electronic signatures, governed by the Uniform Electronic Transactions Act, C.R.S. §§ 24 71.3 101 to 121. The Parties will not deny the legal effect or enforceability of this Agreement solely because it is in electronic form or because an electronic record was used in its creation. The Parties will not object to the admissibility of this Agreement in the form of electronic record, or paper copy of an electronic document, or paper copy of a document bearing an electronic signature, because it is not in its original form or is not an original.

28. Limitation of Liability: COUNTY SHALL NOT BE LIABLE TO RECIPIENT FOR ANY DAMAGES ARISING FROM OR RELATING TO THIS AGREEMENT, REGARDLESS OF ANY NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

[Signature Page to Follow]

IN WITNESS WHEREOF, the Parties have executed and entered into this Agreement as of the latter day and year indicated below.

SIGNED for and on behalf of Boulder County		SIGNED for and on behalf of Recipient	
Signature:		Signature:	
Name:		Name:	
Title:		Title:	
Date:		Date:	
<p>↓↓<i>For Board-signed documents only</i>↓↓</p>			
Attest:	<i>Initials</i>		
Attestor Name:			
Attestor Title:			

**EXHIBIT A
USE OF FUNDS, PAYMENT SCHEDULE & ADMINISTRATIVE REQUIREMENTS**

1. PURPOSE

Boulder County Department of Human Services (BCHS) is committed to co-creating solutions with its community partners to address complex participant and community challenges.

The Developmental Disabilities property tax, approved by voters in 2002, supplemented an existing mill levy to support developmental disabilities programs in Boulder County. These funds may provide additional services not covered by Medicaid, Medicare and private insurance but may not supplant any existing services and/or funds.

This Contract was awarded through an RFP process to increase programs that will sustain or increase the availability and access to community social activities, community recreational opportunities, and direct services supports for persons living with Intellectual and Developmental Disabilities (IDD), Autism, and/or Brain Injury (BI).

These programs will afford people of all ages with IDD/DD, Autism, and/or BI to live fulfilling lives of independence and quality in their homes and communities. Boulder County IDD Mill Levy funding will support school-aged services, adult community services, behavioral management, therapies and education, mental health and dual diagnosis, nursing, service administration, technology, social enterprise services,

The Boulder County IDD Mill Levy funds may be used to:

- A. Support Contractor in filling funding gaps for agreed upon services, as described in Section 3.
- B. Collect performance and outcome data to determine the ongoing effectiveness of services listed in Section 3 and plan for the implementation of new services for Boulder County.
- C. Support the system-wide efforts of the Boulder County IDD Advisory Council and improve overall communication between all stakeholders who are funded through the Mill Levy.

2. PERFORMANCE RESPONSIBILITIES

Contractor, in accordance with the terms and conditions in this Contract, shall, in a timely and satisfactory manner, ensure Boulder County residents with an IDD/DD, Autism, and/or BI have access to recreational and social opportunities and direct services. To assist an individual with IDD/DD, Autism, and/or BI in accessing necessary services and supports to meet his or her needs. To this end, Contractor agrees to:

- A. As needed, Contractor shall support participants in connecting with self-reliance benefits utilizing the Colorado PEAK online application and/or creating a Boulder County Connect (BCC) Account and encourage online system use for accessing case information, completing required actions on their cases, and uploading documents.
- B. Provide culturally appropriate marketing materials of Contractor's services to other local agencies and Family Resource Centers who serve low-income and at-risk individuals to

- increase participant access to Contractor's services.
- C. As needed, work collaboratively with BCHS staff to develop, and distribute culturally appropriate marketing materials that work to destigmatize access to and enrollment in public assistance benefits.
 - D. Contractor shall, in a good and workmanlike manner and at its own cost and expense, furnish all labor and equipment and do all work necessary and incidental to provide independent living, vocational, advocacy and support services to residents of Boulder County with IDD/DD, Autism, and/or BI as specified in this Contract and in the Contract Documents (the "Work").
 - E. Contractor shall take necessary steps to provide services virtually and/or adhere to any current public health emergencies and/or restrictions throughout the Contract term for services provided in-person. If Contractor is unable to provide services safely to meet client needs due to the public health restrictions, Contractor shall notify BCHS within 30 days.
 - F. Support the system-wide efforts of the Boulder County IDD Advisory Council and improve overall communication between all stakeholders who are funded through the IDD Mill Levy. Support the recommendations in the Boulder County IDD needs assessment that are being implemented by the IDD Advisory Council.

3. PROJECT TASKS AND DELIVERABLES

A. School Aged Services:

- a. Fund private pay subsidies for families, supplies background checks, activity fees, fuel and vehicle maintenance, class space, certain operational costs and occupancy/IT costs.
- b. Continue serving current number of clients in School-Aged Services as well as draw down on the Summer Camp waitlist that exists during current contract term by adding an additional 40 children into services.
- c. 6.0 FTE therapeutic recreation and other staff dedicated to School-Aged Services.
- d. Promote staff training, communication, community connections, learning, inclusion, socialization, safety, health, and wellness.
- e. The maintenance, modification, licensure, and operation of vehicles.
- f. Building space needed to stage programming and the IT systems needed to support its execution and administration.

B. Adult Community Services

- a. Support with community integration costs of School Aged Services and Adult Community Services and private pay events for participants unable to afford access to community resources (e.g., rec passes, class fees, etc.).
- b. 4.0 FTE therapeutic recreation and other staff dedicated to Adult Community Services, including bringing 20 individuals off the waitlist that exists during current contract.

C. Behavioral Management, Therapies and Education

- a. Create a multidisciplinary service aimed at providing comprehensive behavioral, psychological, and psychiatric support to individuals with IDD, BI and Autism in Boulder County.
- b. Conduct holistic assessments, which include:
 - i. Psychiatric Evaluation
 - ii. Psychotherapy and counseling assessment
 - iii. Behavioral assessment
 - iv. Psychological, neuropsychological, academic, and mental health evaluation

- v. Medical testing (as needed)
- vi. Recommendations based on findings.
- c. Develop personalized treatment plans involving psychiatrists and/or medical staff, psychologists, medical, BCBA's (Applied Behavioral Analysis), counselors and/or social workers.
- d. Educate clients and families using evaluations, assessments, and professional services.
- e. Connect clients and families with professional teams who can provide support and community resources available to aid individuals with I/DD, mental health, and behavioral needs.
- f. Utilize evidence-based practices to conduct this program and data will be collect on the services provided, population utilizing the service, effectiveness of the services, and other data points that may contribute to research in this field.
- g. Build a highly collaborative and ongoing relationship with the START program to help ensure START's ability to support the community.

D. Mental Health and Dual Diagnosis

- a. Enhance the delivery of mental health services to individuals living with dual-diagnosis by improving communication and coordination between the individual, psychiatrist, behaviorist, nurse, case manager, providers, and family.
- b. 0.85 FTE plus for 3rd party psychiatry services, operating expenses, occupancy, and IT expenses.

E. Nursing

- a. 24/7 on-call nurse to support DSPs in making appropriate medical care decisions and ensure timely care for individuals in programming.
- b. 3.0 FTE, operating expenses, occupancy, and IT expenses.

F. Service Administration

- a. Continue to provide free Representative Payee services and to pay for other residential services administrative costs for individuals for expenses not reimbursable by Medicaid.
- b. 2.6 FTE, operating expenses, occupancy, and IT expenses.

G. Technology

- a. Identify ways in which individuals would benefit from high-tech and low-tech devices via assessment.
- b. Create devices where appropriate.
- c. Provide training to the individual user and their support team if necessary.
- d. Provide ongoing maintenance and technical support for existing devices.
- e. 1.5 FTE for Assistive Technology Specialists, including operating costs to run the program.

H. Social Enterprise Services

- a. Implementing Assistive Technology into art programs and offering support for clients to create and sell their art.
- b. Affords the opportunities to program participants to sell their artwork at art shows across Boulder County.
- c. Development of classes that other individuals with IDD, and the community at large can attend.
- d. Fund 1.0 FTE
- e. Art show fees and advertising

4. TARGET POPULATION

A. For the purposes of the IDD Mill Levy and the IDD Advisory Council, IDD has been further defined as:

1. **A documented intellectual and/or** developmental disability that is manifested before the person reaches 22 years of age or brain injury acquired as an adult **that results in a disability.**
2. A **documented** disability attributed to a diagnosed intellectual disability or related conditions which include cerebral palsy, epilepsy, autism or other neurological conditions when such conditions result in EITHER impairment of general intellectual functioning OR adaptive behavior similar to that of a person with a diagnosed intellectual disability.
3. **Individual must be in process or have qualified for a Medicaid waiver or disability benefit program due to an IDD/BI/Autism diagnosis to receive IDD Mill Levy funding for emergency needs.**
4. Must reside in Boulder County to access these services.

5. BUDGET

- A. The approved budget is included as Exhibit A-1, Budget Form.
- B. Contractor has the discretion to transfer up to ten percent (10%) of the approved budget between the major direct cost budget categories without the approval of Boulder County Department of Human Services (BCHS). Any budget transfer greater than ten percent (10%) requires prior written approval from an authorized BCHS representative.

6. PAYMENT AND REPORTING REQUIREMENTS

- A. Monthly Invoicing
 - a. BCHS shall provide Contractor with a monthly invoice template.
 - b. Contractor shall complete and submit monthly invoices and supporting documentation that supports the amount invoiced on/or before the thirtieth (30th) calendar day following the reporting period, regardless of the level of activity or amount of expenditure(s) in the preceding report period. Any invoices submitted 90 days after due date may not be accepted.
 - c. Recipient shall only invoice BCHS for the actual number of Boulder County residents served by that program, to ensure that Boulder County funds are not subsidizing services for residents who reside outside of Boulder County.
 - d. Monthly invoiced expenses shall be for actual expenditures incurred by the Contractor.
 - e. BCHS shall not pay for vacant positions funded through this Task Order Contract. Recipient shall not reallocate vacancy funds to another position without written approval of BCHS.
 - f. Monthly invoiced expenses may not be reimbursable by any other funding source.
 - g. Monthly invoices shall only include expenditures for the prior billing period. Any adjustments to a previously billed period need to be billed as an amendment to a previous invoice.
 - h. The invoice shall contain the name and title of the person authorized, or his or her designee, to submit claims for payment.
 - i. All invoices, supporting documentation, and applicable reports shall be submitted

electronically to BCHS via email to:

- a. hhsaccountingoffice@bouldercounty.gov

B. Supporting Documentation

- a. Monthly invoices shall be supported by a general ledger and/or sub-ledger detail generated from the Contractor's accounting system to include payee, description, date, and amount.
 - i. For participant services, participant initials or non-identifying information and purpose should be included.
 - ii. For personnel requests, an excerpt of the payroll register from the paying system is appropriate. The payroll register should include staff name(s) or initials, period paid, salary and itemized employer-paid taxes and benefits.
- b. Supporting documentation submitted with monthly invoices must meet or exceed the amount being invoiced.
- c. Contractor shall determine and report on actual number of consumers served who are residents of Boulder County by program area.
- d. Contractor shall provide an agency-level income statement.
- e. Contractor shall keep on site for BCHS review, for the contract term plus three years, the following supporting documentation for each invoice:
 - i. Non-personnel reimbursements must be supported by general ledger or sub-ledger detail generated from Contractor's accounting system.
 1. The ledger detail should include payee, description, date and amount.
 2. For participant services, participant name and purpose must be maintained on file (for those participants who have signed an authorization to release information).
 3. The documentation should include all receipts and/or other original support. Receipts are required for purchases from a single vendor more than \$100.
 4. Travel expenditures should include receipts and/or original supporting documentation.
 5. Mileage will be reimbursed at a rate equal to or less than the IRS standard mileage rate.
 - ii. For personnel requests, an excerpt of the payroll register from the paying system is appropriate. The payroll register should include staff name(s) or initials, period paid, salary and itemized employer-paid taxes and benefits.
 1. Staff working less than 100% on contracted work may be required via a written amendment to maintain an accurate daily record of hours worked and correct charge codes. These records shall be made available to BCHS during financial review visits or upon request.
 - iii. If Contractor does not produce sufficient documentation as described above at financial review visits, BCHS has the right to recapture any unsupported payments.

C. Payments

- a. Monthly invoices, supporting documentation, and all required deliverables as

outlined in Section 6, Deliverable and Reporting Requirements must be submitted in a timely manner and in accordance with the terms of the Contract in order to receive payment.

- b. BCHS will reimburse the Contractor within 30 days of receipt and approval of a fully supported and payable invoice. BCHS will follow-up with Contractor within 15 days of receipt should there be any questioned or unsupported costs.

D. Internal Controls

- a. Contractor shall maintain written internal control policies and procedures around financial and accounting practices, including procurement policies and procedures.
- b. Confidentiality of Client Information and Records: Contractor shall maintain best practices for safeguarding confidential information, including signed certification from Contractor's directors, officers, and employees.
- c. Conflict of Interest: Contractor shall maintain best practices regarding conflicts of interest, including signed certification from Contractor's directors, officers, and employees.
- d. Written policies and procedures shall be made available to BCHS during financial review visits or upon request. During the contract term, BCHS will request to review Contractor's procurement policy.

7. MEETINGS AND COMMUNICATIONS

- A. BCHS and Recipient shall meet bimonthly or more to evaluate Contracted budget levels and program effectiveness that may include:
 - 1. recommendations for modifications in the scope of services for this Contract,
 - 2. technical assistance necessary to enable the performance of this Contract by Recipient, or the specification of necessary additional services to enable the Recipient's performance of the services provided under this Contract.
- B. A fiscal review may be conducted up to two times during the Contract term. Prior to this review, BCHS may request documentation including a copy of Recipient's published annual report for the prior year.
- C. Recipient shall attend applicable trainings and meetings as available.

8. DELIVERABLE AND REPORTING REQUIREMENTS

- A. Contractor shall submit quarterly reports by the 45th day following the end of the quarter using the metrics outlined in Exhibit A-4.
 - 1. Quarterly reports will be submitted by email to hhsimpactreporting@bouldercounty.org
 - 2. Excel reporting form will be sent to BCHS for quarterly report submission by Contractor.
- B. IMAGINE will provide copies of any required State Level Reports upon request.
 - a. Submit to the following email: hhsimpactreporting@bouldercounty.org
- C. Contractor shall notify BCHS within 30 days of vacancies for positions funded under this Contract. Notification shall be sent in writing to Whitney Wilcox at wwilcox@bouldercounty.gov

- D. Contractor shall submit an annual qualitative report at the conclusion of each Contract term. Annual reports shall be submitted no later than the 45 days following the end of the Contract term. Reports shall be submitted to hhsimpactreporting@bouldercounty.org

9. CONTRACTOR RECORDS AND INSPECTION

- A. Contractor shall maintain a file of all documents, records, communications, notes and other materials relating to the services provided under this Contract (the "Records").
- B. Contractor shall permit the County to audit, inspect, examine, excerpt, copy and transcribe Records for payer purposes during the state-defined Record Retention Period. Contractor shall make Records available during normal business hours at a Contractor office or place of business, or at other mutually agreed upon times or locations, upon no fewer than two business days' notice.
- D. Training and credentialing records of staff shall be made available upon request.

10. ROLE OF CONTRACTOR OVERSIGHT OF FUNDS

- A. Contractor will oversee the expenditure of Boulder County IDD/DD Mill Levy in providing effective IDD-specific services.
- B. Contractor shall ensure that funds utilized by this Contract do not supplant Medicaid nor other funds that can cover consumer services.
- C. Contractor shall determine eligibility for Boulder County consumers' status, using the eligibility definition from Boulder County's IDD Mill Levy language per section 4 above.
- D. Contractor shall determine, and report on % of consumers served who are residents of Boulder County by program area. Contractor shall only invoice BCHS for the % of shortfall that is less than or equal to the % of Boulder County residents served by that program area, to ensure that Boulder County funds are not subsidizing services for residents who reside outside of Boulder County.
- E. Contractor may braid or leverage Contract funds with other funding sources in order to enhance services and/or expand capacity to serve consumers.

11. **SCHEDULE OF ATTACHMENTS:** The following attachments to this Exhibit are hereby attached and incorporated by this reference:

- A. Exhibit A-1, Budget Form
- B. Exhibit A-2, Sample Income Statement
- C. Exhibit A-3, Monthly Invoice Coversheet with Allocation by Program
- D. Exhibit A-4, Program Level Report

**EXHIBIT A-1
BUDGET FORM**

Contract Term: 07/01/2024 to 06/30/2025
Agency Name: Developmental Disabilities Centers dba Imagine!
Program Name: General Operations
Approved Amount \$ 2,529,478.75

DESCRIPTION	Budget of Line Item
Salaries (list positions and indicate FTE allocated to each source and whether the person within the position is bilingual/bicultural or bilingual only)	
Mental Health Therapist (licensed) (.25 FTE)	\$ 17,675
Mental Health Therapist (unlicensed, under supervision) (.30 FTE)	\$ 17,032
Program Specialist (.30 FTE)	\$ 13,497
Salary for Public Building Cooperative Behavior Class development, class time (.08)	\$ 8,570
Vehicle Coordinator (.37 FTE)	\$ 14,291
Certified Therapeutic Recreation Specialist (75% of 3 FTE)	\$ 126,536
Assistant Director - .3 FTE	\$ 25,959
Director - .15 FTE	\$ 22,251
Program Manager (.77 FTE)	\$ 45,365
Assistant Director - .25 FTE	\$ 27,316
CSO - .1 FTE	\$ 14,834
Vehicle Coordinator (.37 FTE)	\$ 18,374
Program Coordinator (.77 FTE)	\$ 36,540
50 hours of annual training for each DSP, 48 DSPs predicted	\$ 38,069
Bi-weekly review of therapeutic recreation plans for DSPs	\$ 46,666
Admin Assistant Director (0.72 FTE)	\$ 56,729
Manager of Business Support (0.35 FTE)	\$ 17,108
Business Support 1 (0.69 FTE)	\$ 25,834
Business Support 2 (0.69 FTE)	\$ 24,398
Business Support 3 (0.13 FTE)	\$ 4,597
RN, Nurse Case Manager (.63 FTE)	\$ 55,810
Medical Coordinator (.63 FTE)	\$ 29,694
LPN (.63 FTE)	\$ 40,308
LPN (.63 FTE)	\$ 39,823
LPN (.63 FTE)	\$ 37,792
Program Manager (75% of 1 FTE)	\$ 44,805
AT Assistant (75% of 3 FTE)	\$ 96,408
Art Program Specialist	\$ 32,960

Commented [RG1]: If this contract is to be disclosed publicly, we would strongly prefer not to list salaries and compensation of specific titles/individuals.

Commented [SR2R1]: I will check. We do need complete budget.

Commented [SR3R1]: Need to have complete budget per Braden

Payroll Taxes & Benefits	
Mental Health Therapist (licensed) (.25 FTE)	\$ 3,722
Mental Health Therapist (unlicensed, under supervision) (.30 FTE)	\$ 3,688
Program Specialist (.30 FTE)	\$ 4,340
Public Building Cooperative Behavior Class Development	\$ 2,057
Vehicle Coordinator (.37 FTE)	\$ 3,429.90
CTRS (75% of 3 FTE)	\$ 30,368.52
Assistant Director - .3 FTE	\$ 6,230.27
Director - .15 FTE	\$ 5,340.23
2-Year Stability/Retention Bonuses (\$300)	\$ 2,000.00
5-Year Stability/Retention Bonuses (\$500)	\$ 1,500.00
10-Year Stability/Retention Bonuses (\$750)	\$ 750.00
Signing Bonuses (\$250 at 6 months, add'l \$250 at 1 year)	\$ 1,500.00
Program Manager (.77 FTE)	\$ 10,887.68
Assistant Director - .25 FTE	\$ 6,555.74
CSO - .1 FTE	\$ 3,560.15
CTRS (.77 FTE)	\$ 8,908.10
Vehicle Coordinator (.37 FTE)	\$ 4,409.76
Program Coordinator (.77 FTE)	\$ 8,769.60
Admin Assistant Director (0.72 FTE)	\$ 13,614.98
Manager of Business Support (0.35 FTE)	\$ 4,105.92
Business Support 1 (0.69 FTE)	\$ 6,200.06
Business Support 2 (0.69 FTE)	\$ 5,855.62
Business Support 3 (0.13 FTE)	\$ 1,103.23
RN, Nurse Case Manager (.63 FTE)	\$ 13,394.40
Medical Coordinator (.63 FTE)	\$ 7,126.48
LPN (.63 FTE)	\$ 9,673.92
Director of Nursing (.63 FTE)	\$ 9,557.52
LPN (.63 FTE)	\$ 9,070.06
Program Manager (75% of 1 FTE)	\$ 10,753.20
AT Assistant (75% of 3 FTE)	\$ 23,137.92
Art Program Specialist	\$ 7,910.40

Operating Expenses	
Materials for clinic	\$ 16,400
Billing	\$ 14,000
Activity Fees & Supplies	\$ 45,000
Fuel & Oil/Vehicle Maintenance	\$ 78,800
Class space rental for Program Ramp Up	\$ 2,400
Site Lease for Community Services (40% of site lease)	\$ 47,310
Private Pay Subsidies for Families	\$ 66,000
Dues & Fees for Enhanced Background Checks & Fingerprinting	\$ 15,000
Fuel & Oil	\$ 51,060
Vehicle Maintenance	\$ 58,680
Janitorial Supplies	\$ 1,000
Medical Client Supplies	\$ 2,000
Participant Food	\$ 1,000
Registration website per year	\$ 2,000
Additional licensure fees/costs	\$ 525
Summer Camp Activity Costs	\$ 10,000
Training- CPR, QMAP	\$ 2,512
Mileage	\$ 2,800
Postage	\$ 500.00
Supplies	\$ 7,500.00
JAMF License (yearly renewal for 75% of participants)	\$ 900.00
Advertising/Art Shows	\$ 2,000.00
Subcontractor/consultation/Employee services (list individual costs)	
Professional Services- Contract for Psychiatry Services	\$ 50,200
Psychiatrist \$5 hrs @\$350/hr	\$ 31,500
Psychologist: 12 hrs @\$200/hr	\$ 43,200
Social Worker: 10 hrs @ 150/hr	\$ 27,000
BCBA: 10 hrs @\$150 hr	\$ 27,000
Administration/promotion of cross functional team: 20 hrs @\$50/hr	\$ 24,000
Other Costs	
Occupancy/IT/Admin.	\$ 423,361
TOTAL Program Budget	\$ 2,299,526.14
Admin 10%	\$ 229,952.61
TOTAL FUNDED	\$ 2,529,478.75

**A-2
SAMPLE INCOME STATEMENT**

Developmental Disabilities Center dba Imagine!	
Income Statement	
From July 2024 to June 2025	
Ordinary Income/Expense	
Income	
4001- State Case Mgmt	\$ -
4002- State SLS Mgmt	\$ -
4003- State EI Mgmt	\$ -
4005- State Base EI	\$ -
4010- State Family & Children	\$ -
4040- State SLS	\$ -
4201- Eligibility Determination	\$ -
4250- Section 8 Housing	\$ -
4260- Other Govt Grants	\$ -
4300- Medicaid Admin	\$ -
4301- Medicaid Case Mgmt	\$ -
4330- CES Services	\$ -
4400- Medicaid Residential	\$ -
4401- FACILITY COMM PART	\$ -
4402- NON-FACILITY COMM PART	\$ -
4403- Supported Employment	\$ -
4404- Transportation	\$ -
4405- Behavioral	\$ -
4407- Spec Med Supplies	\$ -
4409- Vision	\$ -
4420- Uncollectible Medicaid	\$ -
4440- MEDICARE PART B	\$ -
4441- MEDICAID- STATE PLAN	\$ -
4460- Medicaid SLS Services	\$ -
4475- Child Welfare County Reserve	\$ -
4500- Food Stamp Revenue	\$ -
4600- Boulder Cnty Revenue	\$ -
4601- Broomfield Cnty Revenue	\$ -
4630- Other Government Income	\$ -
4700- Customer Fees	\$ -
4705- Rent & Utilities Revenue	\$ -
4710- Contract Revenues	\$ -
4735- Interest Income	\$ -
4740- Private Pay	\$ -
4745- TRUST FUND REVENUE	\$ -

4747- Uncollectible State	\$	-
4750- Other Revenue	\$	-
4775- Foundation Grants	\$	-
4780- Gain or Loss on Assets	\$	-
4900- In-Kind Donations	\$	-
Total- Income	\$	-
Expense		
5000-5002- Salaries	\$	-
5005-5010- Employee Taxes	\$	-
5015-5030- Employee Benefits	\$	-
5100-5109- Professional Services	\$	-
5110- Audit Expense	\$	-
5111- Legal	\$	-
5114- Pref Vision	\$	-
5115- Prof Behavioral	\$	-
5120- Consultants	\$	-
5150- Employee Education	\$	-
5160- Employee Events	\$	-
5170- Board of Directors Events	\$	-
5180- Mileage Reimbursement	\$	-
5190- Travel/Entertainment	\$	-
5200- Fuel and Oil	\$	-
5210- Vehicle Maintenance	\$	-
5300- Rent	\$	-
5310- Building Maintenance	\$	-
5320- Electric	\$	-
5321- Water	\$	-
5322- Gas	\$	-
5323- Sewer	\$	-
5324- Trash	\$	-
5325- Cable	\$	-
5330- Janitorial/Supplies	\$	-
5350- Equipment Maintenance	\$	-
5370- Equipment Lease	\$	-
5400- Office Expense	\$	-
5401- Printing/Copier Expense	\$	-
5402- Postage Expense	\$	-
5410- Medical/Client Supplies	\$	-
5411- Spec Med Equip	\$	-
5415- Pharmacy Supplies	\$	-
5420- Other Supplies	\$	-
5421- Technology Supplies	\$	-
5425- Equipment/Furn Over \$100	\$	-
5450- Telephone	\$	-

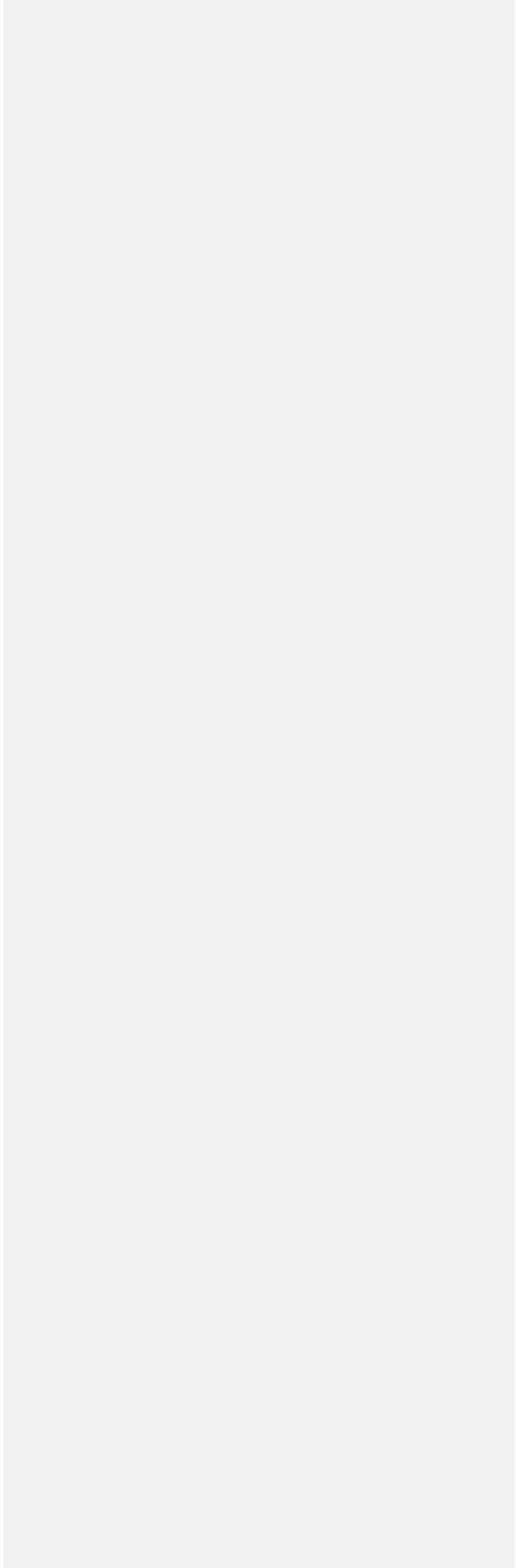
5425- Equipment/Furn Over \$100	\$	-
5450- Telephone	\$	-
5455- T1/Computer Lines	\$	-
4560- Dues and Fees	\$	-
5470- Pubs and Subs	\$	-
5490- Food	\$	-
5495- Food Stamp Expense	\$	-
5500- Consumer Activities	\$	-
5505- Audit Refunds	\$	-
5530- Consumer	\$	-
5550- State Grant	\$	-
5551- Boulder County Grant	\$	-
5552- Broomfield County Grant	\$	-
5700- Liability Insurance	\$	-
5750- Interest Building	\$	-
5755- Interest Expense	\$	-
5800- Advertising	\$	-
5810- Bad Debt Expense	\$	-
5820- Fund Raising Expense	\$	-
5830- Advertising/PR/Fred Only	\$	-
5830- Other Expenses	\$	-
5850- Bank/Payroll Charges	\$	-
5900- In-Kind Expense	\$	-
8000-8050 Deprec	\$	-
Total Expense	\$	-
Net Ordinary Income		
Other Income and Expenses		
Other Income		
4730- Realized Investment Earnings	\$	-
4731- Unrealized Investment Earnings	\$	-
Total- Other Income		
Other Expense		
9000- Periodic Pension Cost	\$	-
Total- Other Expense	\$	-
Net Other Income	\$	-
Net Income	\$	-

**EXHIBIT A-3
SAMPLE MONTHLY INVOICE BY PROGRAM**

Direct Services	Original Allocation	Jan-2020	Feb-2020	Mar-2020	Apr-2020	May-2020	Jun-2020
Mental Health							
School Age Services							
Nursing							
Adult Community Services							
Technology							
Embedded Behavior Supports							
Imagine Indirect Costs							
Total Direct and Indirect							
Service Administration							
Social Enterprise Services							
Total Contract							

Jul-2020	Aug-2020	Sep-2020	Oct-2020	Nov-2020	Dec-2020	Total Billed	% Billed
							0%
							0%
							0%
							0%
							0%
							0%
							0%
							0%
							0%
							0%
							0%
							0%

A-4
PROGRAM LEVEL REPORT



Name of Organization: _____
 Name of Program (should match funding award): _____
 Name of Person Completing Report: _____
 Program staff email to use if questions arise: _____

Quarterly Metrics	Q1	Q2	Q3	Q4
Total Clients Served by Quarter				
Number of clients served by Residency	Q1	Q2	Q3	Q4
Boulder				
Lafayette				
Louisville				
Longmont				
Other Cities Inside Boulder County				
Homeless Inside Boulder County				
Other Cities Outside Boulder County				
Homeless Outside Boulder County				
Unknown				
Number of clients served by Age	Q1	Q2	Q3	Q4
0-5				
6-12				
13-17				
18-24				
25-54				
55 or older				
Child- Age Unknown				
Adult- Age Unknown				
Direct Services By Program	Q1	Q2	Q3	Q4
Mental Health (Individuals enrolled)				
Behavioral Management and Therapies and Education				
School Age Services (Individuals enrolled)				
Adult Community Services (Individuals enrolled)				
Nursing				
Technology Services				
Social Enterprise				
Services Administration (Rep Payee)				
Race	Q1	Q2	Q3	Q4
American Indian/Alaska Native				
Asian				
Black/African American				
Native Hawaiian or other Pacific Islander				
Mixed Race				
White/Caucasian				
Other				
Unknown				
Hispanic, Latino or Spanish origin	Q1	Q2	Q3	Q4
No, Not of Hispanic, Latino, or Spanish origin				
Yes, of Hispanic, Latino, or Spanish origin				
Unknown				
TOTAL Number of Individuals served by Program by Gender	Q1	Q2	Q3	Q4
Male				
Female				
Non-binary				
Genderqueer/Gender non-conforming				
Agender				
Two-Spirit (specific to Indigenous respondents)				
Transgender				
GENDER Unknown				
School Aged Services	Q1	Q2	Q3	Q4
Current number clients served in school-aged services				
Current summer camp clients served				
Current summer camp waitlist				
Current clients taken off waitlist				
Adult Community Services	Q1	Q2	Q3	Q4
Current number clients served in adult community services				
Current adult community services on waitlist				
Current clients taken of waitlist				
Behavioral Management, Therapies and Education	Q1	Q2	Q3	Q4
Psychiatric Evaluations provided				
Psychotherapy and counseling assessment provided				
Behavioral assessment provided				
Psychological, neuropsychological, academic, and mental health evaluation pr	Q1	Q2	Q3	Q4
Medical testing provided				
Treatment Plans developed				
Mental Health and Dual Diagnosis	Q1	Q2	Q3	Q4
Number of persons within mental health services				
Nursing	Q1	Q2	Q3	Q4
Number of persons receiving nursing services				
Waitlist				
Service Administration	Q1	Q2	Q3	Q4
Number of persons participating in services				
Social Enterprise Services	Q1	Q2	Q3	Q4
Number of clients in program				
Art Shows attended				
Classes offered and number of participation				
Number of art work sold				

Notes

Quarterly Questions for Funders:

1. What % of program funding does this contract provide as a percent of the total program budget:
2. Please describe the ways in which this funding helps meet program goals:
3. Please briefly describe any gaps or areas of need that you are noticing emerge in the community:
4. This contract is funded by tax dollars. If you are able to share a success story of this program that we can share with the public, How do you know that the program is successful please provide a metric please do so here:

Name of Organization: _____
 Name of Program (should match funding award): _____
 Name of Person Completing Report: _____
 Program staff email to use if questions arise: _____

Quarterly Metrics	Q1	Q2	Q3	Q4
Total Clients Served by Quarter				
Number of clients served by Residency	Q1	Q2	Q3	Q4
Boulder				
Lafayette				
Louisville				
Longmont				
Other Cities Inside Boulder County				
Homeless Inside Boulder County				
Other Cities Outside Boulder County				
Homeless Outside Boulder County				
Unknown				
Number of clients served by Age	Q1	Q2	Q3	Q4
0-5				
6-12				
13-17				
18-24				
25-54				
55 or older				
Child- Age Unknown				
Adult- Age Unknown				
Direct Services By Program	Q1	Q2	Q3	Q4
Mental Health (Individuals enrolled)				
Behavioral Management and Therapies and Education				
School Age Services (Individuals enrolled)				
Adult Community Services (Individuals enrolled)				
Nursing				
Technology Services				
Social Enterprise				
Services Administration (Rep Payee)				
Race	Q1	Q2	Q3	Q4
American Indian/Alaska Native				
Asian				
Black/African American				
Native Hawaiian or other Pacific Islander				
Mixed Race				
White/Caucasian				
Other				
Unknown				
Hispanic, Latino or Spanish origin	Q1	Q2	Q3	Q4
No, Not of Hispanic, Latina/o, or Spanish origin				
Yes, of Hispanic, Latina/o, or Spanish origin				
Unknown				
TOTAL Number of Individuals served by Program by Gender	Q1	Q2	Q3	Q4
Male				
Female				
Non-binary				
Genderqueer/Gender non-conforming				
Agender				
Two-Spirit (specific to Indigenous respondents)				
Transgender				
GENDER Unknown				
School Aged Services	Q1	Q2	Q3	Q4
Current number clients served in school-aged services				
Current summer camp clients served				
Current summer camp waitlist				
Current clients taken off waitlist				
Adult Community Services	Q1	Q2	Q3	Q4
Current number clients served in adult community services				
Current adult community services on waitlist				
Current clients taken off waitlist				
Behavioral Management, Therapies and Education	Q1	Q2	Q3	Q4
Psychiatric Evaluations provided				
Psychotherapy and counseling assessment provided				
Behavioral assessment provided				
Psychological, neuropsychological, academic, and mental health evaluation provided	Q1	Q2	Q3	Q4
Medical testing provided				
Treatment Plans developed				
Mental Health and Dual Diagnosis	Q1	Q2	Q3	Q4
Number of persons within mental health services				
Nursing	Q1	Q2	Q3	Q4
Number of persons receiving nursing services				
Waitlist				
Service Administration	Q1	Q2	Q3	Q4
Number of persons participating in services				
Social Enterprise Services	Q1	Q2	Q3	Q4
Number of clients in program				
Art Shows attended				
Classes offered and number of participation				
Number of art work sold				

Notes

Quarterly Questions for Funders:

1. What % of program funding does this contract provide as a percent of the total program budget?
2. Please describe the ways in which this funding helps meet program goals:
3. Please briefly describe any gaps or areas of need that you are noticing emerge in the community:
4. This contract is funded by tax dollars. If you are able to share a success story of this program that we can share with the public, How do you know that the program is successful please provide a metric please do so here:

Funding Agreement
Human Services
Intellectual and Developmental Disability Grant Program

SUMMARY	
Contract Identification	
Oracle Number	303743
Agreement Name	A&I Avenues - HHS - Crisis Case Management
County Information	
Office or Department	Housing & Human Services
Division/Program	Partnerships, Contracts and Services Division
Mailing Address	PO BOX 471, Boulder, CO 80306
Project Manager Name and Email	Rebecca Seiden, rseiden@bouldercounty.gov
Other Contact Name and Email	Whitney Wilcox, wwilcox@bouldercounty.gov
Recipient Information	
Legal Entity Name	Adult Care Management Inc
Recipient d/b/a (if any)	A&I Avenues
Mailing Address	1665 Coal Creek Drive, Lafayette, CO 80026
Signer Name and Email	Barb Wilkins-Crowder (bcrowder@aiavenues.org) / Kathryn Arbour (karbour@aiavenues.org)
Other Contact Name and Email	N/A
Term	
Start Date	July 01, 2024
Expiration Date	December 31, 2024
Amount	
Funding Amount (not to exceed)	\$1,511,473
Agreement Documents	
Exhibit A - Use of Funds, Payment Schedule, and Administrative Requirements	

THIS FUNDING AGREEMENT ("**Agreement**") is entered into by and between the Board of County Commissioners on behalf of the County of Boulder, State of Colorado, a body corporate and politic, for the benefit of Housing & Human Services ("**County**") and Adult Care Management Inc ("**Recipient**"). County and Recipient are each a "**Party**," and collectively the "**Parties**."

RECITALS

A. The Developmental Disabilities property tax (the "**Tax**") was approved by voters in 2002 to supplement an existing mill levy to support developmental disabilities programs in Boulder County.

B. The County sets aside 2/3 of the revenues received from the Tax for funding services in the community that help people of all ages with cognitive and developmental disabilities, autism, and brain injury (BI) live fuller, more satisfying and independent lives (the “**Grant Program**”).

C. Recipient submitted a Grant Program application to the County, which application was reviewed and evaluated by the County and determined by the County to merit an award under the Grant Program.

Recipient has been awarded funding under the Grant Program.

AGREEMENT

1. Incorporation into Agreement: The **Summary, Recitals, and Agreement Documents** are incorporated into this Agreement by reference.

2. Use of Funds: Recipient must use the **Funding Amount** for the purposes, and pursuant to the terms, set forth in the Agreement Documents and in accordance with the Grant Program requirements.

3. Term of Agreement: The **Term** begins on the **Start Date** and expires on the **Expiration Date**, unless terminated sooner. The Funding Amount must be used during the Term.

4. Payment of Grant Funding: Subject to the terms contained herein, County will pay to Recipient an amount not to exceed the Funding Amount in accordance with the **Agreement Documents**.

5. Indemnity: Recipient will be liable for any damages to persons or property caused by or arising out of the actions, obligations, or omissions of Recipient, its employees, agents, representatives or other persons acting under Recipient's direction or control in performing or failing to perform its obligations under this Agreement. Recipient will indemnify and hold harmless County, its elected officials and appointed department heads, and its employees, agents and representatives (the "indemnified parties"), from any and all liability, claims, demands, actions, damages, losses, judgments, costs or expenses, including attorneys' fees, which may be made or brought or which may result against any of the indemnified parties as a result or on account of the actions or omissions of Recipient, its employees, agents or representatives, or other persons acting under Recipient's direction or control. This indemnification obligation will extend to claims based on Recipient's unauthorized use or disclosure of confidential information and intellectual property infringement. County will not be obligated to indemnify or defend Recipient under any circumstances. Recipient's obligations under this provision shall survive expiration or termination of this Agreement. Nothing contained in this Agreement is intended to limit or restrict the indemnification rights or obligations of any Party under this provision, or damages available for breaches of the obligations herein.

6. Nondiscrimination: Recipient will comply with the letter and spirit of the Colorado Anti-Discrimination Act, C.R.S. § 24-34-401, et seq., as amended, and all applicable local, State and Federal laws concerning discrimination and unfair employment practices. County prohibits unlawful discrimination on the basis of race, color, religion, gender, gender identity, national origin, age 40 and over, disability, socio-economic status, sexual orientation, genetic information, or any other status protected by applicable Federal, State or local law. Recipient must require that its subcontractors, if any, similarly comply with all applicable laws concerning discrimination and unfair employment practices.

7. Information and Reports: Recipient will provide to authorized County, State, and Federal government representatives all information and reports that may be required for any purpose authorized by law. Recipient will permit access to such representatives to Recipient's facilities, books, records, accounts, and any other relevant sources of information. Where information required by a representative is in the exclusive possession of a person or entity other than Recipient, Recipient must so certify to the County and explain what efforts it has made to obtain the information.

8. Independent Contractor: Recipient is an independent contractor for all purposes. Recipient is not an employee of the County for any purpose, including the Federal Insurance Contribution Act, the Social Security Act, the Federal Unemployment Tax Act, the provisions of the Internal Revenue Code, the Colorado Workers' Compensation Act, the Colorado Unemployment Insurance Act, and the Public Employees Retirement Association. Accordingly, County will not withhold or pay any income tax, payroll tax, or retirement contribution of any kind on behalf of Recipient or Recipient's employees. Recipient will exercise complete authority over its personnel and agents and will be fully responsible for their actions.

9. Termination for Breach: Either Party's failure to perform any of its material obligations under this Agreement, in whole or in part or in a timely or satisfactory manner, will be a breach. The institution of proceedings under any bankruptcy, insolvency, reorganization or similar law, by or against Recipient, or the appointment of a receiver or similar officer for Recipient or any of its property, which is not vacated or fully stayed within thirty (30) days after the institution of such proceeding, will also constitute a breach. In the event of a breach, the non-breaching Party may provide written notice of the breach to the other Party. If the notified Party does not cure the breach, at its sole expense, within thirty (30) days after delivery of notice, the non-breaching Party may exercise any of its remedies provided under this Agreement or at law, including immediate termination of this Agreement.

10. Termination for Convenience: County may terminate this Agreement, in whole or in part, for any reason and without penalty, upon thirty (30) days' advance written notice to Recipient.

11. Remedies for Non-Compliance: If Recipient fails to perform any of its obligations under this Agreement, County may, at its sole discretion, and in addition to any remedies available at law or in equity, require Recipient to repay to County all or any part of the Funding Amount.

12. Notices: All notices provided under this Agreement must be in writing and sent by Certified U.S. Mail (Return Receipt Requested), electronic mail, or hand-delivery to the other Party's **Contact** at the address specified in the Summary. For certified mailings, notice periods will begin to run on the day after the postmarked date of mailing. For electronic mail or hand-delivery, notice periods will begin to run on the date of delivery.

13. Statutory Requirements: This Agreement is subject to all statutory requirements that are or may become applicable to counties or political subdivisions of the State of Colorado generally, including but not limited to: C.R.S. § 38-26-107, which requires withholding funds where the County receives a claim for payment from a supplier or subcontractor of Recipient upon notice of final settlement (required for public works contracts that exceed \$150,000); C.R.S. § 8-17-101 et seq.; C.R.S. § 18-8-301, et seq.; and C.R.S. § 18-8-401, et seq.

14. Entire Agreement/Binding Effect/Amendments: This Agreement represents the complete agreement between the Parties and is fully binding upon them and their successors, heirs, and

assigns, if any. This Agreement terminates any prior agreements, whether written or oral in whole or in part, between the Parties relating to the subject matter hereof. This Agreement may be amended only by a written agreement signed by both Parties.

15. Assignment/Subcontractors: This Agreement may not be assigned or subcontracted by Recipient without the prior written consent of the County. If Recipient subcontracts any of its obligations under this Agreement, Recipient will remain liable to the County for those obligations and will also be responsible for subcontractor's performance under, and compliance with, this Agreement.

16. Governing Law/Venue: The laws of the State of Colorado govern the construction, interpretation, performance, and enforcement of this Agreement. Any claim relating to this Agreement or breach thereof may only be brought exclusively in the Courts of the 20th Judicial District of the State of Colorado and the applicable Colorado Appellate Courts.

17. Breach: The failure of either Party to exercise any of its rights under this Agreement will not be deemed to be a waiver of such rights or a waiver of any breach of the Agreement. All remedies available to a Party in this Agreement are cumulative and in addition to every other remedy provided by law.

18. Severability: If any provision of this Agreement becomes inoperable for any reason but the fundamental terms and conditions continue to be legal and enforceable, then the remainder of the Agreement will continue to be operative and binding on the Parties.

19. Third-Party Beneficiary: Enforcement of the terms and conditions and all rights and obligations of this Agreement are reserved to the Parties. Any other person receiving services or benefits under this Agreement is an incidental beneficiary only and has no rights under this Agreement. Notwithstanding, where the beneficiary **Department** is led by an Elected Official, such Elected Official shall be considered a third-party beneficiary.

20. Colorado Open Records Act: County may disclose any records that are subject to public release under the Colorado Open Records Act, C.R.S. § 24-72-101, et seq.

21. Conflict of Provisions: If there is any conflict between the terms of the main body of this Agreement and the terms of any of the Agreement Documents, the terms of the main body of the Agreement will control.

22. Governmental Immunity: Nothing in this Agreement shall be construed in any way to be a waiver of the County's immunity protection under the Colorado Governmental Immunity Act, C.R.S. § 24-10-101, et seq., as amended.

23. Representations and Warranties: Recipient represents and warrants the following:

- a. Execution of this Agreement and performance thereof is within Recipient's duly authorized powers;
- b. The individual executing this Agreement is authorized to do so by Recipient; and
- c. Recipient is authorized to do business in the State of Colorado and is properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over the Recipient.

24. Legal Compliance: Recipient assumes full responsibility for obtaining and maintaining any permits and licenses required to carry out its obligations hereunder. Recipient's performance under this Agreement will comply with all Federal, State, and local laws, regulations, ordinances and codes.

25. Delegation of Authority: The Parties acknowledge that the Board of County Commissioners has delegated authority to the Department Head or Elected Official that leads the beneficiary Department and their designees to act on behalf of the County under the terms of this Agreement, including but not limited to the authority to terminate this Agreement.

26. Publicity Releases: Recipient will not refer to this Agreement or the County in commercial advertising without prior written consent of the County. This provision shall survive expiration or termination of this Agreement.

27. Execution by Counterparts; Electronic Signatures: This Agreement may be executed in multiple counterparts, each of which will be deemed an original, but all of which will constitute one agreement. The Parties approve the use of electronic signatures, governed by the Uniform Electronic Transactions Act, C.R.S. §§ 24 71.3 101 to 121. The Parties will not deny the legal effect or enforceability of this Agreement solely because it is in electronic form or because an electronic record was used in its creation. The Parties will not object to the admissibility of this Agreement in the form of electronic record, or paper copy of an electronic document, or paper copy of a document bearing an electronic signature, because it is not in its original form or is not an original.

28. Limitation of Liability: COUNTY SHALL NOT BE LIABLE TO RECIPIENT FOR ANY DAMAGES ARISING FROM OR RELATING TO THIS AGREEMENT, REGARDLESS OF ANY NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

[Signature Page to Follow]

IN WITNESS WHEREOF, the Parties have executed and entered into this Agreement as of the latter day and year indicated below.

SIGNED for and on behalf of Boulder County		SIGNED for and on behalf of Recipient	
Signature:		Signature:	
Name:		Name:	
Title:		Title:	
Date:		Date:	
<p>↓↓ <i>For Board-signed documents only</i> ↓↓</p>			
Attest:	Initials		
Attestor Name:			
Attestor Title:			

EXHIBIT A
USE OF FUNDS, FEE SCHEDULE, AND ADMINISTRATIVE REQUIREMENTS

1. PURPOSE

Boulder County Department of Human Services (BCHS) is committed to co-creating solutions with its community partners to address complex participant and community challenges by fully, effectively, and efficiently integrating health, housing, and human services to strengthen the broad range of Social Determinants of Health, in turn generating a more self-sufficient, sustainable, and resilient community. The seven key areas of stability BCHS is targeting, and key priorities for the investment of BCHS funds, includes housing stability, employment and income stability, access to adequate food and nutrition, environmental health, health and well-being, safety, and education.

This Contract supports Case Management Agency (CMA) functions under the health and well-being pillar, and more specifically, ensures Boulder County residents with an Intellectual and Developmental Disability (IDD)/Developmental Disability (DD), Autism, and/or Brain Injury (BI) has (have) access to information and referral and independent living skills training. This Contract will also support access to crisis management services to mitigate emergencies, emergency placements, and unmet needs for persons with IDD/DD, Autism and/or BI that results in a disability. The Parties further acknowledge Recipient provides a continuum of services to persons experiencing an IDD/DD, Autism, and/or BI that results in a disability which may limit their ability to live an independent life in Boulder County.

Boulder County residents who are being served by Recipient may experience a crisis that requires a case management response beyond the normal programming. This Contract also provides funding for .85 of a Full Time Equivalent (FTE) of Crisis Case Management Specialist, to fill the gap in the existing service delivery system for residents living with IDD/DD, Autism and/or BI that results in a disability. The Crisis Management Specialist is responsible for providing crisis management services to Case Management and Intake departments at A&I Avenues assuring safety and well-being of the individual in services.

The Boulder County IDD Mill Levy supports Recipient in filling funding gaps for agreed upon services, as described in Section 3.A. These funds may provide additional services not covered by Medicaid, Medicare, and private insurance but may not supplant any existing services and/or funds.

The Boulder County IDD Mill Levy funds may be used to:

- A. Fund priority case management and support services in identified programs, as listed in Section 3.A., for Boulder County residents who meet the IDD Mill Levy definition of individuals with IDD/DD, Autism, and/or BI. Funds may also be used to provide value-added services that enhance services for Boulder County resident consumers of IDD/DD, Autism, and/or BI services.

- B. Collect performance and outcome data to determine the ongoing effectiveness of services listed in Section 3.A and plan for the implementation of new services for Boulder County.
- C. Support the system-wide efforts of the Boulder County IDD Advisory Council and improve overall communication between all stakeholders who are funded through the IDD Mill Levy. Support the recommendations in the Boulder County IDD needs assessment that are being implemented by the IDD Advisory Council.

2. PERFORMANCE RESPONSIBILITIES

Recipient, in accordance with the terms and conditions in this Contract, shall, in a timely and satisfactory manner, ensure Boulder County residents with an IDD/DD, Autism, and/or BI have access to Case Management Services to assist an individual with IDD/DD, Autism, and/or BI in accessing necessary services and supports to meet his or her needs. To this end, Recipient agrees to:

- A. Employment and supervision of .85 FTE for Crisis Case Management for IDD clients in crisis. Specific duties and job qualifications for this position are documented in Exhibit A-3: Job Description for Crisis Management Specialist.
 - o Any changes in Policies and Procedures for Crisis Management shall provide an avenue for input from BCHS and the IDD Advisory Council for input and feedback.
 - o Continue triage process for assessing and responding to clients experiencing crisis situations. Recipient agrees to solicit input and feedback into the design and implementation of this triage response system.
 - o Creation of a Plan-Do-Study-Act (PDSA) cycle in partnership with key stakeholders, including the Association for Community Living (ACL) to evaluate the effectiveness of this position, and to understand the impact of the additional capacity on the overall stability of clients experiencing crisis.
 - o Quarterly summaries of activities supported by this position, and associated client outcomes of activities.
- B. As needed, Recipient shall support participants in connecting with self-reliance benefits utilizing the Colorado PEAK online application and/or creating a Boulder County Connect (BCC) Account and encourage online system use for accessing case information, completing required actions on their cases and uploading documents.
- C. Provide culturally appropriate marketing materials of Recipient's services to other local agencies and Family Resource Centers who serve low-income and at-risk individuals to increase participant access to Recipient's services.
- D. As needed, work collaboratively with BCHS staff to develop and distribute culturally appropriate marketing materials that work to destigmatize access to and enrollment in public assistance benefits.

- E. Recipient shall take necessary steps to provide services virtually and/or adhere to any current public health emergencies and/or restrictions throughout the Contract term for services provided in-person. If Recipient is unable to provide services safely to meet client needs due to the public health restrictions, Recipient shall notify BCHS within 30 days.

3. ALLOCATION SERVICE AND PROGRAM AREAS

Boulder County residents who are being served by the following programs may receive services funded under this Contract:

A. Focus Area 1: Case Management Agency Functions

- 1. Case Management
- 2. Case Management Agency Functions
- 3. Emergency Situations
- 4. Crisis Management
- 5. Family Support Services
- 6. Autism Spectrum Disorder Services
- 7. Organized Healthcare Delivery System (OHCDs)

B. Focus Area 2: Indirect Costs and Evaluation Activities

- 1. Other operational costs that support administrative efficiencies
- 2. Evaluation activities, including but not limited to the annual satisfaction surveys by program area

4. TARGET POPULATION

- A. For the purposes of the IDD Mill Levy and the IDD Advisory Council, IDD has been further defined as:
 - 1. ***A documented intellectual and/or*** developmental disability that is manifested before the person reaches 22 years of age or brain injury acquired as an adult ***that results in a disability.***
 - 2. A ***documented*** disability attributed to a diagnosed intellectual disability or related conditions which include cerebral palsy, epilepsy, autism or other neurological conditions when such conditions result in EITHER impairment of general intellectual functioning OR adaptive behavior similar to that of a person with a diagnosed intellectual disability.
 - 3. ***Individual must be in process or have qualified for a Medicaid waiver or disability benefit program due to an IDD/BI/Autism diagnosis to receive IDD Mill Levy funding for emergency needs.***

- B. All Boulder County residents with IDD/DD, Autism, and/or BI who are at risk in Recipient's geographic service area for Boulder County and who need access to additional supportive case management services to mitigate or avoid a crisis.

5. **BUDGET**

- A. The projected allocation of funds across service delivery areas is outlined in the table below. For all allocations, the percentage of funding that is used can only be an "up-to" percentage based on the percentage of participants served by the program who are Boulder County residents.
- B. Emergency funds up to \$10,000 per household may be used for eligible needs, per Recipient's written policy. Unmet needs funds up to \$10,000 per household may be used for eligible needs, per Recipient's written policy. Exceeding these funds needs prior written approval from the Recipient's CEO and the BCHS Partnerships, Contracts, and Services (PCS) Division Director or designated Manager.
- C. Any budget transfer between programs in the Contract requires prior written approval from BCHS. Recipient shall request the transfer in writing along with a rationale for the requested change. Requests should be submitted to Whitney Wilcox at wwilcox@bouldercounty.gov.

6. **PAYMENT AND FISCAL REPORTING REQUIREMENTS**

- A. Monthly Invoicing
 - i. BCHS shall provide Recipient with a monthly invoice template.
 - ii. Recipient shall complete and submit monthly invoices and supporting documentation that supports the amount invoiced on/or the 30th calendar day following the reporting period regardless of the level of activity or amount of expenditure(s) in the preceding report period. Any invoices submitted 90 days after due date may not be accepted.
 - iii. Monthly invoiced expenses shall be for actual expenditures incurred by the Recipient.
 - iv. Recipient shall only invoice BCHS for Organized Health Care Delivery System (OHCDS) for the % of shortfall that is less than or equal to the % of Boulder County residents served by that program area, to ensure that Boulder County funds are not subsidizing services for residents who reside outside of Boulder County.
 - v. Recipient shall only invoice BCHS for actual number of Boulder County residents for all other programs.
 - vi. BCHS shall not pay for vacant positions funded through this Contract. Recipient shall not reallocate vacancy funds to another position without written approval of BCHS.
 - vii. Monthly invoiced expenses may not be reimbursable by any other funding source.

- viii. Monthly invoices shall only include expenditures for the prior billing period. Any adjustments to a previously billed period need to be billed as an amendment to a previous invoice.
- ix. The invoice shall contain the name and title of the person authorized, or his or her designee, to submit claims for payment. All invoices, supporting documentation, and applicable reports shall be submitted electronically to BCHS via email to: hhsaccountingoffice@bouldercounty.gov.

B. Supporting Documentation

- i. Monthly invoices shall be supported by a general ledger and/or sub-ledger detail generated from the Recipient's accounting system to include payee, description, date, and amount.
 - 1. For participant services, participant initials or non-identifying information and purpose should be included.
 - 2. For personnel requests, an excerpt of the payroll register from the paying system is appropriate. The payroll register should include staff name(s) or initials, period paid, salary and itemized employer-paid taxes and benefits.
- ii. Fiscal Reporting Requirements
 - 1. Monthly fiscal reporting
 - 2. Recipient shall provide the revenues and expenditures for each service delivery area in Section 1.B. above. Information should be submitted in an income statement format, with a level of detail similar to Exhibit A-2, Sample Income Statement.
 - 3. Recipient shall provide an agency-level income statement.
 - 4. All fiscal reports will be due on a monthly basis, by the 30th calendar day following the reporting period and shall be submitted to: HHSimpactreporting@bouldercounty.gov.
- iii. Supporting documentation submitted with monthly invoices must meet or exceed the amount being invoiced.
 - 1. Recipient shall keep on site for BCHS review, for the Contract term plus three years, the following supporting documentation for each invoice:
 - 2. Non-personnel reimbursements must be supported by general ledger or sub-ledger detail generated from Recipient's accounting system.
 - a. The ledger detail should include payee, description, date and amount.
 - b. For participant services, participant name and purpose must

- be maintained on file (for those participants who have signed an authorization to release information).
 - c. The documentation should include all receipts and/or other original support. Receipts are required for purchases from a single vendor more than \$100.
 - d. Travel expenditures should include travel expense reports.
 - e. Mileage will be reimbursed at a rate equal to or less than the IRS standard mileage rate.
 - 3. For personnel requests, an excerpt of the payroll register from the paying system is appropriate. The payroll register should include staff name(s) or initials, period paid, salary and itemized employer-paid taxes and benefits.
 - a. Staff working less than 100% on Contracted work may be required via a written amendment to maintain an accurate daily record of hours worked and correct charge codes. These records shall be made available to BCHS during financial review visits or upon request.
 - iv. If Recipient does not produce sufficient documentation as described above at financial review visits, BCHS has the right to recapture any unsupported payments.

C. Payments

- i. Monthly invoices, supporting documentation, and all required deliverables as outlined in, Section 7., Deliverable and Reporting Requirements must be submitted in a timely manner and in accordance with the terms of the Contract in order to receive payment.
- ii. BCHS will reimburse the Recipient within 30 days of receipt and approval of a fully supported and payable invoice. BCHS will follow-up with Recipient within 15 days of receipt should there be any questioned or unsupported costs.
- iii. BCHS will reimburse the Recipient within 30 days of receipt of all required deliverables as outlined in Section 7. Deliverables and Reporting Requirements, and the Payment and Reporting Requirements Section 2. Payment and Fiscal Reporting Requirements.
- iv. BCHS will follow-up with the Recipient within 15 days of receipt should there be any additional documentation required.

D. Internal Controls

- i. Recipient shall maintain written internal control policies and procedures around financial and accounting practices, including procurement policies and procedures.

- ii. Confidentiality of Participant Information and Records: Recipient shall maintain best practices for safeguarding confidential information, including signed certification from Recipient's directors, officers and employees.
- iii. Conflict of Interest: Recipient shall maintain best practices regarding conflicts of interest, including signed certification from Recipient's directors, officers and employees.
- iv. Written policies and procedures shall be made available to BCHS during financial review visits or upon request. During the Contract term, BCHS will request to review Recipient's procurement policy.

7. REFERRALS FOR SERVICE

- A. For those participants who are not enrolled for Supplemental Nutrition Program (SNAP) or Medicaid benefits, Recipient shall refer them to BCHS, for eligibility and enrollment screening.
- B. Recipient shall make referrals to appropriate service providers in effort to move participants from crisis to stability, establishing a network of care supporting the participant.
- C. As appropriate for the participant, recipient shall refer all participants and family members to their local Family Resource Center (OUR Center, Emergency Family Assistance Association (EFAA), or Sister Carmen Community Center) for additional stabilizing services, depending on their geographic location.

8. MEETINGS AND COMMUNICATIONS

- A. BCHS and Recipient shall meet bimonthly or more to evaluate Contracted budget levels and program effectiveness that may include:
 - 1. Recommendations for modifications in the scope of services for this Contract,
 - 2. Technical assistance necessary to enable the performance of this Contract by Recipient, or the specification of necessary additional services to enable the Recipient's performance of the services provided under this Contract.
- B. A fiscal review may be conducted up to two times during the Contract term. Prior to this review, BCHS may request documentation including a copy of Recipient's published annual report for the prior year.
- C. Recipient shall attend applicable trainings and meetings as available.

9. DELIVERABLE AND REPORTING REQUIREMENTS

- A. Recipient shall submit quarterly reports by the 30th day following the end of the quarter using the metrics outlined in Exhibit A-5, Program Level Report.
 - 1. Quarterly reports will be submitted by email to hhsimpactreporting@bouldercounty.gov.

2. Excel reporting form will be sent to BCHS for quarterly report submission by Recipient.
- B. Recipient will provide copies of any required State Level Reports upon request.
1. Submit to the following email: hhsimpactreporting@bouldercounty.gov
- C. Recipient shall submit an annual qualitative report at the conclusion of each Contract term. Annual reports shall be submitted no later than 30 days after conclusion of contract. Reports shall be submitted to hhsimpactreporting@bouldercounty.gov.
- D. Recipient shall submit an annual report each year summarizing Data Collection and Evaluation Exhibit A-7 that indicates satisfaction and support of general operating funded programs no later than 30 days after conclusion of contract. Report shall be submitted to hhsimpactreporting@bouldercounty.gov.
- E. Recipient shall notify BCHS within 30 days of vacancies for positions funded under this Contract. Notification shall be sent in writing to Whitney Wilcox at wwilcox@bouldercounty.gov.

10. RECIPIENT RECORDS AND INSPECTION

- A. Recipient shall maintain a file of all documents, records, communications, notes and other materials relating to the services provided under this Contract (the "Records").
- B. Recipient shall permit the County to audit, inspect, examine, excerpt, copy and transcribe Records for payer purposes during the state-defined Record Retention Period. Recipient shall make Records available during normal business hours at a Recipient office or place of business, or at other mutually agreed upon times or locations, upon no fewer than two business days' notice.
- C. Training and credentialing records of staff shall be made available upon request.

11. ROLE OF RECIPIENT OVERSIGHT OF FUNDS

- A. Recipient shall oversee the expenditure of Boulder County IDD Mill Levy in providing effective IDD/DD, Autism and/or BI-specific services.
- B. Recipient shall ensure that funds utilized by this Contract do not supplant Medicaid nor other funds that can cover consumer services.
- C. Recipient shall determine eligibility for Boulder County consumers' status, using the eligibility definition from Boulder County's IDD Mill Levy language per section 4 above.
- D. Recipient shall determine and report on actual number of consumers served who are residents of Boulder County by program area.
- E. Recipient may braid or leverage Contract funds with other funding sources in order to enhance services and/or expand capacity to serve consumers.

12. PLACEMENT OF CONSUMERS SEEKING SERVICES INTO THE APPROPRIATE LEVEL OF CARE

- A. Recipient shall assure use of a standardized placement protocol based upon the most recent Supports Intensity Scale (SIS) to assess accurately each consumer for the most appropriate level of care. Other assessments may be used that are population-specific to determine level of care.

13. SCHEDULE OF ATTACHMENTS:

The following attachments to this Exhibit are hereby attached and incorporated by this reference:

- 1. Exhibit A-1, Budget Form
- 2. Exhibit A-2, Sample Income Statement
- 3. Exhibit A-3, Monthly Invoice Coversheet with Allocation by Program
- 4. Exhibit A-4, Sample Monthly Program Invoice Detail with % Boulder County Residents as A Multiplier
- 5. Exhibit A-5, Program Level Report
- 6. Exhibit A-6, Descriptions of Services and Numbers Served by Program
- 7. Exhibit A-7, Data Collection and Evaluation in Support of General Operating Funded Programs

**EXHIBIT A-1
BUDGET FORM**

Boulder County Department of Housing and Human Services IDD 1/2 2024 Budget

Contract Term: 07/01/2024 to 12/31/2024

Agency Name: A&I Avenues

Program Name: Case Management Agency (CMA)

2024 Approved Amount 1,511,473

Once you have matched the award amount below, this should be "0" : \$ 0

Feel free to add or change expense rows categories to this form

DESCRIPTION	Budget of Line Item
Subtotal Salaries (including retention bonuses)	\$ 394,465
Subtotal Payroll Taxes & Benefits	\$ 40,669
Operating Expenses	\$ 0
Equipment	\$ 0
Subcontractor/Consultation Subtotal	\$ 832,435
Subtotal Other Costs	\$ 106,497
Subtotal CMA Costs	\$ 1,374,066
10% Admin	\$ 137,407
TOTAL Program Budget	\$ 1,511,473

**EXHIBIT A-2
SAMPLE INCOME STATEMENT**

A&I Avenues	
Income Statement	
From July 2024 to December 2024	
Ordinary Income/Expense	
Income	
4001- State Case Mgmt	\$ -
4002- State SLS Mgmt	\$ -
4003- State EI Mgmt	\$ -
4005- State Base EI	\$ -
4010- State Family & Children	\$ -
4040- State SLS	\$ -
4201- Eligibility Determination	\$ -
4250- Section 8 Housing	\$ -
4260- Other Govt Grants	\$ -
4300- Medicaid Admin	\$ -
4301- Medicaid Case Mgmt	\$ -
4330- CES Services	\$ -
4400- Medicaid Residential	\$ -
4401- FACILITY COMM PART	\$ -
4402- NON-FACILITY COMM PART	\$ -
4403- Supported Employment	\$ -
4404- Transportation	\$ -
4405- Behavioral	\$ -
4407- Spec Med Supplies	\$ -
4409- Vision	\$ -
4420- Uncollectible Medicaid	\$ -
4440- MEDICARE PART B	\$ -
4441- MEDICAID- STATE PLAN	\$ -
4460- Medicaid SLS Services	\$ -
4475- Child Welfare County Reserve	\$ -
4500- Food Stamp Revenue	\$ -
4600- Boulder Cnty Revenue	\$ -
4601- Broomfield Cnty Revenue	\$ -
4630- Other Government Income	\$ -
4700- Customer Fees	\$ -
4705- Rent & Utilities Revenue	\$ -
4710- Contract Revenues	\$ -
4735- Interest Income	\$ -
4740- Private Pay	\$ -

5160- Employee Events	\$	-
5170- Board of Directors Events	\$	-
5180- Mileage Reimbursement	\$	-
5190- Travel/Entertainment	\$	-
5200- Fuel and Oil	\$	-
5210- Vehicle Maintenance	\$	-
5300- Rent	\$	-
5310- Building Maintenance	\$	-
5320- Electric	\$	-
5321- Water	\$	-
5322- Gas	\$	-
5323- Sewer	\$	-
5324- Trash	\$	-
5325- Cable	\$	-
5330- Janitorial/Supplies	\$	-
5350- Equipment Maintenance	\$	-
5370- Equipment Lease	\$	-
5400- Office Expense	\$	-
5401- Printing/Copier Expense	\$	-
5402- Postage Expense	\$	-
5410- Medical/Client Supplies	\$	-
5411- Spec Med Equip	\$	-
5415- Pharmacy Supplies	\$	-
5420- Other Supplies	\$	-
5421- Technology Supplies	\$	-
5425- Equipment/Furn Over \$100	\$	-
5450- Telephone	\$	-
5455- T1/Computer Lines	\$	-
4560- Dues and Fees	\$	-
5470- Pubs and Subs	\$	-
5490- Food	\$	-
5495- Food Stamp Expense	\$	-
5500- Consumer Activities	\$	-
5505- Audit Refunds	\$	-
5530- Consumer	\$	-
5550- State Grant	\$	-
5551- Boulder County Grant	\$	-
5552- Broomfield County Grant	\$	-
5700- Liability Insurance	\$	-
5750- Interest Building	\$	-
5755- Interest Expense	\$	-
5800- Advertising	\$	-

5425- Equipment/Furn Over \$100	\$	-
5450- Telephone	\$	-
5455- T1/Computer Lines	\$	-
4560- Dues and Fees	\$	-
5470- Pubs and Subs	\$	-
5490- Food	\$	-
5495- Food Stamp Expense	\$	-
5500- Consumer Activities	\$	-
5505- Audit Refunds	\$	-
5530- Consumer	\$	-
5550- State Grant	\$	-
5551- Boulder County Grant	\$	-
5552- Broomfield County Grant	\$	-
5700- Liability Insurance	\$	-
5750- Interest Building	\$	-
5755- Interest Expense	\$	-
5800- Advertising	\$	-
5810- Bad Debt Expense	\$	-
5820- Fund Raising Expense	\$	-
5830- Advertising/PR/Fred Only	\$	-
5830- Other Expenses	\$	-
5850- Bank/Payroll Charges	\$	-
5900- In-Kind Expense	\$	-
8000-8050 Deprec	\$	-
Total Expense	\$	-
Net Ordinary Income		
Other Income and Expenses		
Other Income		
4730- Realized Investment Earnings	\$	-
4731- Unrealized Investment Earnings	\$	-
Total- Other Income		
Other Expense		
9000- Periodic Pension Cost	\$	-
Total- Other Expense	\$	-
Net Other Income	\$	-
Net Income	\$	-

**EXHIBIT A-3
MONTHLY INVOICE TEMPLATE COVERSHEET WITH ALLOCATION BY PROGRAM**

Excel file to be supplied by BCHS.

Case Management Agency Functions	Original Allocation	Jan-2020	Feb-2020	Mar-2020	Apr-2020	May-2020	Jun-2020
Case Management Functions	250,000						
Emergency Situations	150,000						
Emergency Placements	75,000						
Unmet Needs	75,000						
Family Support Services Program	855,000						
Autism Spectrum Disorder	295,000						
OHCDS	100,000						
Total CM Functions	18,000,000.00						

Jul-2020	Aug-2020	Sep-2020	Oct-2020	Nov-2020	Dec-2020	Total Billed	% Billed
							0%
							0%
							0%
							0%
							0%
							0%
							0%
							0%

**EXHIBIT A-5
PROGRAM LEVEL REPORTS
Crisis Management:**

Quarterly Metrics	Q1	Q1	Q2	Q2	Q3	Q3	Q4	Q4
	Unduplicated	Duplicated	Unduplicated	Duplicated	Unduplicated	Duplicated	Unduplicated	Duplicated
Crisis Management cases by residency								
Boulder								
Lafayette								
Louisville								
Longmont								
Other Cities Inside Boulder County								
Homeless Inside Boulder County								
Other Cities Outside Boulder County								
Homeless Outside Boulder County								
Unknown								
Number of cases by Residency	0	0	0	0	0	0	0	0
Crisis Management cases by Age								
0-5								
6-12								
13-17								
18-24								
25-54								
55 or older								
Child- Age Unknown								
Adult- Age Unknown								
Total	0	0	0	0	0	0	0	0
(Total Unable to Serve)								
Race								
American Indian/Alaska Native								
Asian								
Black/African American								
Native Hawaiian or other Pacific Islander								
Mixed Race								
White/Caucasian								
Other								
Unknown								
Total Race	0	0	0	0	0	0	0	0
Hispanic, Latino or Spanish origin								
No, Not of Hispanic, Latina/o, or Spanish origin								
Yes, of Hispanic, Latina/o, or Spanish origin								
Unknown								
Total Origin	0	0	0	0	0	0	0	0
Referrals outside A&I Avenues funding								
	Q1	Q1	Q2	Q2	Q3	Q3	Q4	Q4
	Unduplicated	Duplicated	Unduplicated	Duplicated	Unduplicated	Duplicated	Unduplicated	Duplicated
SSM domains addressed								
Food								
Housing								
Income								
Childcare								
Employment								
Money Management								
Transportation								
Workplace Skills								
Adult Education								
Child Education								
Parenting Skills								
Relationship Safety								
Support System								
Life Skills (Household Management)								
Healthcare Coverage								
Physical Health								
Mental Health								
Substance Abuse								
Functional Ability								
Criminal Justice System								
Legal (non-criminal)								
Quarterly Questions for Funders:								
1. What % of program funding does this contract provide as a percent of the total program budget:								
2. Please describe the ways in which this funding helps meet program goals:								
3. Please briefly describe any gaps or areas of need that you are noticing emerge in the community:								
4. This contract is funded by tax dollars. If you are able to share a success story of this program that we can share with the public, how do you know that the program is successful please provide a metric please do so here:								

Case Management:

Quarterly Metrics	Q1	Q2	Q3	Q4
Number of clients served by A&I Avenues				
Numer of clients served by Residency				
Boulder				
Lafayette				
Louisville				
Longmont				
Other Cities Inside Boulder County				
Homeless Inside Boulder County				
Other Cities Outside Boulder County				
Homeless Outside Boulder County				
Unknown				
Number of clients served by Age				
0-5				
6-12				
13-17				
18-24				
25-54				
55 or older				
Child- Age Unknown				
Adult- Age Unknown				
Total	0	0	0	0
(Waitlist/Unable to Serve)				
Case Management Agency Served By Program				
Case Management / CMA Functions				
Family Support Services Program (Individuals enrolled)				
Autism Spectrum Disorder Program				
IQ and or adaptive testing				
Organized Healthcare Delivery System (OHCDS)				
Race				
American Indian/Alaska Native				
Asian				
Black/African American				
Native Hawaiian or other Pacific Islander				
Mixed Race				
White/Caucasian				
Other				
Unknown				
Total Race	0	0	0	0
Hispanic, Latino or Spanish origin				
No, Not of Hispanic, Latina/o, or Spanish origin				
Yes, of Hispanic, Latina/o, or Spanish origin				
Unknown				
Total Origin	0	0	0	0
Quarterly Questions for Funders:				
1. What % of program funding does this contract provide as a percent of the total program budget:				
2. Please describe the ways in which this funding helps meet program goals:				
3. Please briefly describe any gaps or areas of need that you are noticing emerge in the community:				
4. This contract is funded by tax dollars. If you are able to share a success story of this program that we can share with the public, how do you know that the program is successful please provide a metric please do so here:				

EXHIBIT A-6
DESCRIPTION OF SERVICES AND NUMBERS SERVED BY PROGRAM

Case Management

Case Management serves as the gateway to services at A&I Avenues. Once individuals qualify for support through the intake and eligibility process, they, along with their family, guardian/s, and providers meet with a Case Manager to discuss which services will help them reach their goals. The Case Manager then drafts a Service Plan. These plans focus on the goals discussed in the meeting and outline the strategy for addressing them. Working directly with individuals and their families, the Case Manager helps identify appropriate services and supports the team in locating a provider/s for the individual. Frequent reviews of the Service Plan ensure that the services remain relevant to each individual's needs.

Case Management activities include:

1. Functional Assessment– determines eligibility for services
2. Supports Intensity Scale – determines the level of need
3. Service Plan Development
4. Service and Support Coordination
5. Monitoring and follow-up activities
6. Intake and Eligibility
7. Reporting/reviewing/follow up of critical incidents
8. Reviewing/follow up of complaints
9. Utilization review – services provided
10. Documentation of all case management activities

Case Management - Other Functions

Case Management functions include developing a network of qualified providers within the Recipient catchment area, developing ties within the community to help utilized funding services and supports efficiently, assuring the quality of services and supports of all providers, administering a Family Support Council, a Community Advisory Committee, a Human Rights (HRC) Committee, and complying with all Federal and State regulations. Community Centered Board activities are underfunded, or unfunded, by Colorado yet A&I Avenues must deliver on them as a contractor of the state.

Boulder County funding will be used to improve the effectiveness and efficiency of Case Management provided to families by funding three FTE called Case Specialist I.

Case Specialist I works in collaboration with the ongoing case manager to support individuals in crisis. This position is reactive and provides support to typical case managers by alleviating crisis situations on their behalf. They do not have an identified caseload but rather take cases on temporarily as needed. This position will provide immediate support to case managers so they can continue to meet their daily job tasks and avoid burnout.

In addition to three Case Specialist I positions, Boulder County funding will be used to provide enhanced case management to individuals in Boulder County by funding three Case Specialist II positions.

Case Specialist II provides enhanced case management to a small caseload (either children OR adults) who have ongoing, intense needs. This position is proactive and provides a higher level than typical case management to avoid crisis. This position has an identified caseload.

Both of the positions above are different from a Crisis Specialist who assures delivery of crisis management services to persons in the intake process, enrolled in Early Intervention, Family Support, Autism Spectrum Disorder program or an HCBS waiver, assures timely and efficient completion of documentation for crisis coordination, and creates, manages and delegates budget for emergency situations included but not limited to emergency funds situations, unmet needs funds, and emergency placements. This is an agency wide position who is mostly responsible for vetting, approving, paying for, tracking, budgeting, and reporting on crisis funding. This position does not act as a Case Manager.

In July of 2023, Health Care Policy and Financing (HCPF) rolled out a new IT system called the Care and Case Management (CCM) Tool. This had required extensive training and modification to Case Management processes, procedures, and training documents. With the support of two types of Case Specialists, typical intake and ongoing case managers will be able to take the appropriate time needed to invest in system and process changes.

Additionally, A&I Avenues will use \$3,750 of Boulder County funding to support enhanced training of Case Management employees between July 1, 2024, and December 31, 2024, and \$4,500 investment in a website tool being created by a 3rd party that will assist case managers and the community in finding appropriate service solutions (Wayfinder).

Boulder County funding will also be used to pay \$5,000 in retention bonuses to case management employees who are not eligible for state funded bonuses.

In regard to reporting outcomes for Case Management, A&I Avenues measures and reports on the departments Key Performance Indicators which include percentage of annual individualized plans of care (Service Plans) submitted on time, percentage of quarterly monitoring completed, and percentage of Per Member/Per Month Case Management. It is anticipated that with additional FTE, these key performance indicators will improve with time. Each indicator has a significant impact on customer service.

Submitting Service Plans on time allows providers serving clients to be aware of the goals and services the client has chosen to participate in. It allows them to have a contract in order to know what they are able to bill in a timely manner as well. Quarterly monitoring allows Case Managers to monitor the health and safety of our clients. On a monthly basis (at a minimum), Case Management makes sure we have a pulse on individual needs. In addition to these outcomes, A&I Avenues sends a monthly Customer Satisfaction Survey for Intake and an annual survey for Case Management. These results are shared annually. A&I Avenues will use \$90,072.25. in Boulder County funds to support IT and occupancy costs for the Case Management team. The

total request for Case Management Agency's functions is \$330,302 for July 01, 2024, through December 31, 2024.

Crisis Management

Crisis Management includes grant funding needed to mitigate or avoid a crisis that would place an individual's health and safety at risk. There is a need for crisis support for both ongoing cases and the intake department. The Crisis Specialist is in support of this program, and shall oversee the Emergency Situations Funds, Unmet Needs, and Emergency Placement funds allocated from this contract. Specifically, this Contract provides funding for .85 of a Full Time Equivalent (FTE) of Crisis Specialist, to fill the gap in the existing service delivery system for residents living with Intellectual Developmental Disabilities (IDD), Autism, and Brain Injury as defined.

Crisis situations can include medical and dental care not covered by other means, respite care beyond a family's resources, or an eligible individual's temporary food or housing assistance. In calendar year 2022 and 2023, A&I Avenues observed an uptick in emergency funding requests due housing.

Funding is needed for rapid enrollment into services for people transitioning from incarceration, are at risk of incarceration, or who are homeless. Additionally, funding will be used for IDD determinations, intensive case management, and direct services. A&I Avenues has seen an increase in the number of individuals who are either homeless or in jail and will require this funding to get them enrolled into a waiver to meet their needs in the community. This category of funds is called Emergency Placements funds.

The Unmet Needs Fund is intended to assist in the event of an emergent or crisis situation when no other funding source is available, or when the individual is enrolled in a program and has needs that cannot be met within that program. A&I Avenues is serving individuals in Medicaid waivers who are unable to have all of their needs met by that waiver. Emergent or crisis situations are unexpected events that have a significant impact on the person's health, safety or welfare or may pose a threat to the health, safety, or welfare of the individual if assistance is not available. The fund is intended to address short term needs and is not intended to be ongoing financial support for an individual. Requests will only be considered one time per fiscal year for an individual.

These funds are not available through any other existing funding streams.

Total grant funding request for Crisis Management services including Emergency Situations, Placements and Unmet Needs is \$175,000 for July 1, 2024, through December 31, 2024. Additionally, Boulder County will fund \$2,750 of IT and occupancy charges for a total of \$200,292 in funding.

Family Support Services

Currently there are approximately 1,000 people eligible for Family Support Services in Boulder County. To be eligible for this service, the person must live at home with family. FSSP provides information, referral, and financial assistance.

Family Support Services include:

- Respite Care
- Professional Services
- Medical and Dental Services
- Transportation
- Other Individual Expenses related to person's disability
- Assistive Technology
- Home Modification
- Parent and Sibling Support

The State of Colorado requires A&I Avenues to complete an annual Most in Need (MIN) Assessment for all eligible Family Support Services Program participants. Funding allocations are assigned based on MIN scores of “high”, “moderate”, and “low”. Families may only access a grant with an annual MIN on file with A&I Avenues. Our projections suggest that 450 families will likely request assistance beyond that funded by the State of Colorado and we propose to fund all of them. The state funds each family \$1,700 which is typically not adequate to serve the needs of a family with an individual with an IDD. FSSP funds that are funded by Boulder County Mill Levy funds may be accessed by undocumented individuals who would meet definition of disability.

Regarding outcomes, this department will report on how families use their grant funding. Each year A&I Avenues sends a Customer Satisfaction Survey, and this data will show if families had additional needs beyond their funding. This tells A&I Avenues how effective the program is in meeting the needs of families not otherwise eligible for a Medicaid waiver. A&I Avenues will outreach to BIPOC communities to better communicate the utilization of these funds.

Total request for Family Support Services is \$676,802. of which is to support 3.98 FTE, \$11,213 is for IT and occupancy costs supporting the Family Support Services team, and \$534,685 for direct grants to families.

Autism Spectrum Disorder (ASD) Services:

The Autism Spectrum Disorder (ASD) Program is unique in that it is a self-selected and self-directed set of services for individuals who do not meet the criteria of having an Intellectual/Developmental Disability (IDD) in Colorado. The family creates a plan of care around a significant need that they will address over three years. The program enrollment is limited to three years. Services are selected and ordered by the family on-line using an allocation of funds that they can track. The selection is made from a list of independent providers who specialize in a variety of services appropriate to people with ASD. Provider's bill A&I Avenues at market rates and A&I Avenues pays from each family's allocation.

Services can include:

- Behavior therapy, planning and intervention for social and emotional support.
- Family-Recruited Providers who follow social integration or behavior support plans.
- Social integration activities.

- Speech therapy, Occupational Therapy, or Physical Therapy.
- Psychological, psychiatric, and other services from licensed professionals.
- Therapeutic recreation activities including therapeutic summer camps.
- Remedial tutoring.
- Alternative Intervention Therapies.*

**At its discretion, A&I Avenues may agree to fund a professional service or program for alternative therapies, but does not endorse, verify, recommend or vouch for the safety, quality or efficacy of a particular provider, program, or treatment.*

Individuals with Autism Spectrum Disorder are not eligible for Home and Community Based Services Medicaid waivers, so they are funded with local dollars. The ASD Program Reporting includes what was funded and how it impacted families in a positive way who are caring for a child/young adult with ASD. A&I Avenues shall submit a copy of the client satisfaction survey results to BCHS upon execution of Contract.

Total request for funding the ASD program is \$146,754.00 which includes \$30,927.00 for 1.33 FTE, \$109,500.00 for direct grants to families and \$2,461.25 for IT and occupancy costs.

IQ and/or Adaptive Testing

The state of Colorado requires IQ and Adaptive testing to complete an IDD determination for individuals aged 5 and up. Each year, A&I Avenues is contacted by families who do not currently have the documentation they need, nor the funds necessary to obtain the testing that is required. We anticipate serving approximately 15 families in the second half of this year who will require assistance in funding these required assessments. A&I Avenues is requesting \$5,000 to support these tests.

Organized Healthcare Delivery System (OHCDS)

A&I Avenues acts as an OHCDS to support the needs of its consumers. When program approved provider agencies (PASAs) are not available to provide a service that is indicated on a consumer's service plan, A&I Avenues will contract with qualified providers to provide that service. Only those providers that meet the standards of our mission and code of conduct will be afforded the relationship with A&I Avenues. Items purchased include products (assistive technology, home accommodations, weighted blankets, etc.) and a wide variety of services (dental, vision, behavioral, mental health, music therapy, and hippotherapy, etc.).

This is an unfunded service provided by A&I Avenues. A&I Avenues is requesting \$14,916.00 to support this service which is for 0.77 FTE in the business office.

A&I Avenues Indirect Costs

A&I Avenues indirect supports include finance, human resources, information technologies, building costs, community outreach, provider contracts management, and corporate integrity. The administrative overhead is fixed at 10%.

EXHIBIT A-7
DATA COLLECTION AND EVALUATION IN SUPPORT OF GENERAL OPERATING FUNDED PROGRAMS

The following evaluation efforts and reports shall be conducted as described below, in support of the IDD Mill Levy funding. Annual reports summarizing the results of evaluation efforts A through C below shall be submitted yearly HHImpactreporting@bouldercounty.gov.

- A. Family Support Services use annual satisfaction surveys in conjunction with an Individual Family Support Plan which is reviewed annually for each person enrolled.
- B. Case Management conducts annual satisfaction surveys and develops an Individualized plan for each recipient of service.
- C. Intake for determination of IDD also conducts family satisfaction with the intake process immediately after completion of the process regardless of determination outcome and will report quarterly.



Department of Human Services

2525 13th Street, Suite 204 • Boulder, Colorado 80304 • Tel: 303.441.1000 Fax: 720.564.2283
Boulder Office • 3460 Broadway • Boulder, Colorado 80304 • Tel: 303.441.1000 Fax
303.441.1523 515 Coffman Street • Longmont, Colorado 80501 • Tel: 303.441.1000

www.bouldercountyhhs.org

To: Boulder County Board of County Commissioners
From: Rebecca Seiden, IDD Mill Levy Program Coordinator
Date: June 4, 2024
Re: Waiver of Bid Requirements for A&I Avenues, Case Management Agency

Request:

Boulder County Department of Human Services (BCDHS) is requesting a waiver of bid requirements to contract with A&I Avenues, a provider who serves Boulder County’s Intellectual and Developmental Disability (IDD), Autism, and Brain Injury population with its Case Management Agency.

Budget:

The budget for the work from July 1, 2024, to December 31, 2024, shall not exceed \$1,511,473 and shall be covered by IDD mill levy funds.

Background:

A&I Avenues is the new sole source provider of the regional “single entry point” as identified by the State of Colorado for Case Management in accordance with Case Management Redesign. Per State guidelines, A&I Avenues includes IDD, Autism, and Brain Injury client population. A&I Avenues is the only source in Boulder County for individuals with disabilities to access case management and long-term services and supports (LTSS) through one of ten Home and Community-Based Service waivers (HCBS).

The use of IDD mill levy funds continues to be guided by the community-wide IDD Needs Assessment completed in 2019. The services provided by A&I Avenues will specifically address intake, eligibility determination, service plan development, arrangement of services, delivery of services, service and support coordination, monitoring, any safeguards necessary to prevent conflict of interest between case management and direct service provision, termination, and discharge from services conjointly with priorities identified in the 2019 Boulder County IDD Needs Assessment such as Case Management and Ongoing Monitoring and Evaluation.

Purchasing Approved: Courtney Gabriel June 6, 2024

Director Approved: Krivi Hunt June 6, 2024

BOCC Approved: Ashley Stolzmann June 12, 2024

Attester: Matthew Ramos June 13, 2024 *MR*

**Intergovernmental Agreement Between Boulder County
and the Town of Erie Re: Rehabilitation of Prince Lake No. 1**

This Intergovernmental Agreement related to rehabilitation of the Prince Lake No. 1 Dam ("Agreement") is entered into this 11th day of June, 2024, by and between the County of Boulder, a body corporate and politic of the State of Colorado (the "County"), and the Town of Erie, a Colorado home rule municipality (the "Town"), each a "Party" and collectively referred to herein as the "Parties."

Recitals

Whereas, the Parties are authorized to enter into this Agreement pursuant to C.R.S. §§ 29-1-201, *et seq.*;

Whereas, the County owns Prince Lake No. 1 (the "Reservoir"), a water storage reservoir in unincorporated Boulder County located in Section 27, Township 1N, Range 69W of the 6th P.M.;

Whereas, the Reservoir was constructed in 1879 and was decreed to store water for irrigation. The water stored in Reservoir is used primarily for the irrigation of Boulder County Open Space property;

Whereas, the Reservoir was historically classified as a Low Hazard dam by the Colorado Division of Water Resources Dam Safety Branch ("Dam Safety Branch"), but the classification was recently upgraded to a Significant Hazard dam;

Whereas, the County desires to rehabilitate the Reservoir and its dam to comply with the Dam Safety Branch's current classification requirements and to reduce the flood risk to downstream homes, property, and public infrastructure located in the Town and to comply with the new classification;

Whereas, the County has completed plans to rehabilitate the dam to create mitigations to reduce the potential for failure from a 50-year precipitation event to a 1,000-year precipitation event. A copy of the plans are attached hereto and incorporated herein as Exhibit A (the "Plans");

Whereas, among other elements, the Plans call for raising the dam height, installing a toe drain, modernizing and enlarging the outlet works, and enlarging the spillway and armoring it with riprap, all to increase the Reservoir's safety;

Whereas, the toe of the Reservoir's dam abuts the incorporated boundary of the Town and the right of way for 111th Street, a Town road. In order for the County to construct the Reservoir rehabilitation in accordance with the Plans, it will be necessary for the County to perform construction activities and place improvements on portions of the Town's property; and

Whereas, the Parties are entering into this Agreement to set forth the conditions under which the County may use the Town's property to rehabilitate the Reservoir.

Now, Therefore, in consideration of the mutual covenants below, and other good and valuable consideration, the receipt of which is acknowledged, the Parties agree to the following terms:

Term and Conditions

1. The Recitals set forth above are incorporated herein and made a part of this Agreement.

2. The County has applied to the Federal Emergency Management Agency ("FEMA") for a Hazard Mitigation Grant. If the County is awarded a Hazard Mitigation Grant, it is anticipated that construction will commence in 2024. If a Hazard Mitigation Grant is not awarded to the County, construction will be delayed until funding is secured.

3. So long as the remaining elements of this Agreement are met, the Town approves of the County's rehabilitation of the Reservoir in accordance with the Plans. The Town shall have the right to review and approve any material changes to the Plans once this Agreement is executed.

4. The County shall be responsible for obtaining all permits required in order to construct the Reservoir rehabilitation in accordance with the Plans including, without limitation applicable Town and/or County building, stormwater quality, and right-of-way permits, and any applicable state or federal permits.

5. The County accepts responsibility for ongoing maintenance of all improvements installed as part of the Plans, specifically including all improvement located on property owned by the Town. The Town hereby grants the County a license to enter property owned by the Town in order to inspect, maintain, and repair any infrastructure constructed pursuant to the Plans. If the County will be providing anything other than routine inspections or maintenance of any Town-owned property, the County will provide advance notice to the Town before any maintenance or repair work is completed.

6. The Plans call for installation of Turf Reinforcement Mat for erosion protection as shown in Exhibit A on private property belonging to HT Flatiron LP, a Texas Limited Partnership, whose property is located below the Reservoir within the Town of Erie (the "Flatiron Property"). The County has contacted HT Flatiron LP to seek permission to install the Turf Reinforcement Mat on the Flatiron Property. The Town is in negotiations to acquire the Flatiron Property that will be affected by construction of the Plans. If the Town acquires this property from HT Flatiron LP, this Agreement shall control the Flatiron Property affected by the Plans and shall supersede and replace any agreement reached between the County and HT Flatiron LP about any impact of the Plans on the Flatiron Property.

7. Any notices or other communications required or permitted by this Agreement or by law to be served on, given to, or delivered to either Party by the other Party, shall be in writing and shall be deemed duly served, given, or delivered when personally delivered to the representative to whom it is addressed or in lieu of such personal services, upon receipt in the United States mail, first-class postage prepaid, addressed to the following:

Town of Erie: Town Manager
 Town of Erie
 P.O. Box 750
 Erie, CO 80516

Boulder County: Director
 Boulder County Parks & Open Space
 P.O. Box 471
 Boulder, CO 80306

With a copy to: Office of the Boulder County Attorney
 P.O. Box 471
 Boulder, CO 80306

Either Party may change its address for the purpose of this paragraph by giving written notice of such change to the other Party in the manner provided in this paragraph.

8. It is expressly understood and agreed that enforcement of the terms and conditions of this Agreement, and all rights of action relating to such enforcement, shall be strictly reserved to the Parties and nothing contained in this Agreement shall give or allow any claim or right of action by any other third party on such Agreement. It is the express intention of the Parties that any person other than Parties receiving services or benefits under this Agreement shall be deemed to be an incidental beneficiary only.

9. Neither of the Parties may assign this Agreement, or parts hereof, or its duties hereunder without the express written consent of the other Party.

10. This Agreement may be amended or modified only in writing signed by both Parties. Either Party may terminate this Agreement by providing 90 days' written notice to the other Party, but once the dam rehabilitation project has been completed pursuant to the Plans, the County's maintenance obligation shall survive any termination of the Agreement.

11. This Agreement constitutes the entire agreement between the Parties relating to the rehabilitation of Prince Lake No. 1. Any prior agreements, promises, negotiations or representations not expressly set forth in this Agreement are of no force and effect.

12. This Agreement shall be governed by, and construed in accordance with, the laws of the State of Colorado, with venue in Boulder County for any litigation related to this Agreement.

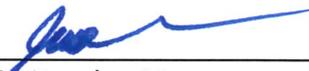
13. Each Party agrees to be responsible for its own negligent actions or omissions and those of its officers, agents, and employees in the performance or failure to perform the Work under this Agreement. No waiver of any of the provisions of this Agreement shall be deemed to constitute a waiver of any other provisions of this Agreement, nor shall such waiver constitute a continuing waiver unless otherwise expressly provided herein, nor shall the waiver of any default hereunder be deemed a waiver of any subsequent default hereunder.

14. Nothing herein shall be construed as a waiver of the rights and privileges of the Town or the County under the Colorado Governmental Immunity Act, C.R.S. §§ 24-10-101, *et seq.*

15. This Agreement may be executed in two counterparts, each of which shall be deemed an original, but all of which shall constitute one and the same instrument. The Parties approve the use of electronic signatures for execution of this Agreement. Only the following two forms of electronic signatures shall be permitted to bind the Parties to this Contract: (1) Electronic or facsimile delivery of a fully executed copy of a signature page; (2) The image of the signature of an authorized signer inserted onto PDF format documents. All use of electronic signatures shall be governed by the Uniform Electronic Transactions Act, C.R.S. §§ 24-71.3-101-121.

In Witness Whereof, the Parties have caused this Agreement to be duly executed and delivered by their respective officers thereunto duly authorized as of the date first above written.

Town of Erie, Colorado

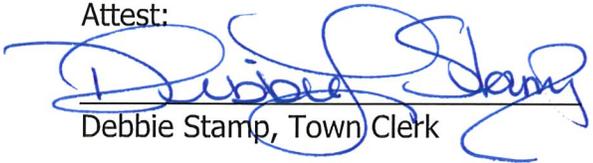


Justin Brooks, Mayor

County of Boulder

_____, Chair
Board of County Commissioners

Attest:



Debbie Stamp, Town Clerk

Attest:

Clerk to the Board of Commissioners

Approved as to Form:
Vladimir Ryazancev
Boulder County Attorney's Office

**Town of Erie
Resolution No. 24-089**

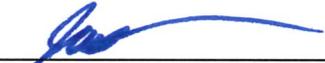
A Resolution of the Town Council of the Town of Erie Approving an Intergovernmental Agreement with Boulder County for the Rehabilitation of Prince Lake No. 1

Whereas, the Town Council finds that it is in the best interest of the Town and the public health, safety and welfare to approve the Intergovernmental Agreement with Boulder County for the rehabilitation of Prince Lake No. 1.

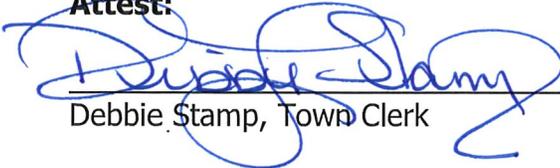
Now Therefore be it Resolved by the Town Council of the Town of Erie, Colorado that:

Section 1. The Intergovernmental Agreement is hereby approved in substantially the form attached hereto, subject to final approval by the Town Attorney. Upon such approval, the Mayor is authorized to execute the Intergovernmental Agreement on behalf of the Town.

Adopted this 11th day of June, 2024.



Justin Brooks, Mayor

Attest:


Debbie Stamp, Town Clerk



Accessibility Report

Filename: Sunny Belle Purchase Agreement Seller Signed accessibility checked.pdf

Report created by: [Enter personal and organization information through the Preferences > Identity dialog.]

Organization:

Summary

The checker found no problems in this document.

- Needs manual check: 2
- Passed manually: 0
- Failed manually: 0
- Skipped: 5
- Passed: 25
- Failed: 0

Detailed Report

Document

Rule Name	Status	Description
Accessibility permission flag	Passed	Accessibility permission flag must be set
Image-only PDF	Passed	Document is not image-only PDF
Tagged PDF	Passed	Document is tagged PDF
Logical Reading Order	Needs manual check	Document structure provides a logical reading order
Primary language	Passed	Text language is specified
Title	Skipped	Document title is showing in title bar
Bookmarks	Passed	Bookmarks are present in large documents
Color contrast	Needs manual check	Document has appropriate color contrast

Page Content

Rule Name	Status	Description
Tagged content	Passed	All page content is tagged
Tagged annotations	Skipped	All annotations are tagged
Tab order	Passed	Tab order is consistent with structure order
Character encoding	Passed	Reliable character encoding is provided
Tagged multimedia	Passed	All multimedia objects are tagged
Screen flicker	Passed	Page will not cause screen flicker
Scripts	Passed	No inaccessible scripts
Timed responses	Passed	Page does not require timed responses
Navigation links	Passed	Navigation links are not repetitive

Forms

Rule Name	Status	Description
Tagged form fields	Passed	All form fields are tagged
Field descriptions	Passed	All form fields have description

Alternate Text

Rule Name	Status	Description
Figures alternate text	Passed	Figures require alternate text
Nested alternate text	Passed	Alternate text that will never be read
Associated with content	Passed	Alternate text must be associated with some content
Hides annotation	Passed	Alternate text should not hide annotation
Other elements alternate text	Passed	Other elements that require alternate text

Tables

Rule Name	Status	Description
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Rows	Skipped	TR must be a child of Table, THead, TBody, or TFoot
TH and TD	Passed	TH and TD must be children of TR
Headers	Passed	Tables should have headers
Regularity	Passed	Tables must contain the same number of columns in each row and rows in each column
Summary	Skipped	Tables must have a summary

Lists

Rule Name	Status	Description
List items	Passed	LI must be a child of L
Lbl and LBody	Passed	Lbl and LBody must be children of LI

Headings

Rule Name	Status	Description
Appropriate nesting	Skipped	Appropriate nesting

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PURCHASE AGREEMENT

THIS AGREEMENT (“Agreement”) is made and entered into this ____ day of _____, 2024, by and between the **COUNTY OF BOULDER**, a body corporate and politic (“County”) and **DELORAS E. FIFER AND LARRY K. FIFER** (collectively “Seller”).

RECITALS

County desires to purchase from Seller and Seller desires to sell to County that certain real property within the County of Boulder, State of Colorado, consisting of approximately 5.16 acres, and which is legally described on Exhibit A, attached hereto and incorporated herein by this reference (the “Property”).

AGREEMENT

NOW, THEREFORE, in consideration of the above recitals and the promises, payments, covenants, and undertakings hereinafter set forth, and other good and valuable consideration, which is hereby acknowledged and received for, County and Seller agree as follows:

PURCHASE PROVISIONS

1. Seller hereby agrees to sell, and County hereby agrees to purchase the Property. Seller shall provide a copy of any available engineering and/or survey work of the Property to County. Additionally, County may at its sole expense contract for an ALTA engineering survey of the Property sufficient to satisfy the requirements of the title company to delete the standard pre-printed exceptions from County’s title policy, as set forth in Paragraph 4 below. Any survey shall be certified to County and the title company and the legal description for the Property shall be furnished to Seller on or before the closing of the Property, said legal descriptions to include a certificate of the acreage therein as determined by the surveyor. Any survey must be acceptable to County, in County’s sole discretion. Closing may be postponed for as long as is reasonably necessary for County to receive and approve the survey identified in this paragraph.

2. The purchase price for the Property shall be TWENTY-FIVE THOUSAND DOLLARS (\$25,000.00), payable in good funds at closing. Additionally, Seller agrees to convey to County, at no extra cost, any quitclaim deeds requested by County to ensure that County receives title to the Property as historically described or to ensure that County receives Seller’s right, title, and interest to any additional property adjacent to the Property for which Seller may have a claim by adverse possession or disputed boundary.

3. The purchase price for the Property shall include all surface and subsurface water and water rights, ditches and ditch rights, ponds and pond rights, springs and spring rights, wells and well rights, whether decreed or not, if any, attached or appurtenant to or used in connection with the Property and owned by Seller. The purchase price will also include any and all minerals

appurtenant to the Property. The purchase of the Property shall also include any existing access to the Property to which Seller has title or in which Seller has an interest. If requested by County, Seller shall convey to County access to the Property over any additional land owned by Seller.

4. Within three weeks after the execution of this Agreement by the Board of County Commissioners of Boulder County, Seller shall furnish to County a title insurance commitment on all of the Property, to insure County's ownership of a fee simple interest in the Property, in the amount of the purchase price. The title commitment shall include copies of all exception documents identified in the commitment. The title insurance commitment shall be on a form acceptable to County and issued by a title insurance company acceptable to County, which maintains an office in Boulder County, and is authorized to do business in the State of Colorado ("Title Company"). Seller shall be solely responsible for the cost of said title commitment and an owner's policy of title insurance issued pursuant to the commitment.

5. Title to the Property shall be merchantable in Seller, and the title commitment shall contain no exceptions other than:

5.1. taxes and assessments for the current year, which shall be adjusted and prorated to the date of delivery of the deed; and

5.2. rights-of-way, easements, restrictions, covenants, and mineral reservations, which are acceptable to County.

Seller shall execute an affidavit concerning mechanic's liens and other reasonable documentation required by the Title Company to delete the standard pre-printed exceptions related to liens and rights of parties in possession.

6. Should title not be merchantable as aforesaid, or if the title commitment includes additional exceptions which are not acceptable to County (even though such additional exceptions would not make the title unmerchantable), a written notice of the defects shall be given to Seller by County within 30 days after receipt of the title commitment and all exception documents as set forth in Paragraph 4 of this Agreement. If Seller provides County with a title commitment and exception documents before the execution of this Agreement by the Board of Commissioners, County shall have 30 days from the date of the execution of the Agreement by the Board of Commissioners within which to provide Seller with a written notice of title defects. Seller agrees to attempt to correct such defects at Seller's expense within 120 days from receipt of said notice of defects, and the closing shall be postponed for said 120 days. If Seller has not corrected such defects within said 120 days, County, at its option, may complete the transaction notwithstanding the defects or may, upon notice to Seller in recordable form, declare this Agreement terminated, whereupon all payment made by County to Seller shall be returned to County and both parties shall be released herefrom.

7. Unless postponed pursuant to the provisions of this Agreement, closing will take place no later than July 31, 2024, at a mutually agreeable time, or closing may be done virtually, or as may otherwise be mutually agreed to by the Parties. The closing will be handled by the title

company issuing a title policy to the County. Grantor shall have the title company provide County with settlement sheets for both buyer and seller at least 10 days before the closing.

7.1. At the closing of the sale of the Property to County, Seller shall deliver to County the following:

a. A fully good and sufficient executed and acknowledged General Warranty Deed conveying to County good and merchantable title to the Property being purchased, free and clear of all liens, tenancies, and encumbrances except those set forth in Paragraphs 5.1 and 5.2 above;

b. Possession of the Property, free and clear of all existing leases and tenancies; except for those leases described in Paragraph 9.8 below, if any;

c. Documents acceptable to County and the Title Company evidencing the authority of Seller to execute this Agreement and to convey the Property being purchased to County;

d. All instruments, certificates, affidavits, and other documents necessary to satisfy the Requirements listed on Schedule B-1 of the title commitment;

e. A current update of the title commitment, at Seller's expense, showing title subject only to the permitted exceptions determined by Paragraph 5 of this Agreement. Seller shall cause the Title Company to issue to County its standard form owner's policy of title insurance insuring good and merchantable title to the Property in County, with the standard printed exceptions concerning liens and rights of parties in possession deleted, and subject only to the permitted exceptions as determined in Paragraph 5 of this Agreement;

f. A certification that the representations and warranties of Seller pursuant to Paragraph 9 hereof continue to be true and correct as of the date of closing;

g. Seller's closing costs, which include Seller's portion of the prorated taxes and other assessments affecting the Property, all incidental costs and fees customarily paid by Seller in Boulder County land transactions, the cost of providing Owner's extended title coverage, and one-half of the cost of any closing fee;

h. If applicable, an affidavit by a professional engineer as described in Paragraph 12;

i. Any other documents required by this Agreement to be delivered by Seller to the title company or reasonably required by County or the Title Company in connection herewith; and

j. Any quitclaim deeds as described in Paragraph 2 of this Agreement or documents required by Paragraph 3.

7.2. At the closing of the sale of the Property to County, County shall deliver to Seller the following:

a. The applicable purchase price by County warrant, or other good funds for the Property; and

b. County's closing costs which include all incidental costs and fees customarily paid by purchasers in Boulder County and one-half of the cost of any settlement or closing fee charged by the Title Company.

7.3. Prior to the closing of the sale of the Property to County, Seller shall remove all equipment, vehicles, salvage, rubbish, and other personal property from the Property. Closing may be postponed by County if equipment, vehicles, salvage, rubbish, and other personal property has not been removed prior to the scheduled closing date.

8. It is agreed that time is of the essence hereof. If County should fail or default in prompt payment of the purchase price for the Property according to the terms and conditions of this Agreement, and such failure is not attributable to any failure by Seller to timely and fully perform all of Seller's obligations hereunder, Seller, at Seller's option, may in writing declare this Agreement terminated and retain all monies paid to Seller as liquidated damages. It is agreed that such payments are Seller's sole and only remedy for County's failure to perform the obligations of this Agreement. Seller expressly waives the remedies of specific performance and additional damages. If Seller is in default: (1) County may elect to treat this Agreement as terminated, in which case all payments and things of value received hereunder shall be returned to County; or (2) County may elect to treat this Agreement as being in full force and effect, and County shall have the right to an action for specific performance or damages, or both.

REPRESENTATIONS AND WARRANTIES

9. Seller hereby represents and warrants to County that as of the date of the signing of this Agreement:

9.1. Seller has received no notice of and has no other knowledge of any litigation, claim or proceeding pending or currently threatened which in any manner affects the Property; and

9.2. Seller has received no notice and has no other knowledge of any current, existing violations of, or pending investigations into possible violations of, any federal, state or local law, code, ordinance, rule, regulation or requirement affecting the Property; and

9.3. Seller has the full right, power, and authority to transfer and convey the Property to County as provided in this Agreement and to carry out Seller's obligations under this Agreement; and

9.4. Each and every document, schedule, item, and other information delivered or to be delivered by Seller to County hereunder, or made available to County for inspection hereunder, shall be true, accurate, and correct to the best of Seller's knowledge; and

9.5. Seller has not entered into any agreement with any private person or entity or with any governmental or quasi-governmental entity with respect to the Property that may result in liability or expenses to County upon County's acquisition of all or any portion of the Property; and

9.6. There are no special assessments which now burden or encumber the Property and there are no special assessments currently proposed as to the Property; and

9.7. The execution and delivery of this Agreement and the performance of all of the obligations of Seller hereunder will not result in a breach of or constitute a default under any agreement entered into by Seller or under any covenant or restriction affecting the Property; and

9.8. There are no leases, tenancies or rental agreements relating to the Property, or to any part thereof, which cannot be terminated by Seller on or prior to the date of closing of the transactions provided in the Agreement; and

9.9. Seller has not granted or created, and has no knowledge of any third parties who may have the right to claim or assert any easement, right-of-way or claim of possession not shown by record, whether by grant, prescription, adverse possession or otherwise, as to any part of the Property, except as to the leases, if any, as described above; and

9.10. To the best of Seller's knowledge, no part of the Property has ever been used as a landfill, and no materials have ever been stored or deposited upon the Property which under any applicable governmental law or regulation would require that the Property be treated or such materials removed from the Property prior to the use of the Property for any purpose which would be permitted by law, but for the existence of said materials on the Property; and

9.11. To the best of Seller's knowledge, no underground storage tank, as that term is defined by federal statute or Colorado statute, is located on the Property which under applicable governmental law or regulation would require such underground storage tank to be upgraded, modified, replaced, closed or removed; and

9.12. To the best of Seller's knowledge, Seller has not caused or permitted the release of any hazardous substance on the Property. The terms "hazardous substance" and "release" as used herein shall have the same meaning and definition as set forth in Paragraphs (14), (22) and (23), respectively, of Title 42 U.S.C. Section 9601; provided,

however, that the term “hazardous substance” as used herein also shall include “hazardous waste”, as defined in Paragraph (5) of 42 U.S.C. Section 6903; and

9.13. Seller has received no actual notice from any oil company or related business of any intention to conduct operations for the drilling of any oil or gas well on the Property, whether such notice is in the form of a “thirty-day notice” under the rules of the Energy and Carbon Management Conservation Commission of the State of Colorado, a notice to commence earthwork for drilling operations, a notice for the location of access roads, or any other notice of any kind related to the conduct of operations for such drilling; and

9.14. Seller has no knowledge of any claims or purported claims of adverse possession pertaining to the Property and/or any land adjacent thereto by reason of the location of any exterior boundary fence lines, or otherwise.

Seller shall, at the time of closing, certify to County in writing that the above and foregoing representations and warranties remain true and correct as of the date of closing. Seller agrees that if, at any time, it is discovered that any of the foregoing representations and warranties were not true and correct at the time they were made, Seller will indemnify County and hold it harmless from and against claims for any and all liabilities, costs or damages, including, but not limited to, attorney fees, suffered by or claimed against County as a result of the breach. This indemnity shall survive the closing of the Property.

10. In addition to all other rights and remedies of County and Seller as set forth and provided in this Agreement, Seller agrees that County shall have the right to terminate this Agreement and to make the same of no further force and effect:

10.1. If the representations and warranties of Seller as set forth and provided for in Paragraph 9 herein are not true and correct as of the date of the closing of the Property; or

10.2. If Seller fails or refuses to provide the title insurance commitment and title insurance policy to County within the time period and in the form and content required under the provisions of this Agreement; or

10.3. If any part of the Property is condemned, or if proceedings for such condemnation are commenced or notice of condemnation is received by Seller from a condemning authority prior to the date of closing of the Property; or

10.4. If any of the standards provided for in Paragraph 11 and/or 12 are not satisfied as of the date of closing of the Property.

If County terminates this Agreement pursuant to this provision any sums paid hereunder by County to Seller shall be returned to County.

INSPECTION AND ENVIRONMENTAL AUDIT

11. At all reasonable times during the term of this Agreement, County shall have access to the Property for the purpose of conducting tests, studies, and surveys thereon, including, without limitation, environmental audits, soil and subsoil tests. County may perform or have performed at its option and/or expense the following inspections:

11.1. Soil and percolation tests;

11.2. Inspections for asbestos, PCBs, underground tanks, or other hazardous substances;

11.3. Any other inspections, tests, and/or studies deemed necessary by County, which do not materially damage the Property.

County shall promptly provide to Seller copies of the results of all such tests, inspections, and studies following the receipt of same by County. Any inspections conducted by County shall not mitigate or otherwise affect Seller's representations and warranties above. Prior to closing of the sale of the Property to County, County may at its sole expense, obtain a Phase I environmental audit of the Property. The Phase I environmental audit and any follow up testing must be satisfactory to County, in the County's sole discretion. If the Phase I, or any other tests or inspections received by or performed by County, is/are not satisfactory to County, County shall give Seller written notice of the defects. Seller agrees to attempt to correct such defects at Seller's expense within 120 days of said notice, or within a time agreed to, in writing, by both parties. If necessary, the closing set forth in Paragraph 7 of this Agreement, may be postponed for 120 days. If Seller has not corrected such defects within said 120 days, County, at its option, may complete the transaction notwithstanding the defects or may, upon notice to Seller in recordable form, declare this Agreement terminated, whereupon all payments made by County to Seller shall be returned to County, and both parties released herefrom.

12. If any underground tank/s is/are located on the Property, said tank/s shall be removed by Seller at Seller's expense prior to the closing of the Property. If any underground tank/s is/are removed prior to closing pursuant to this Paragraph, Seller shall provide at the time of closing of the Property an affidavit, subscribed and sworn to by a registered professional engineer licensed in the State of Colorado and approved by County, stating that the Property meets all applicable federal, state and local laws, regulations, and standards regarding such sites, including without limitation, the following standards:

12.1. No more than 75 parts per million total petroleum hydrocarbons in the soil using an analytical test/s which are standard in the industry for the detection of specific compound mentioned herein.

12.2. No more than 10 parts per million total petroleum hydrocarbons in ground water, other than drinking water, using an analytical test/s which are standard in the industry for the detection of the specific compound mentioned herein.

12.3. The BTEX (benzene, toluene, ethyl benzene and xylene) and the petroleum contaminants in the ground water shall not exceed the maximum contaminant levels for these components in the ground water as set forth by the state water quality provisions in effect at the time of the execution of this contract.

13. This contract is not intended and shall not be deemed to create, expand, diminish or in any way affect any liability or responsibility of Seller or County for any hazardous materials or other environmental matters on or relating in any way to the Property. "Hazardous materials" as used herein shall mean and include any pollutant, contaminants or hazardous or toxic materials, wastes or materials as defined, listed or regulated by any federal, state or local law, regulation, order or decree. "Environmental matters" shall mean and include any condition, claim, cost, order, demand, requirement or liability either (1) regulated or arising under any federal, state or local laws or regulations governing or relating to the environment, including without limitation RCRA, 42 U.S.C. Sec. 6901 et seq., and CERCLA, 42 U.S.C. Sec. 9601 et seq., as amended, or (2) caused by or relating to the presence or release of any hazardous materials in or to the air, soil, surface waters or groundwater.

REAL ESTATE COMMISSION

14. Any real estate commission due to any broker upon sale of the Property to County shall be paid by Seller. County represents to Seller that County is not a party to a contract which requires the payment of any real estate commission upon sale of a fee simple interest in the Property to County.

PROPERTY TO REMAIN UNENCUMBERED

15. Seller agrees that Seller will not, so long as this Agreement is in effect, encumber or burden the Property or any part thereof without County's consent. Seller further agrees that during the term of this Agreement and through the date of delivery of possession of the Property to County, Seller shall not develop the Property in any manner, including without limitation, constructing any improvements or erecting any structures on the Property, leasing mineral rights for the Property, or disturbing the surface of the Property.

ASSIGNMENT

16. Seller shall not assign Seller's rights and obligations hereunder unless County first consents thereto in writing, which consent shall not be unreasonably withheld.

County does, however, consent to Seller assigning Seller's rights hereunder in furtherance of an IRC Section 1031 tax-deferred exchange so long as County incurs no increased expense, delay of closing, or liability exposure and so long as the assignee complies with all of the provisions of this Agreement. Said consent does not give Seller the right to impose any responsibilities on County that are not set forth in this Agreement other than the consent to the assignment. Seller agrees that so long as County is not in default hereunder, Seller shall not sell or convey any of the Property except to County pursuant to this Agreement. County may assign its rights to purchase all or a portion of the Property or any interest in the Property, without the consent

of Seller and Seller shall cooperate in executing appropriate documentation for the transfer of all or part of the Property, or any interest in the Property, to any assignee of County, so long as Seller incurs no increased expense or liability exposure and so long as the assignee complies with all of the provisions of this agreement.

CONDEMNATION

17.1. Condemnation of the Entire Property Which is the Subject of This Agreement

If another governmental entity or agency exercises its powers of eminent domain to acquire title to the Property, County shall, in such event, release its rights and option to purchase as to the Property so condemned and shall make no claim as to the monies paid for the Property so taken by the condemning authority. In the event of such a condemnation, the money so paid by the condemning authority for the Property so taken shall be and become the sole and separate Property of Seller. The provisions of this Paragraph shall not be construed, however, as precluding or preventing County from condemning any property which it is statutorily authorized to condemn.

17.2. Condemnation of a Portion of the Property Which is The Subject of This Agreement

If another governmental entity or agency exercises its powers of eminent domain to acquire title to a portion of the Property which is the subject of this Agreement, County shall still retain the rights granted under this Agreement as to such of the Property described in Exhibit A which is not taken by the condemnation. In such event, the portion of the Property which is not condemned shall remain subject to the terms of the Agreement. The purchase price of the portion of the Property remaining subject to this Agreement shall be determined on a per acre basis, by dividing the total purchase price for the Property by the total acreage of the Property to determine a per acre price.

TAX CONSEQUENCES

18.1. Seller acknowledges that neither the County, nor any of its agents or attorneys, has made any representations as to the fair market value of the Property or the donation thereof, except to acknowledge the potential for a bargain sale due to the Property's current assessed value. Seller further acknowledges that neither the County, nor any of its agents or attorneys, has made any representations as to the tax treatment to be accorded to this bargain sale or to any proceeds thereof by the Internal Revenue Service under the Internal Revenue Code or by the officials of the State of Colorado under Colorado law. Seller acknowledges she is solely responsible for meeting any and all Internal Revenue Service and/or State of Colorado statutes, rules, and regulations related to potential tax benefits associated with this transaction and that the County has encouraged Seller to obtain her own legal, tax, and financial advice.

18.2. Seller intends to seek a fair market appraisal of the Property, and Seller may seek to pursue tax benefits associated with the bargain sale of the Property to the County if such appraisal substantiates a value higher than the price paid by County. If Seller receives an appraisal of the Property Seller shall provide the County with a full copy of the final signed appraisal that Seller will rely on for tax purposes and complete copies of all relevant tax documents before the County will sign any tax documents acknowledging receipt of a partial donation, if any. County shall cooperate with Seller to provide documentation reasonably necessary for Seller to apply for tax benefits, except that County shall have the right, in its sole discretion, not to sign any tax documents acknowledging receipt of a donation if County reasonably believes the donation value being sought is more than the actual donation value, or to note on Seller's tax forms the County's objection to the appraised value.

AGREEMENT TO SURVIVE CLOSING

19. The parties hereto agree that, except for such of the terms, conditions, covenants, and agreements hereof which are, by their very nature fully and completely performed upon the closing of the purchase-sale transactions herein provided for, all of the terms, conditions, representations, warranties, covenants, and agreements herein set forth and contained shall survive the closing of any purchase-sale transaction herein provided for and shall continue after said closing to be binding upon and inure to the benefit of the parties hereto, their successors, and assigns.

ENTIRE AGREEMENT

20. This Agreement, including exhibits, contains the entire contract, understanding, and agreement between the parties and supersedes all prior understandings, warranties, representations, letters of intent, all of which are by execution hereof rendered null and void.

NOTICE

21. Within sixty (60) days after a change of a party's address, that party shall provide a written notice of any change of address to all other parties. Whenever notice is required to be given hereunder, it shall be in writing and may be mailed, or hand delivered to the party entitled thereto, and if mailed, it shall be done by registered or certified mail, return receipt requested. If mailed, said notice shall be effective and complete as of the date of mailing. If hand delivered, said notice shall be effective and complete upon completion of the hand delivery. Notice may also be accomplished by email, if emailed to a current email address specified in writing by the receiving party. Until changed by notice in writing, each party's mailing addresses are as follows:

To County: Real Estate Division
 Boulder County Parks & Open Space
 Administration Building
 5201 St. Vrain Road
 Longmont, Colorado 80503

With copy to: The Boulder County Attorney's Office
P.O. Box 471
Boulder, Colorado 80306

To Seller: Deloras and Larry Fifer
20090 E. 118th Avenue
Commerce City, CO 80022

GOVERNING LAW

22. The validity and effect of this Agreement shall be determined in accordance with the laws of the State of Colorado.

COUNTERPARTS

23. This Agreement may be executed in any number of counterparts, each of which shall be deemed an original, and all of which shall constitute one and the same agreement. Digital signatures conforming with the Uniform Electronic Transactions Act, C.R.S. §§ 24-71.3-101 through 24-71.3-121 shall be acceptable to and binding upon all Parties.

RECORDING

24. This Agreement shall be recorded in the office of the Clerk and Recorder of Boulder County, Colorado.

SEVERABILITY

25. If any part of this Agreement is found, decreed or held to be void or unenforceable, such finding, decree or holding shall not affect the other remaining provisions of this Agreement which shall remain in full force and effect.

[Remainder of page intentionally left blank]

IN WITNESS WHEREOF, the Parties have executed this Agreement as of the date set forth above.

COUNTY OF BOULDER,
a body corporate and politic

Matthew Ramos
Clerk to the Board

By: _____
Ashley Stolzmann, Chair, of the Board of
County Commissioners of Boulder County,
Colorado.

SELLER:

Deloras E. Fifer

05/06/2024

Deloras E. Fifer

Larry K. Fifer

05/06/2024

Larry K. Fifer

EXHIBIT A

Legal Description

That certain real estate situated in the County of Boulder, State of Colorado, and legally described as:

The Sunny Belle Lode, U. S. Survey #7563, located in the Gold Hill Mining District



Boulder County Purchasing

Downtown Courthouse • 1325 Pearl Street • Boulder, Colorado 80302 • 303.441.3525
Mailing Address: P.O. Box 471 • Boulder, Colorado 80306 • www.bouldercounty.gov

SOQ ANALYSIS AND RECOMMENDATION

Requesting Department: Public Works
 Building Services

SOQ Title: Asphalt/Paving Continuing Services

SOQ No.: SOQ-062-24

SOQ Opening Date: June 4, 2024

No. of Vendors Contacted: 1,744

No. of Minority Owned, Women Owned, Disadvantaged, Veteran Owned Vendors Contacted: 284

This SOQ has been posted in accordance with County Policy.

Evaluated by:

Anthony Amaya, Building Services Project Coordinator, Public Works
 Joe May, Building Services Project Manager II, Public Works

Bid Responses:

Company Name
Brannan Sand and Gravel Company, LLC, 2800 Brannan Way, Denver, CO 80229
EVH Enterprises, LLC, P.O. Box 33091 Denver, CO 80233

Recommendation:

The evaluation committee recommends awarding SOQ-062-24, Asphalt/Paving Continuing Services, to both vendors who submitted a proposal:

Brannan Sand and Gravel Company, LLC
EVH Enterprises, LLC

An additional procurement will be issued in July to attempt to find more shortlisted vendors for these services.

Not to exceed: \$1,000,000.00 per year.

Contract Required: Yes No

_____/_____
Department Date

I certify this SOQ has been conducted in accordance with Boulder County policy. Purchasing makes no representation regarding the evaluations or recommendations contained in this analysis.

_____/_____
Purchasing Date

Comments:

_____/_____
Chair, Board of Commissioners Date

Attest:

_____/_____
Clerk to the Board Date

Date of Board Action:



Board of County Commissioners

MEMORANDUM

To: Boulder County Board of County Commissioners

Cc: Boulder County Sheriff Curtis Johnson
Emily Beam, Budget Director, Office of Financial Management

From: Barb Halpin, Staff Liaison to the Emergency Services Grant Program Advisory Committee

Date: June 24, 2024

Subject: Emergency Services Grant Program Advisory Committee Funding Recommendations – Spring 2024 Funding for Search & Rescue and Recreation/Trail Safety Service Providers in Boulder County

Introduction

The Emergency Services Grant Program Advisory Committee (ESGPAC) provides recommendations to the Boulder County Commissioners regarding the allocation of funds for the grant program portion of the Emergency Services Ballot Measure (ESBM) approved by voters in 2022 as County Issue “1B.”

The first grant round of the ESBM was offered in the fall of 2023 to mountain and rural fire protection districts that serve Boulder County. For this second round of grants, the advisory committee was tasked with making funding recommendations for **search & rescue (SAR) and recreation/trail safety service providers in Boulder County**. (Another round of grants for mountain and rural fire protection districts is scheduled for the fall of 2024.)

The ESGPAC is recommending funding eight grant awardees for a total of \$721,703.39 for the spring 2024 grant round (see table on p. 3).

Evaluation Process

Boulder County received 17 funding proposals totaling \$1,330,097.46 by the application deadline. The advisory committee created a process to evaluate the proposals and met three times (twice in person, once virtually) on April 23, May 14, and June 17 to review and evaluate the applications. (One committee member, Juliette Hans, recused herself from the entire round of grant funding evaluation because she serves as an alternate board member for Boulder Emergency Squad, which was one of the applicants this round.) All meetings were open to the public to attend and observe.

Commissioner Claire Levy • Commissioner Marta Loachamin • Commissioner Ashley Stolzmann

Boulder County Courthouse • 1325 Pearl Street • Boulder, Colorado 80302

Mailing Address: P.O. Box 471 • Boulder, CO 80306 • www.BoulderCounty.gov

commissioners@bouldercounty.gov • Telephone: 303.441.3500 • Fax: 303.441.4525

Each participating advisory committee member independently reviewed and scored all proposals based on the following questions asked on the application:

- A. Does the Proposal serve one (or more) of the following purposes?
 - 1. Capital, including facilities and equipment, and operational costs of search and rescue organizations that can assist Boulder County in responding to emergencies;
 - 2. Trail and trailhead safety services to increase emergency response and public safety on public trails and open space/recreational areas in Boulder County;
 - 3. Innovative pilot program proposals to enhance emergency response and public safety on public trails and open space/recreational areas in Boulder County.
- B. What are the goals of the project? How will it serve Boulder County residents and/or improve SAR and recreation/trail safety services in Boulder County? What specific impacts or benefits will the request provide?
- C. Describe the need(s) for this funding: What is the problem/opportunity this program/project would address? How significant is/are the challenge(s) you're presenting and how will your project/program address those challenge(s)?
- D. How/Will this project be sustainable and continue to support Boulder County SAR recreation/trail safety efforts after this one-time funding source? How is your organization set up to manage the funding and how will you ensure either the completion of the project or provide ongoing support for the project long-term?
- E. Does the proposal identify a clear need or service demand (i.e., fill a gap) that is addressed by the request OR enhances an organization's effectiveness in providing SAR or recreation/trail safety services AND is implementable and realistic?
- F. Does the organization and/or proposal promote equity and inclusion of all community members (for example, youth, older adults, non-English language speakers/readers, people of color, LGBTQ+, differently abled, etc.)?
- G. Does the organization show positive fiscal management, an ability to implement the proposal, and operational sustainability through its grant application?
- H. Is the proposed cost (requested amount of money) appropriate, reasonable, and relevant to the purpose of making public trails and recreational areas in Boulder County safer to access and use for all community members?
- I. Does the grant request demonstrate cooperative or cross-agency grant collaboration?

The Advisory Committee met three times (for a total of six hours) to discuss the 17 applications. On June 17, the committee approved a recommendation for a total award amount of \$721,703.39 based on the following funding recommendations:

[See Table on Next Page]

Spring 2024 Emergency Services Sales & Use Tax Funding Recommendations

Agency/Organization Name	Project/Request	Funding Recommendation*
Boulder County Amateur Radio Emergency Services (BCARES)	Upgrades, Repairs, and Enhancements of Emergency Voice, Video, and Digital Communications.	\$30,000.00
Boulder Emergency Squad (BES)	Facility-Related Capital Upgrades or Replacements, Including a Roof Replacement and Other Facility Repairs; Dual-Band Radios and Repeater to Conform to Boulder County Communications Standards by 2028.	\$454,944.00
Boulder Mountainbike Alliance (BMA)	Bike Patrol & Wapiti Trail Safety First Aid Training and Equipment.	\$8,105.00 *
Bryan Mountain Nordic Ski Patrol (BMNSP)	Education & Training for CPR/First Aid, Avalanche Awareness, Mountain Travel and Rescue, and Communications Equipment (Internal Radios).	\$50,521.35 *
Colorado 4x4 Rescue and Recovery	Amount to Cover Personal Expenses Incurred by Volunteers When Performing Search and Rescue Activities and Vehicle Recoveries in Boulder County.	\$10,000.00 *
Front Range Rescue Dogs (FRRD)	Pagers, Dual-Band Radios, Dog Tracking Collars (with inReach Capabilities).	\$34,694.30
Indian Peaks Wilderness Alliance (IPWA)	Internal and Partner Organization Communications Devices, InReach Subscription, SPOT Device, and Radio Cabinet.	\$7,207.00
Rocky Mountain Rescue Group, Inc (RMR)	Dual-Band Radios to Meet Boulder County Communications Standards by 2028.	\$126,231.74
	Total Recommended Funding	\$721,703.39

* Not all funding recommendations represent the total dollar amount requested (i.e., amounts marked with an "*" represent partial funding of the full amount requested).

ESGPAC Spring 2024 Funding Round Comments

The ESGPAC also noted for the record the following comments:

- 1) Counseling services for first responders and co-responders were requested by a collaborative group of organizations in this funding round. Because of the widespread need and interest expressed by emergency service providers for counseling and mental health services, the Boulder County Sheriff's Office is pursuing a program whereby counseling can be made available to providers who respond to emergencies or search & rescue incidents in Boulder County. ESGPAC did not recommend funding the request for counseling services in this grant round because the Sheriff's Office is looking into a different funding source to make mental health resources available to emergency service providers in Boulder County.
- 2) ESGPAC has requested that the Boulder County Sheriff's Office (BCSO) explain how an organization might pursue a "pathway to becoming an official responder for the BCSO" for the next round of SAR and recreation/trail safety grants (i.e., provide a list of expectations and instructions for organizations desiring to enter a formal Memorandum of Understanding (MOU) with the BCSO). ESGPAC acknowledges that any new MOU service provider would be required to meet the rigorous standards, commitment levels, and abilities to be able to serve in an official "call-out" capacity with the BCSO.
- 3) ESGPAC encourages the Sheriff's Office to continue to provide supplemental funding for its MOU agencies (as BCSO has with its annual grant program) and not to solely put that responsibility on ESBM/2022-1B funds (i.e., ESGPAC would like to see the BCSO continue to budget annually for ongoing operating and capital needs of its MOU agencies in addition to funding made available through the ESBM grant program).
- 4) Boulder County Sheriff Curtis Johnson and Commander Randy Wilber informed the advisory committee that all radios purchased under the Emergency Services Grant Program must be approved by the BCSO radio shop before an awardee will be allowed to use the grant money to purchase the radios. All agencies that serve in an official capacity with the BCSO must acquire dual-band radios that conform to Boulder County's Communications Standards by 2028. **While the radio shop will not specify a brand of radio to buy**, it will ensure that radios purchased with ESBM funding meet a set of standards that are compatible with communications in the rural and mountain areas of Boulder County. The BCSO radio shop will also provide radio programming and maintenance services for agencies that communicate with the BCSO and fire protection districts in the event of an emergency or disaster.

Action Requested: Approval of the Emergency Services Grant Program Advisory Committee's Spring 2024 Search & Rescue and Recreation/Trail Safety Funding Grant Recommendations allocating **\$721,703.39** from the grant portion of the Emergency Services Sales & Use Tax revenues.

RESOLUTION 2024-049

A RESOLUTION SETTING THE DAYS AND HOURS FOR COUNTY SEAT (LOCATED AT 1325 Pearl St, Boulder, CO)

Recitals

Whereas, the County strives to offer services to the community to “provide the best in public service.” and

Whereas, in order to serve the community in ways to best meet community needs, a variety of service delivery methods including in person at offices, virtually, at public facilities, at private facilities (like DMV kiosks at grocery stores), by phone, and other service delivery methods are employed and

Whereas, the commissioners recognize satellite sites are a benefit to the community as they allow people in person options that are closer to where a community member might need service, but realize that there is not capacity to operate satellite sites on a 24/7 basis and

Whereas, because of the variation in service delivery methods and to provide services in a fiscally responsible way, county office hours are set for the physical offices in this resolution, other service delivery methods are posted as they occur and

Whereas, the hours set here for county offices hours do not reflect any particular employee’s work-week, full time employees are still working forty or more hours a week and

Whereas, the board of county commissioners acknowledges and thanks those that work beyond these set county hours

NOW, THEREFORE, BE IT RESOLVED THAT:

1. The office hours for the county offices are set from Monday – Thursday from 8:00 am – 4:30 pm at the County Seat located at 1325 Pearl Street, Boulder Colorado, effective as of July 12, 2024.
2. Nothing in this resolution shall prohibit any office of the county from providing services to the public additional days and hours.

3. Nothing in this resolution shall prohibit any office of the county from providing non-traditional service delivery methods including virtual services or offering services at satellite locations around the community.
4. Nothing in this resolution supersedes the days and hours that the county is closed for holidays listed in a separate resolution or emergency closures.

ADOPTED this 2nd day of July 2024, and **EFFECTIVE** July 12, 2024.

THE BOARD OF COUNTY COMMISSIONERS
OF THE COUNTY OF BOULDER, COLORADO

Ashley Stolzmann, Chair

Marta Loachamin, Vice Chair

Claire Levy, Commissioner

ATTEST:

Clerk to the Board

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INTEREST OF AMICI CURIAE¹

Amici curiae comprise (i) [19] major cities across the United States (the “Amici Cities”); (ii) [8] major U.S. counties (the “Amici Counties”); (iii) the nationwide group of prosecutors known as Prosecutors Against Gun Violence (“PAGV”); and (iv) the District Attorneys for [4] counties in Texas (the “Amici Texas Prosecutors”). The Amici Cities, the Amici Counties, PAGV, and the Amici Texas Prosecutors are herein collectively referred to as “Amici.”

The Amici Cities are Baltimore, Maryland; Boston, Massachusetts; Chicago, Illinois; Columbus, Ohio; Dayton, Ohio; Hartford, Connecticut; Los Angeles, California; Newark, New Jersey; [New York, New York]; Oakland, California; [San Jose, California]; Pittsburgh, Pennsylvania; Philadelphia, Pennsylvania; Providence, Rhode Island; Rochester, New York; San Francisco, California; Seattle, Washington; and Syracuse, New York. The Amici Cities have a collective population of approximately 31 million.

The Amici Counties are [others to come] Arlington County, Virginia; Harris County, Texas; King County, Washington; Los Angeles County, California; San Diego County, California; San Mateo County, California; Santa Clara County, California;

¹ This brief is submitted pursuant to Supreme Court Rule 37.6. Amici confirm that this brief was not authored in whole or in part by counsel for any party, and no person or entity other than amici and their counsel made a monetary contribution to the preparation or submission of this brief.

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and Washtenaw County, Michigan. The Amici Counties have a collective population of approximately [17] million.

The Amici Cities and the Amici Counties are a diverse coalition of municipalities united by a common purpose—to curb the spread of ghost guns and the resulting increase in gun violence on their streets and across the country.

PAGV is an independent, nonpartisan group that identifies and promotes prosecutorial and policy solutions for the national public health and safety crisis of gun violence. PAGV's membership comprises over 60 elected prosecutors, who serve over 65 million individuals in 30 states. Its mission includes sharing best practices for prosecuting gun offenders and defending common-sense gun safety policies. PAGV's members, and the local law enforcement officers with whom they collaborate daily, play a critical role in promoting residents' safety—the highest objective of state and local governments. As local leaders in the nationwide effort to curb gun violence and promote public safety, PAGV members witness firsthand the tragic effects of the proliferation of unregulated ghost guns.

The Amici Texas Prosecutors are John C. Creuzot, the Dallas County Criminal District Attorney; [José Garza, the Travis County District Attorney]; Joe Gonzalez, the Bexar County District Attorney; and [Kim Ogg, the Harris County District Attorney]. The Amici Texas Prosecutors, who serve a collective population of nearly [4] million Texans, are likewise deeply concerned about the spread of ghost

guns and the resulting increase in gun violence in their counties.

The Amici submit this brief to illustrate for the Court, based on specific, real-world examples and numerical trends, the prevalence and deadly effects of ghost guns across the United States—and the unique challenges ghost guns present to prosecutors and local law enforcement agencies who are tasked with preventing and prosecuting gun crime and protecting public safety. The Amici also submit this brief to express their uniform view that the current Bureau of Alcohol, Tobacco, Firearms and Explosives (“ATF”) rule regulating ghost guns, 87 Fed. Reg. 24652 (April 26, 2022) (the “Final Rule” or “Rule”), was and remains urgently needed to curb the dangerous spread of ghost guns and to protect public safety.

SUMMARY OF ARGUMENT

The Amici have witnessed firsthand the damage to public health and safety wrought by the recent proliferation of so-called “ghost guns”—unregistered firearms without serial numbers that are readily assembled from gun-building kits that can be easily purchased over the Internet without a background check. The Final Rule, which has been in effect since August 24, 2022,² is a critical component of the nationwide effort to curb the dangerous spread of ghost guns.

² The Final Rule was partially enjoined in September 2022 and later briefly vacated in its entirety until this Court entered a stay of those lower court orders in August 2023. See *Petition for Writ of Certiorari, Garland v. VanDerStok*, 9–12 (No. 23-852).

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As detailed below, in the years leading up to the implementation of the Final Rule, the ghost gun market was thriving and prosecutors and other law enforcement agencies in the Amici Cities and Counties, as well as the districts represented by the Amici Texas Prosecutors, reported dramatic increases in the use of ghost guns in connection with criminal activity in their jurisdictions. As also detailed below, the ready acquisition of ghost guns by high-risk individuals, including convicted felons, domestic abusers, and minors, led to horrific incidents of gun crime in these locations and elsewhere—incidents that might have been prevented if ghost guns had been subject to federal regulation. Indeed, in the relatively short time that the Final Rule has been in effect, the Rule appears to have caused a measurable reduction in the use of ghost guns in the Amici’s municipalities.

Although ghost gun recoveries have decreased in the limited time the Rule has been in effect, ghost guns have plainly not been eliminated and, as noted below, violent crimes committed with ghost guns have continued to occur. If the Rule remains in effect, Amici believe that the problem of ghost guns will be further ameliorated over time, but the continuation of offenses involving ghost guns underscores the need for long term federal regulation of this type of firearm.

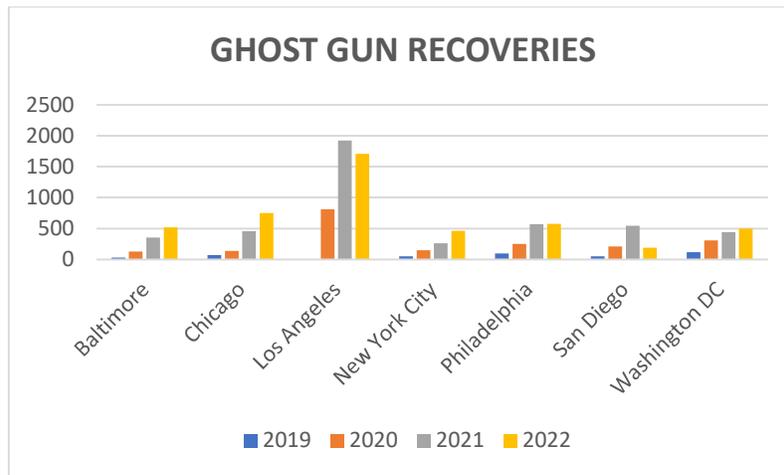
In short, ghost guns pose a genuine threat to the health and safety of Americans and undermine the ability of law enforcement authorities to effectively prosecute and prevent gun violence. For these and other reasons discussed in this brief, the Amici Cities, the Amici Counties, PAGV, and the Amici Texas

Prosecutors all respectfully urge this Court to reverse the Fifth Circuit’s decision vacating the challenged sections of ATF’s Final Rule.

ARGUMENT

I. Federal Regulation of Ghost Guns Is Needed to Curb the Proliferation of These Unregistered and Dangerous Firearms

The Final Rule was promulgated in response to a dramatic and alarming increase in the criminal use of unregistered and unserialized ghost guns in cities across the country. Indeed, every city in the chart depicted below saw significant increases in ghost gun recoveries between 2019 and 2022, and that trend is representative of rates of ghost gun recoveries in dozens of major municipalities across the United States.



By way of example, in 2022, the New York Police Department reported an over 300% increase in

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ghost gun recoveries from January through April 2022, as compared to January through April 2021.³ In Philadelphia, while ghost guns represented only 2% of all firearms recovered in 2019, that number increased by 311% in 2022, in which year the Philadelphia Police Department seized more than 575 ghost guns.⁴ And in Baltimore, during the period June 2021 through the end of 2023, ghost guns were the most commonly recovered type of firearm, outpacing all other firearms.⁵

Many other major cities and counties have also seen a dramatic increase in recoveries since 2019. For example:

³ Dan Krauth and Brett Cohen, *Ghost Guns: Eyewitness News Investigates A Growing Menace*, ABC News, Apr. 28, 2022, available at <https://abc7ny.com/ghost-guns-nypd-atf-street-crime/11798077/>.

⁴ Rep. Joanna E. McClinton, *Ghost Guns: Fueling Real Horror in PA Communities Ghost Guns Are Untraceable, Do-It-Yourself Kits*, Pennsylvania House of Representatives, Democratic Caucus, Mar. 4, 2024, available at <https://www.pahouse.com/McClinton/InTheNews/NewsRelease/?id=133088>.

⁵ Lee O. Sanderlin, *Legal fight over Ghost Guns, Baltimore's Most Common Firearm, Heads to Supreme Court*, Apr. 22, 2024, available at https://www.thebaltimorebanner.com/community/criminal-justice/supreme-court-ghost-gun-baltimore-srjw2wymr5ehddlqdstkpy6nfy/?schk=no&rchk=yes&utm_source=the+baltimore+banner&utm_campaign=1842a821fc-nl_alrt_20240422_1200&utm_medium=email&utm_term=0_1842a821fc-%5blist_email_id%5d&mc_cid=1842a821fc&mc_eid=8b0c81cdf5.

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- Law enforcement in Newark saw a 414% increase in ghost gun seizures from 2020 to 2021.⁶
- Law enforcement in Hartford seized 29 ghost guns in 2021, an increase of 314% from 2020. In 2022, that number again increased, this time to 58 ghost gun seizures.⁷
- The Seattle Police Department seized 83 ghost guns between May 2019 and May 2022. From 2020 to 2022, ghost gun recoveries as a percentage of all firearm recoveries have more than tripled.⁸ King County, Washington reported at least 120 ghost gun recoveries in 2022 alone.⁹
- In 2019, only 6.7% of guns recovered by local law enforcement in Oakland, California were classified as ghost guns. In 2020, that number jumped to 16.5%. And as of March 2021, ghost

⁶ Mayor Ras Baraka's and Public Safety Director O'Hara's Joint Statement on President Biden's Strategy to Reduce Gun Crime, Feb. 4, 2022, available at <https://www.newarknj.gov/news/mayor-ras-barakas-and-public-safety-director-oharas-joint-statement-on-president-bidens-strategy-to-reduce-gun-crime>.

⁷ 2022 data on file with Hartford Police Department (current as of May 13, 2024).

⁸ See Decl. of A. Diaz, Interim Chief of Police for the Seattle Police Department, filed in *Division 80, LLC v. Garland*, 3:22-CV-00148 (S.D. Tex. 2022); see also *Vanderstok v. Garland*, 4:22-CV000691-O, Dkt. No. 61 at 40-41.

⁹ Data on file with King County Prosecuting Attorney's Office (current as of June 13, 2024).

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guns accounted for 21.7% of all confiscated firearms.¹⁰

- Law enforcement in Columbus seized 14 ghost guns in 2021. That number more than doubled to 31 in 2022, and increased again in 2023 to 43 seizures.¹¹
- In Santa Clara County, ghost gun recoveries have increased from 45 in 2018 to 323 in 2022.¹²
- In Rochester, ghost gun recoveries have dramatically increased from 9 in 2019 to 57 in 2022 and to 86 in 2023.¹³
- In Dallas, ghost gun recoveries have increased every year from 2017 to 2023, with 61 ghost guns retrieved in 2023.¹⁴

¹⁰ *Oakland City Councilmembers Propose Ban on Ghost Guns*, CBS Bay Area, Jan. 11, 2022, available at <https://www.cbsnews.com/sanfrancisco/news/oakland-city-councilmembers-propose-ban-on-ghost-guns/>.

¹¹ Aaron Burd and Anna Hoffman, *'Astronomical' Numbers Of Illegal Gun Part Found In Columbus In 2023, Police Say*, NBC Columbus, Jan. 11, 2024, available at: <https://www.nbc4i.com/news/local-news/columbus/astronomical-numbers-of-illegal-gun-part-found-in-columbus-in-2023-police-say/#:~:text=Ghost%20gun%20seizures%20also%20saw,built%20without%20a%20background%20check>.

¹² Data on file with the San Jose and Santa Clara County Police Department (current as of June 15, 2024).

¹³ Data on file with the Rochester Police Department (current as of May 14, 2024).

¹⁴ Data on file with the Dallas District Attorney's Office (Current as of May 15, 2024).

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Early signs indicate, however, that the Final Rule is having its intended effect: it is beginning to curb the rate at which ghost guns are seized in several of the Amici Cities and Counties, and in other locations around the country. Since the Rule went into effect in 2022, ghost gun recoveries have decreased in several major cities. For example:

- Ghost gun recoveries in New York decreased in 2023 for the first time in four years, declining from 436 in 2022 to 359 in 2023.¹⁵
- In Baltimore, ghost gun recoveries decreased in 2023 for the first time since 2019, dropping from 519 in 2022 to 385 in 2023.¹⁶
- Ghost gun recoveries declined in Boston for the first time in four years, from 104 in 2022 to 86 in 2023.¹⁷
- In Los Angeles, ghost gun recoveries in 2023, while still the largest in the country, decreased

¹⁵ Data on file with the New York Police Department (current as of June 13, 2024).

¹⁶ Priya Krishnakumar, *High Number of Firearm Recoveries Underscores America's Worsening Gun Violence Epidemic*, CNN, Jan. 30, 2022, available at [https://www.cnn.com/2022/01/30/us/firearm-recoveries-gun-violence/index.html#:~:text=CNN%20requested%20data%20on%20gun,in%20at%20least%20a%20decade.\(2021 data\); 2023](https://www.cnn.com/2022/01/30/us/firearm-recoveries-gun-violence/index.html#:~:text=CNN%20requested%20data%20on%20gun,in%20at%20least%20a%20decade.(2021%20data);2023) Data on file with Baltimore Police Department (current as of May 14, 2024)

¹⁷ Boston Police Department, 2023 Boston Firearm Trafficking Report, (Feb. 9, 2024), <https://boston-pd-crime-hub-boston.hub.arcgis.com/apps/167f9bc56f5342408c0e3b52c52b4b9e/explore>.

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27% from the prior year.¹⁸

- In Newark, 39 ghost guns were recovered in 2023, compared to 64 in 2022.¹⁹
- Police recovered 37 ghost guns in 2023 in Hartford, compared to 58 in 2022.²⁰
- In San Francisco, law enforcement recovered 195 ghost guns in 2023, compared to 224 in 2022.²¹
- In Philadelphia, police recovered 526 ghost guns in 2023, compared to 575 in 2022.²²
- In Pittsburgh, police recovered 21 ghost guns in 2023, compared to 54 in 2022, and 50 in 2021.²³

¹⁸ Everytown for Gun Safety, *Ghost Gun Recoveries and Shootings*, July 31, 2023, available at <https://everytownresearch.org/report/ghost-guns-recoveries-and-shootings/> (2022 data).

¹⁹ 2022 and 2023 data on file with Newark Department of Public Safety (current as of May 22, 2024)

²⁰ Decl. of C. Mastroianni, Intelligence Division Sergeant for the Hartford Police Department, filed in *Division 80, LLC v. Garland*, 3:22-CV-00148 (S.D. Tex. 2022); see also *Vanderstok v. Garland*, 4:22-CV000691-O, Dkt. No. 61 at 37-38; 2022 data on file with Hartford Police Department (current as of May 13, 2024).

²¹ Data on file with San Francisco City Attorney's Office (current as of June 10, 2024).

²² 2023 Data on file with the Pennsylvania Office of Attorney General (current as of Feb. 28, 2024).

²³ Data on file with the Pittsburgh City Bureau of Police (current as of June 18, 2024).

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- Police recovered 407 ghost guns in 2023 in Washington, D.C. compared to 500 in 2022.²⁴
- In Oakland, law enforcement recovered 305 ghost guns in 2023, compared to 354 in 2022.²⁵

Though this early data is promising, these figures likely understate the true prevalence of ghost guns in the Amici municipalities, and across the country. Ghost guns are nearly impossible to trace, and law enforcement in many cities have only recently begun to classify ghost guns separately from other recovered guns.²⁶ Accordingly, the figures reported above²⁷ represent only those firearms actually seized

²⁴ 2023 data on file with the Metropolitan Police Department (current as of Feb. 22, 2024).

²⁵ Data on file with Oakland Police Department (current as of June 12, 2024).

²⁶ See T. Taniguchi, K. Hoogesteyn, K. Renouard, and D. Esserman, *The Proliferation of Ghost Guns: Regulation Gaps and Challenges for Law Enforcement*, National Police Foundation, 2021.

²⁷ Data for 2019 and 2021 the chart on page 3 is sourced from the National Police Foundation report, unless otherwise indicated: T. Taniguchi, K. Hoogesteyn, K. Renouard, and D. Esserman, *supra* n. 2. The remaining data was sourced as follows: **Baltimore**, Priya Krishnakumar, *High Number of Firearm Recoveries Underscores America's Worsening Gun Violence Epidemic*, CNN, Jan. 30, 2022, available at [https://www.cnn.com/2022/01/30/us/firearm-recoveries-gun-violence/index.html#:~:text=CNN%20requested%20data%20on%20gun,in%20at%20least%20a%20decade.\(2021%20data\);2022%20&2023](https://www.cnn.com/2022/01/30/us/firearm-recoveries-gun-violence/index.html#:~:text=CNN%20requested%20data%20on%20gun,in%20at%20least%20a%20decade.(2021%20data);2022%20&2023) Data on file with Baltimore Police Department (current as of May 14, 2024); **Chicago**, see Jeff Pegues, *Rise in Crime Fueled in Part by "Ghost" Guns, ATF Says*, CBS News, Feb. 2, 2022, available at <https://www.cbsnews.com/news/ghost-guns-crime-increase-atf/> (2021 data); Everytown for Gun Safety, *Ghost Gun*

Recoveries and Shootings, July 31, 2023, available at <https://everytownresearch.org/report/ghost-guns-recoveries-and-shootings/> (2022 data); **Los Angeles**, Los Angeles Police Department, 2021 Crime & Initiatives, available at https://lapdonlinestrgeacc.blob.core.usgovcloudapi.net/lapdonlinemedialine/2022/01/2021_crime_initiatives.pdf (2020 and 2021 data); Los Angeles did not track ghost gun recoveries until 2020); Everytown for Gun Safety, *Ghost Gun Recoveries and Shootings*, July 31, 2023, available at <https://everytownresearch.org/report/ghost-guns-recoveries-and-shootings/> (2022 & 2023 data); **New York**, *The City of New York v. Arm or Ally LLC* (S.D.N.Y. 2022), available at <https://www1.nyc.gov/assets/home/downloads/pdf/press-releases/2022/ghost-gun-complaint.pdf> (2019, 2020, and 2021 data); Everytown for Gun Safety, *Ghost Gun Recoveries and Shootings*, July 31, 2023, available at <https://everytownresearch.org/report/ghost-guns-recoveries-and-shootings/> (2022 & 2023 data); **Philadelphia**, see Jan Murphy, *Lawmakers Call For Extending Attorney General’s Jurisdiction to Address Philadelphia Gun Violence* (2021 data); **San Diego**, *Biden’s Ghost Gun rule could bolster San Diego’s ban*, ABC News 10 San Diego, Apr. 11, 2022, available at <https://www.10news.com/news/local-news/bidens-ghost-gun-rule-could-bolster-san-diegos-ban> (2021 & 2022 data); 2023 data on file with the San Diego Police Department (current as of June 7, 2024); Everytown for Gun Safety, *Ghost Gun Recoveries and Shootings*, July 31, 2023, available at <https://everytownresearch.org/report/ghost-guns-recoveries-and-shootings/> (2022 data); 2023 Data on file with the Pennsylvania Office of Attorney General (current as of Feb. 28, 2024); **Washington, D.C.**, Executive Office of the Mayor, *Mayor Bowser Announces New Intelligence-Led Policing Unit Focusing on Violent Crime*, Apr. 25, 2022, available at <https://mayor.dc.gov/release/mayor-bowser-announces-new-intelligence-led-policing-unit-focusing-violent-crime> (2021 data); Everytown for Gun Safety, *Ghost Gun Recoveries and Shootings*, July 31, 2023, available at <https://everytownresearch.org/report/ghost-guns-recoveries-and-shootings/> (2022 data); 2023 data on file with the Metropolitan Police Department (current as of Feb. 22, 2024).

by police and classified as ghost guns, and therefore likely understate the true prevalence of the use of ghost guns in each of the listed cities over the past several years.

If the Final Rule is vacated, the use of ghost guns, including in connection with criminal activity, will likely follow its pre-2023 trend and surge throughout the United States. This is particularly true in large cities, where the rise in ghost guns has only exacerbated the already massive problem of gun violence. More than two-thirds of the country's most populous cities experienced more homicides in 2021 than in the year prior, and experts have reported that homicides are increasingly committed through the use of guns.²⁸ Indeed, 77% of reported murders in 2020 were the result of gun violence—up from 74% in 2019.²⁹ The Final Rule is therefore critical to municipalities' efforts to stem the already rising threat of gun violence in cities across the country.

II. Ghost Guns Have Been Increasingly Used in Connection with Criminal Activity by High-Risk Individuals

As the availability and accessibility of ghost guns increases, so too does their usage in connection with criminal activity. This is particularly true given the attractiveness of ghost guns to high-risk

²⁸ Priya Krishnakuma, Emma Tucker, Ryan Young, and Pamela Kirkland, *Fueled by Gun Violence, Cities Across the US are Breaking All-Time Homicide Records This Year*, CNN, Dec. 12, 2021, [available at https://www.cnn.com/2021/12/12/us/homicides-major-cities-increase-end-of-year-2021/index.html](https://www.cnn.com/2021/12/12/us/homicides-major-cities-increase-end-of-year-2021/index.html).

²⁹ *Id.*

individuals, including those convicted of violent crimes, many of whom are prohibited from legally obtaining and possessing weapons and may be prone to violence. Indeed, as the prevalence of ghost guns has risen over the past several years, prosecutors and law enforcement officers have seen an uptick in the use of these firearms by persons previously convicted of a violent felony, individuals who have committed domestic violence offenses, violent extremists, organized crime syndicates, and minors. The Final Rule is thus necessary to lessen the increasing and grave threat to public safety posed by the unfettered access to untraceable firearms by people who have committed violent crimes and other high-risk individuals.

A. Persons Previously Convicted of a Violent Crime

Federal law and the laws of nearly every state prohibit individuals who have been convicted of, or who are under indictment for, a felony from acquiring or possessing firearms.³⁰ Many states further restrict access to firearms by people convicted of specified misdemeanors, typically those misdemeanors that involve the use of violence or the misuse of firearms.³¹

The market for Internet mail-order ghost gun kits offers individuals who are not legally able to purchase guns from licensed dealers the ability to easily and anonymously purchase kits online, without

³⁰ Giffords Law Center, *Firearms Prohibitions*, <https://giffords.org/lawcenter/gun-laws/policy-areas/who-can-have-a-gun/firearm-prohibitions/>.

³¹ *Id.*

undergoing a background check, and thereby obtain an unregistered and unserialized firearm. Although a black market for untraceable firearms has long existed, acquiring guns on the black market is typically a difficult, costly, and dangerous proposition. In contrast, individuals previously convicted of a felony and others who cannot pass a background check can instead buy gun-building kits online, thereby bypassing the risks associated with participation in the black market. A recent study that looked at 114 federal prosecutions involving the use of a ghost gun found that nearly 40% of those cases involved defendants who were legally prohibited from purchasing or possessing a firearm.³² And the ATF has documented the fact that ghost gun distributors are regularly selling these gun-building-kits directly to individuals legally prohibited from possessing firearms.³³

Amici, as well as municipalities and law enforcement across the country, have seen countless examples of violent criminal activity conducted with the use of a ghost gun by individuals otherwise unable to legally possess a firearm. For instance:

- On December 17, 2023, a Baltimore man was charged with the accidental shooting death of his 2-year-old daughter. The Defendant, who

³² *Untraceable: The Rising Specter of Ghost Guns*, Everytown For Gun Safety, May 14, 2020, available at <https://everytownresearch.org/report/the-rising-specter-of-ghost-guns/>.

³³ ATF Search Warrant Affidavit for Polymer80, at ¶ 87, available at <https://s.wsj.net/public/resources/documents/ghostraid-121420-warrant.pdf>.

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shot his daughter with a ghost gun, had previously been found guilty of a violent crime and was legally prohibited from owning a firearm.³⁴

- In April 2023, a Staten Island man with “multiple violent felonies” that prohibited him from owning a firearm shot his neighbor with a ghost gun.³⁵
- In January 2023, a Philadelphia man with multiple prior felonies was charged with trafficking ghost guns.³⁶
- In December 2022, Baltimore police seized 20 Polymer80 guns and other ghost guns from the home of a man with an extensive criminal background that included first- and second-degree assault, burglary, malicious

³⁴Rohan Mattu and Christian Olaniran, *Baltimore Father Charged In Shooting Death of 2-Year-Old Daughter*, CBS Baltimore, Dec. 21, 2023, available at <https://www.cbsnews.com/baltimore/news/father-charged-with-shooting-killing-2-year-old-girl-in-baltimore/>.

³⁵Maura Grunlund, *NYPD Posts Photo Of ‘Ghost Gun’ Allegedly Used In Shooting Of Neighbor On Staten Island*, SILive.com, Oct. 4, 2023, available at <https://www.silive.com/crime-safety/2023/10/nypd-posts-photo-on-social-media-of-ghost-gun-allegedly-used-in-shooting-on-south-shore-of-staten-island.html>.

³⁶*DA Krasner Announces Charges In Gun Trafficking Operation*, CBS Philadelphia, Jan. 17, 2023, available at <https://www.cbsnews.com/philadelphia/news/da-krasner-announce-charges-in-gun-trafficking-operation/>.

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destruction of property, and other convictions.³⁷

- In December 2021, law enforcement officers recovered an AR-15 ghost gun and an unknown caliber ghost gun from the home of a Pennsylvania man who had prior felony convictions for burglary and theft.³⁸
- In April 2021, a man with a criminal record for unlawfully carrying a concealed weapon used a ghost gun to shoot five people, killing one, in San Diego.³⁹
- In November 2020, a Baltimore man with a prior felony conviction was sentenced to 21 years in federal prison for a string of armed robberies committed using a ghost gun that had been assembled from a gun-building kit.⁴⁰

³⁷ *Baltimore Man Accused Of 3D Printing Multiple Ghost Guns*, CBS Baltimore, Dec. 30, 2022, available at: <https://www.cbsnews.com/baltimore/news/baltimore-man-accused-of-3d-printing-multiple-ghost-guns/>.

³⁸ Tony Rhodin, *Man had 2 ghost guns, 3 shotguns near Nazareth area pot grow operation, authorities say*, LehighValleyLive, Dec. 7, 2021, available at <https://www.lehighvalleylive.com/news/2021/12/man-had-2-ghost-guns-3-shotguns-near-nazareth-area-pot-grow-operation-authorities-say.html>.

³⁹ Richard Allyn, *Untraceable “ghost gun” allegedly used in fatal Gaslamp shooting spree*, CBS8, Apr. 23, 2021, available at <https://www.cbs8.com/article/news/local/untraceable-ghost-gun-allegedly-used-in-fatalgaslamp-shooting-sprees/509-cc352272-85d9-4e4b-bc1b-7446dcb96660>.

⁴⁰ U.S. Attorney’s Office, District of Maryland Press Release, *Baltimore Man Sentenced to 21 Years in Federal Prison for Five*

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- In October 2020, a Washington man who had been convicted of multiple felonies, including a prior conviction for unlawful possession of a firearm, was sentenced to 70 months in prison after agents seized a weapons cache of 17 pistols and 24 rifles from his home, nearly all of which were ghost guns that the defendant had manufactured using parts purchased online.⁴¹
- In September 2020, a Washington, D.C. resident with a prior felony conviction pleaded guilty to felony possession of a firearm and ammunition after he was found by law enforcement to be carrying a .40-caliber pistol, loaded with ten rounds of ammunition, that he had constructed using a ghost gun kit.⁴²
- Also in September 2020, a man with multiple prior felony convictions obtained a ghost gun

Bank Robberies, Five Armed Robberies of Liquor Stores, and Related Firearms Charges, Nov. 12, 2020, available at <https://www.justice.gov/usao-md/pr/baltimore-man-sentenced-21-years-federal-prison-five-bank-robberies-five-armed-robberies>.

⁴¹ USAO Press Release, *Felon sentenced to more than five years in prison for arsenal of 'ghost guns' and smuggled silencers*, Oct. 9, 2020, available at <https://www.justice.gov/usao-wdwa/pr/felon-sentenced-more-five-years-prison-arsenal-ghost-guns-and-smuggled-silencers>.

⁴² U.S. Attorney's Office, District of Maryland Press Release, *D.C. Felon Pleads Guilty in Federal Court in Maryland to Illegal Possession of a "Ghost Gun" Firearm and Ammunition*, Sept. 22, 2020, available at <https://www.justice.gov/usao-md/pr/dc-felon-pleads-guilty-federal-court-maryland-illegal-possession-ghost-gun-firearm-and>.

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and ambushed two Los Angeles County Sheriff's Deputies as they sat in their police car. Both Sheriff's Deputies sustained multiple gunshot wounds.⁴³

These cases are but a few examples of the many cases that powerfully underscore the need for the Final Rule in order to keep ghost guns out of the hands of individuals who are prohibited from legally obtaining and possessing firearms.

B. Domestic Abusers

It has long been understood that domestic violence and gun violence are “deeply interconnected.”⁴⁴ Where a domestic violence perpetrator has access to a gun, a survivor's risk of death increases “at least five-fold.”⁴⁵ Indeed, “a woman is shot by her domestic partner every sixteen

⁴³ *Ghost Gun Kit Seller Polymer80 Sued Over Gun Used to Shoot Two Los Angeles Sheriff's Deputies Last September*, Everytown for Gun Safety, Aug. 9, 2021, available at <https://everytownlaw.org/case/ghost-gun-kit-seller-polymer80-sued-over-gun-used-to-shoot-two-los-angeles-sheriffs-deputies-last-september/>.

⁴⁴ See Everytown for Gun Safety, *Domestic Violence*, available at <https://www.everytown.org/issues/domestic-violence/>.

⁴⁵ Caroline Ramsey, *Firearms in the Family*, 78 Ohio St. L.J. 1257, 1274-75 (2017); see also Giffords Law Center, *Domestic Violence & Firearms*, available at <https://giffords.org/lawcenter/gun-laws/policy-areas/who-can-have-a-gun/domestic-violence-firearms/> (“[D]omestic violence assaults involving a gun are 12 times more likely to end in death than assaults with other weapons or physical harm.”).

hours [in the United States].”⁴⁶ Moreover, even when they are not fired, guns are used by domestic abusers to exercise control over domestic violence survivors:⁴⁷ “Abused women frequently report that their intimate partners brandish guns to threaten deadly force.”⁴⁸ Of female survivors alive today, 4.5 million have reported that an intimate partner threatened them with a gun.⁴⁹ Once threatened, “women are more likely to endure long-term abuse out of fear that leaving the relationship will result in their death or the death of their children.”⁵⁰ Significantly, guns and domestic violence have been found to have a disproportionate impact on Black, Indigenous, and Hispanic women.⁵¹

⁴⁶ Jennifer Mascia, *Once Every 16 Hours, an American Woman Is Fatally Shot by a Current or Former Romantic Partner*, *The Trace*, Feb. 9, 2016, available at <https://www.thetrace.org/2016/02/women-domestic-violence-death-statistics/>.

⁴⁷ Jennifer L Vainik, *Kiss, Kiss, Bang, Bang: How Current Approaches to Guns and Domestic Violence Fail to Save Women’s Lives*, 91 *Minn. L. Rev.* 1113, 1117 (2007); see also Jane K. Stoever, *Intimate Partner Violence and Restorative Justice: Firearms and Domestic Violence Fatalities: Preventable Deaths*, 53 *Fam. L.Q.* 183, 185 (2019) (“[A] domestically abusive individual is likely to use the firearm to perpetrate abuse against an intimate partner and children.”).

⁴⁸ Vainik, *supra* note 26, at 1117.

⁴⁹ Stoever, *supra* note 26, at 186.

⁵⁰ Vainik, *supra* note 26, at 1117.

⁵¹ Everytown for Gun Safety, *Guns and Violence Against Women*, Oct. 17, 2019, available at <https://everytownresearch.org/report/guns-and-violence-against-women-americas-uniquely-lethal-intimate-partner-violence-problem/> (“Compared to non-Hispanic white women, Black women are twice as likely to be fatally shot by an intimate partner, and younger Black women—between the ages of 18 and 34—are at the greatest risk:

To address these risks, Congress and over half the states have passed laws that prohibit persons likely to threaten their intimate partners with violence from obtaining firearms.⁵² Studies have shown that firearm relinquishment laws⁵³ and background checks are critical to keeping domestic violence survivors safe.⁵⁴ Firearm relinquishment laws have been linked to a 16% reduction in intimate partner gun homicides,⁵⁵ and background checks have been shown to reduce domestic violence homicides by

They are nearly three times more likely to be shot and killed by an intimate partner than are white women in the same age group.”).

⁵² See Kellie Descrochers, *Municipalities Are Not Kingdoms: Regulating Gun Ownership in Cases Involving Domestic Violence in Light of the Pauler Decision*, 29 B.U. Pub. Int. L.J. 277, 285 (2020).

⁵³ Seventeen states and the District of Columbia require those convicted of domestic violence misdemeanors to turn in their firearms after conviction, and twenty-eight states have enacted laws that facilitate the removal of firearms from individuals when they become subject to protective orders. See Giffords Law Center, *Who can have a gun: Domestic Violence & Firearms*, available at <https://giffords.org/lawcenter/gun-laws/policy-areas/who-can-have-a-gun/domestic-violence-firearms/>. The strongest state laws, such as New Jersey’s, require officers to remove firearms after the issuance of a protective order, while other’s permit judges to require domestic violence offenders to surrender their firearms. *Id.*

⁵⁴ See Giffords Law Center, *Who can have a gun Firearm Relinquishment*, available at <https://giffords.org/lawcenter/gun-laws/policy-areas/who-can-have-a-gun/firearm-relinquishment/> (citing M. Zeoli, *et al.*, *Analysis of the Strength of Legal Firearms Restrictions for Perpetrators of Domestic Violence and Their Associations With Intimate Partner Homicide*, *American Journal of Epidemiology* 187, No. 11 (2018): 2365–2371).

⁵⁵ See Giffords Law Center, *supra* n. 33.

47%.⁵⁶ From 1994 to 2012, federal domestic violence-related firearm prohibitions blocked the sale of approximately 314,000 purchases of firearms.⁵⁷

These protective measures for domestic violence survivors, however, are severely undermined by the proliferation and accessibility of ghost guns. Indeed, the very existence of a market for unserialized ghost guns, which can easily be acquired without a background check, obstructs the enforcement of laws requiring the relinquishment of firearms upon conviction of a domestic violence offense or issuance of a domestic violence restraining order. Amici, as well as municipalities and law enforcement across the country, have seen the grave danger that ghost guns pose to domestic violence survivors. For example:

- On February 2, 2023, law enforcement responded to a domestic violence situation where the victim had been assaulted and beaten in the face with a gun. Four days later, police in Rochester arrested the 18-year-old suspect and found a ghost gun in his possession.⁵⁸

⁵⁶ Stoeber, *supra* note 26, at 185; *see also* Aaron Edward Brown, This Time I'll Be Bulletproof: Using Ex Parte Firearm Prohibitions to Combat Intimate-Partner Violence, 50 Colum. Human Rights L. Rev. 159, 180 (2019).

⁵⁷ *See* Brown, *supra* note 35, at 178. (noting that this number does not account for those who willingly surrendered their firearms to comply with federal law).

⁵⁸ Evan Bourtis, *RPD: Man accused of Domestic Violence Arrested for Carrying a Ghost Gun*, NBC Rochester, Feb. 8, 2023, available at <https://www.whec.com/top-news/rpd-man-accused-of-domestic-violence-arrested-for-carrying-a-ghost-gun/>.

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- On November 6, 2022, a domestic abuser in Philadelphia broke into the home of his 20-year-old ex-girlfriend. That evening, she obtained an emergency protection-from-abuse order against him. Two days later, her abuser shot and killed her with a ghost gun, shooting her ten times on her walk to work.⁵⁹
- In May 2022, an Ohio man who was in violation of an Aggravated Menacing and Domestic Protection Order pointed a firearm at two victims—an adult and a minor—and threatened to shoot the victims’ entire family. Dayton Police later found a ghost gun rifle located in the man’s residence.⁶⁰
- In February 2022, a man in Sacramento used an unregistered homemade semiautomatic rifle-style weapon to kill his three daughters, a chaperone who was supervising his visit with them, and himself inside of a local church. The man was subject to a domestic violence

⁵⁹ Ellie Rushing, *Loved Ones of a Young Woman Slain in a Domestic Shooting Say Police Didn't Do Enough to Protect Her*, Philadelphia Enquirer, Dec. 11, 2022, available at <https://www.inquirer.com/crime/sahmya-garcia-philadelphia-shooting-domestic-violence-20221207.html>.

⁶⁰ See Decl. of J. Musto, Deputy Law Director at the City of Dayton Law Department, filed in *Division 80, LLC v. Garland*, 3:22-CV-00148 (S.D. Tex. 2022); see also *Vanderstok v. Garland*, 4:22-CV000691-O, Dkt. No. 61 at 34-35.

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restraining order that barred him from possessing a firearm.⁶¹

- In August 2020, police officers in San Jose, California arrested an individual for felony domestic violence. The survivor reported that the abuser had pointed a gun at her during the incident. When the officer explained to the assailant that he would not be permitted to get his firearm back pursuant to a “Gun Violence Restraining Order,” the individual replied, “then I’ll just build another one.”⁶²
- In July 2020, a man in Pennsylvania was arrested for shooting and killing his ex-wife and her friend with a ghost gun. The man’s ex-wife had filed for two separate protection-from-abuse orders in the year prior to her murder and the man had been required to relinquish his firearms pursuant to those orders.⁶³

⁶¹ *A Father Used a Ghost Gun to Kill His Three Daughters. It’s a Sign of a Growing Crisis*, The Guardian, Mar. 8, 2022, <https://www.theguardian.com/us-news/2022/mar/08/a-father-used-a-ghost-gun-to-kill-his-three-daughters-its-a-sign-of-a-growing-crisis>.

⁶² *City of Syracuse, NY, et al., v. Bureau of Alcohol, Tobacco, Firearms, and Explosives, et al.*, 1:20-cv-06885-GHW (S.D.N.Y. 2020), Complaint at ¶ 131, available at https://assets.nationbuilder.com/firearmspolicycoalition/pages/5834/attachments/original/1648681797/Syracuse_v_ATF_Complaint.pdf?1648681797.

⁶³ John Finerty, *State Struggles to Bolster PFA Orders*, June 27, 2020, available at https://www.ncnewsonline.com/news/local_news/state-struggles-to-bolster-pfa-orders/article_618d2d90-0d07-5f0e-bcb8-8a0e667a201e.html; Marcia Moore, *UPDATE*

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- In September 2019, police officers in Chico, California responded to a call regarding a domestic violence dispute between a man and his girlfriend. The man was already the subject of a restraining order filed by his estranged wife, which prohibited him from owning any firearms or ammunition. Officers found ammunition, a semi-automatic AR-15 rifle with an extended magazine, and two loaded pistols at the man’s residence. The man was arrested for possession of illegal firearms and for being a prohibited person in possession of firearms. Two months later, when conducting a welfare check at the man’s residence, officers found the man holding a loaded AR-15 rifle with at least nine rounds and the safety selector switch set to “fire.” Officers also found a semi-automatic handgun, a .308 rifle, a 9mm handgun, and ammunition. The man later admitted that he knew he was not permitted to possess firearms pursuant to his restraining order. He explained, however, that all of his guns were ghost guns that were purchased “80% built from different online websites.” He added that “80% firearms were made for people ‘like me’ who needed to get around not being able to buy guns.”⁶⁴

Fernanders’ Murder Charges Headed to Snyder County Court, Sept. 29, 2020, https://www.dailyitem.com/news/fernanders-murder-charges-headed-to-snyder-county-court/article_41052d22-0285-11eb-9aa6-630b1abad5ed.html.

⁶⁴ See *United States v. Villasenor*, 2:20-cr-00050-KJM (E.D. Cal.), Dkt. No. 1.

C. Minors

There has been an alarming rise in recent years in the use of ghost guns by minors. In 2021 alone, police officers in Washington D.C. arrested nearly 100 teenagers who were in possession of ghost guns.⁶⁵ According to data released by the Baltimore City Police Department in 2023, minors account for 40% of all ghost gun offenders in Baltimore.⁶⁶ Moreover, as a result of the accessibility and proliferation of ghost guns among minors, prosecutors and law enforcement in the Amici Cities and Counties have seen an increase in violent incidents involving these firearms. For example:

- On February 13, 2024, two children aged 12 and 13 used ghost guns during a carjacking in Seattle, firing the guns twice.⁶⁷

⁶⁵ Jodie Fleischer, Rick Yarborough, Jeff Piper, and Skye Witley, *Record Number of Ghost Guns Found in DC in 2021*, NBC News, Nov. 19, 2021, available at <https://www.nbcwashington.com/news/local/dc-gun-violence/record-number-of-ghost-guns-found-in-dc-in-2021/2888734/>.

⁶⁶ Rebecca Pryor, “*It’s Alarming*” *40% Of Baltimore City Ghost Gun Offenders Under The Age Of 21*, Fox News Baltimore, Jan. 25, 2023, available at <https://foxbaltimore.com/news/local/it-is-alarming-40-of-baltimore-city-ghost-gun-arrests-under-the-age-of-21>.

⁶⁷ Jeremy Harris, *Boys Arrested After Seattle Carjacking, Pursuit Were Armed With ‘Ghost Guns’*, KOMO News, Feb. 19, 2024, available at <https://komonews.com/news/local/kids-arrested-in-seattle-carjacking-and-pursuit-were-armed-with-so-called-ghost-guns-charged-high-speed-chase-greenwood-south-lake-union-bitter-lake-gun-recovered-family-justice-center-king-county-crime>.

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- On January 8, 2024, a 16-year-old Syracuse minor was arrested and charged with numerous felonies after police found a ghost gun, cocaine, and fentanyl in the teenager's possession.⁶⁸
- Also in January 2024, a 17-year-old minor on juvenile probation for firearm offenses was found to be in possession of a loaded ghost gun. The weapon had an extended magazine and a switch converting it into a fully automatic firearm.⁶⁹
- On December 28, 2023, an 18-year-old was taken into custody in Hartford after firing 19 rounds with a ghost gun that had an automatic switch and a high-capacity magazine.⁷⁰
- On September 12, 2023, two 14-year-olds in Baltimore fired shots from a ghost gun in their

⁶⁸ Megan Hatch, *Syracuse Teen Arrested, Found With A Ghost Gun, Fentanyl And Cocaine: Police*, Inform NY, Jan. 11, 2024, available at <https://www.informnny.com/news/state-news/syracuse-teen-arrested-found-with-a-ghost-gun-fentanyl-and-cocaine-police/?nxsparm=1>.

⁶⁹ Office of the Pennsylvania Attorney General Press Release, *AG Henry: Carjacking, Possession Of 'Ghost Guns' Among Recent Crimes Involving Young People And Firearms In Philadelphia*, Jan. 18, 2024, available at <https://www.attorneygeneral.gov/taking-action/ag-henry-carjacking-possession-of-ghost-guns-among-recent-crimes-involving-young-people-and-firearms-in-philadelphia/>.

⁷⁰ Justin Musynski, *18 Year Old Accused Of Firing 19 Rounds In Hartford With Ghost Gun*, Hartford Courant, Dec. 28, 2023, available at <https://www.courant.com/2023/12/28/teen-reportedly-found-with-ghost-gun-after-hartford-police-alerted-to-19-gunshots/>.

possession, which prompted lockdowns at three nearby schools.⁷¹

- In May 2023, three 14-year-old boys were arrested for two armed robberies and an armed carjacking that was undertaken with a ghost gun.⁷²
- In 2022, a 17-year-old suspect was charged in the fatal shooting of a 17-year-old high school football player with a ghost gun as classes let out for Labor Day weekend in Baltimore.⁷³
- In April 2022, a 17-year-old shot and killed a 16-year-old and injured two other teenagers with a ghost gun outside of a high school in Bronx, New York.⁷⁴

⁷¹ Alex Glaze, “Ghost Gun” Believed To Have Been Used By 14 Year-Olds In Lansdowne Shooting, CBS Baltimore, Sept. 12, 2023, available at <https://www.cbsnews.com/baltimore/news/ghost-gun-believed-to-have-been-used-by-14-year-olds-in-lansdowne-shooting/>.

⁷² David Collins, *Baltimore Police Arrest 3 Teens Linked to Armed Carjacking, Robberies*, WBALTV11, May 26, 2023, available at <https://www.wbaltv.com/article/3-teens-arrested-armed-carjacking-robbery-baltimore/44017268>.

⁷³ Keith Daniels, *Juvenile Suspect In Mervo Fatal Shooting Held Without Bail, Could Be Charged As Adult*, Fox News Baltimore, Sept. 2, 2022, available at <https://foxbaltimore.com/news/local/juvenile-suspect-in-mervo-high-school-fatal-shooting-debate-over-charged-as-adult>.

⁷⁴ Aaronn Katersky, Mark Crudele, and Ivan Pereira, *17-year-old arrested in connection with Bronx high school shooting that left teen dead*, ABC News, Apr. 9, 2022, available at <https://abcnews.go.com/US/17-year-arrested-connection-bronx-high-school-shooting/story?id=83981645>.

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- In January 2022, a 17-year-old Maryland student was charged with attempted second-degree murder after shooting a 15-year-old at his school with a ghost gun.⁷⁵
- In December 2021, a teenager brought a loaded ghost gun to school in Brooklyn, New York.⁷⁶
- In November 2021, a 16-year-old boy in Arizona sold a ghost gun to a 15-year-old boy at school. After an altercation between the two boys, the purchaser of the gun used it to shoot and wound the teenager from whom he purchased the ghost gun.⁷⁷
- On May 31, 2021, a 17-year-old boy in Washtenaw County, Michigan was shot by another 17-year-old, who bought the ghost gun

⁷⁵ Dan Morse, *Magruder High School student charged as adult with attempted second-degree murder*, The Washington Post, Jan. 22, 2022, available at <https://www.washingtonpost.com/dc-md-va/2022/01/22/magruder-high-shooting-ghost-gun-student-charged/>.

⁷⁶ Thomas Tracy and Michael Else-Rooney, *21 Weapons Recovered at Brooklyn High School Campus Day After Student Caught with Gun and \$30,000*, Daily News, Dec. 2, 2021, available at <https://www.nydailynews.com/new-york/education/ny-weapons-brooklyn-high-school-campus-20211203-kg4k7xxpmbcepnocj2j2rf4py-story.html>.

⁷⁷ Aaron Marquez, *2 School Shootings, 1 Common Problem: Teens Had Easy Access to a Firearm*, AZ Central, Dec. 6, 2021, available at <https://www.azcentral.com/story/opinion/op-ed/2021/12/06/school-shootings-show-arizona-do-more-ghost-guns-gun-safety/8852461002/>.

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online and assembled the weapon “within minutes.”⁷⁸

- In 2019, a 16-year-old shot and killed two students with a ghost gun and injured three others at a high school in Santa Clarita, California.⁷⁹

Disturbingly, many of the incidents involving ghost guns and minors have been the result of accidents, which could have easily been prevented if ghost guns had been more stringently regulated and thus less accessible to the children involved. For example:

- In January 2022, a 14-year-old boy in Florida was accidentally shot and killed by his friend who was “playing” with a loaded ghost gun in the boy’s bedroom. Authorities believe the boy who was killed ordered the weapon online and assembled it himself.⁸⁰

⁷⁸ Emma Tucker, *Michigan Teen Who Alleges His Underage Friend Shot Him With A Ghost Gun In 2021 Sues An Online Supplier*, CNN, Mar. 15, 2024, available at <https://www.cnn.com/2024/03/15/us/michigan-accidental-shooting-ghost-gun/index.html>.

⁷⁹ Dakin Andone, *The gunman in the Saugus High School shooting used a ‘ghost gun,’ sheriff says*, CNN, Nov. 21, 2019, available at <https://www.cnn.com/2019/11/21/us/saugus-shooting-ghost-gun/index.html>.

⁸⁰ Corey Arwood, *Vero Beach boy shot, killed Jan. 30 while playing with gun made from parts bought online*, TC Palm, March 15, 2022, available at <https://www.tcpalm.com/story/news/crime/indian-river-county/2022/03/15/14-year-old-vero-beach-boy-shot-killed-friend-playing-gun-made-parts-bought-online/7049145001/>.

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- In December 2021, a 13-year-old boy in Georgia accidentally shot and killed his 14-year-old sister with a ghost gun that he himself had built. The boy had been manufacturing ghost guns and selling them out of his home. After two people tried to steal one of his ghost guns, the boy opened fire to prevent the theft and, in the process, accidentally shot and killed his older sister.⁸¹
- In November 2021, a seventh grader in California was fatally shot with a ghost gun in his own home. Investigators are still trying to determine whether the 12-year-old boy accidentally shot himself or if his 15-year-old friend, who the police say brought the weapon into the apartment, discharged it while showing it off.⁸²
- In August 2021, an 8-year-old boy in Newark accidentally shot and killed himself with a ghost gun.⁸³

⁸¹ Yaron Steinbuch, *Georgia boy, 13, accused of accidentally killing sister with 'ghost gun'*, New York Post, Dec. 3, 2021, available at <https://nypost.com/2021/12/03/georgia-teen-accidentally-killed-sister-with-ghost-gun/>.

⁸² Glenn Thrush, *'Ghost Guns': Firearm Kits Bought Online Fuel Epidemic of Violence*, The New York Times, Nov. 14, 2021, available at <https://www.nytimes.com/2021/11/14/us/ghost-guns-homemade-firearms.html>.

⁸³ Rebecca Panico, *Fatal shooting of 8-year-old is 'horrible and tragic,' Newark mayor says and calls for accountability*, NJ.com, updated Aug. 31, 2021, available at <https://www.nj.com/essex/2021/08/fatal-shooting-of-8-year-old-is-horrible-and-tragic-newark-mayor-says-and-calls-for-accountability.html>.

Simply put, subjecting gun-building kits to the same regulations as fully-assembled firearms is essential to keeping children safe from intentional gun violence and fatal accidents.

D. Gun Trafficking by Individuals and Organized Crime Syndicates

Gun-building kits also make it easy and convenient for any individual or organized crime syndicate to become an unlicensed gun manufacturer and distributor. With just a few tools and some simple instruction, a criminal entrepreneur can easily turn nearly finished frames and receivers purchased over the Internet into finished, usable, and untraceable guns. As an example of this ready-access to ghost gun kits, in March 15, 2023, the New York Attorney General indicted three defendants in connection with a criminal operation that sold 19 firearms, including 12 ghost guns, 6 high-capacity magazines, and more than 560 grams of cocaine.⁸⁴ This example is not unique, and the conduct at issue is becoming dangerously common. For example:

- In December 2022, the New York Attorney General led a task force that seized 57 illegal firearms, including 51 ghost guns, as part of a

⁸⁴ Office of the New York State Attorney General Press Release, *Attorney General James and NY Drug Enforcement Task Force Take Down Ghost Gun and Narcotics Trafficking Ring*, Mar. 15, 2023, available at <https://ag.ny.gov/press-release/2023/attorney-general-james-and-ny-drug-enforcement-task-force-take-down-ghost-gun#:~:text=The%20123%2Dcount%20indictment%20charges,street%20value%20of%20approximately%20%2425%2C000>.

438-count indictment against three individuals.⁸⁵

- In November 2021, a Rhode Island man was arrested for operating a gun “factory” from his home in Providence. Police seized 100 firearms and parts for 45 ghost guns.⁸⁶
- In November 2021, an 18-year-old in Illinois was charged with assembling and selling ghost guns to numerous people, including a minor, after purchasing the parts online.⁸⁷
- Just a few weeks earlier, in Queens, New York, a couple was charged with the criminal sale of a firearm in the third degree after law enforcement found a stockpile of illegal ghost guns in the couple’s basement apartment where they lived with their child.⁸⁸

⁸⁵ *Id.*

⁸⁶ Benjamin Weiser, *Rhode Island Man Operated ‘Ghost Gun’ Home Factory, U.S. Says*, NY Times, available at <https://www.nytimes.com/2022/01/06/nyregion/rhode-island-man-ghost-guns-arrested.html>.

⁸⁷ Mary Schenk, *Champaign 18-year-old charged with producing, selling ‘ghost guns’*, The News-Gazette, Nov. 10, 2021, available at https://www.news-gazette.com/news/local/courts-police-fire/champaign-18-year-old-charged-with-producing-selling-ghost-guns/article_3e10de2a-b841-54b8-814a-8352082ad134.html.

⁸⁸ Queens District Attorney’s Office Press Release, *Cache of Ghost Guns Seized Following Investigation; Queens Couple Charged with Illegal Possession and Sale of Firearms*, Oct. 15, 2021, available at <https://queensda.org/cache-of-ghost-guns-seized-following-investigation-queens-couple-charged-with-illegal-possession-and-sale-of-firearms/>.

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- In June 2020, the Tenth Circuit affirmed an 87-month sentence of a defendant who used gun-building kits to manufacture and sell ghost guns—including fully automatic pistols and silencers—out of his basement.⁸⁹ The court took note of the extreme danger posed by the defendant’s illicit business and found the sentence necessary to deter others from manufacturing and selling illegal and untraceable weapons using easily accessible kits and tools.⁹⁰
- In 2020, a man in Fairfax, Virginia pleaded guilty to unlawfully dealing firearms without a license in connection with his practice of purchasing gun-building kits online, manufacturing untraceable ghost guns, and selling those guns to anyone with enough money to purchase them, regardless of whether the purchaser could lawfully possess a firearm.⁹¹
- In 2019, a New York City police officer pleaded guilty to second-degree criminal possession of a weapon after admitting to using gun-building kits to manufacture and sell dozens of handguns and rifles to people who could not

⁸⁹ *United States v. Trujillo*, 817 F. App’x 634, 635-36 (10th Cir. 2020).

⁹⁰ *Id.* at 640.

⁹¹ U.S. Attorney’s Office, Eastern District of Virginia Press Release, *Ghost Gun and Machine Gun Conversion Device Dealer Pleads Guilty*, Sept. 29, 2020, available at <https://www.justice.gov/usao-edva/pr/ghost-gun-and-machine-gun-conversion-device-dealer-pleads-guilty>.

legally possess them, including members of motorcycle gangs.⁹²

- That same year, a Texas man who had been making and trafficking ghost guns from his home, was killed by law enforcement after he shot and killed an agent.⁹³

The flourishing market for gun-building kits has also fueled the rise of larger illegal gun-dealing enterprises. In September 2020, federal prosecutors charged 15 members of the Sureños street gang in Concord, California with operating an illicit outdoor bazaar out of a shopping center parking lot where they distributed both drugs and illegal firearms, including ghost guns.⁹⁴ Similarly, in 2018, the Los Angeles

⁹² Associated Press, *Police officer charged with illegally making, selling guns*, ABC News, Mar. 2, 2019, available at <https://abcnews.go.com/US/wireStory/police-officer-charged-illegally-making-selling-guns-61430183>; see also Michael Woyton, *Former NYC Environmental Cop Admits Selling Illegal Weapons*, The Patch, Dec. 5, 2019, available at <https://patch.com/new-york/midhudsonvalley/former-nyc-environmental-cop-admits-selling-illegal-weapons>.

⁹³ See KTSM, Aaron Bracamontes *Document names El Paso man shot, killed by law enforcement after killing K-9 agent*, updated Dec. 19, 2019, available at <https://www.ktsm.com/crime/document-names-el-paso-man-shot-killed-by-law-enforcement-after-killing-k-9-agent/>; see also *United States v. Paul Jarvis*, Western District of Texas Case No. EP:19-M-9978-MAT, Criminal Complaint (Dec. 16, 2019) available at <https://storage.courtlistener.com/recap/gov.uscourts.txwd.1074713/gov.uscourts.txwd.1074713.1.0.pdf>.

⁹⁴ U.S. Attorney's Office, Northern District of California Press Release, *15 Charged on Drugs and Guns Charges as Part of Anti-Gang Sweep in Concord and Surrounding Areas*, Sept. 15, 2020,

Police Department arrested ten members of a street gang involved in the manufacture and sale of ghost guns, and seized approximately 50 rifles and handguns manufactured by the gang for sale on the black market.⁹⁵ Not surprisingly, in addition to manufacturing and selling ghost guns at scale, street gangs (many of whose members are likely unable to pass a background check) also manufacture ghost guns for use in their criminal endeavors.⁹⁶

E. Domestic Terrorists and Violent Extremists

Ghost guns have been deemed the “weapon of choice” by domestic terrorists and white supremacist extremists who seek to avoid detection by law enforcement.⁹⁷ A June 2021 report by the Joint Counterterrorism Assessment Team—a coalition of federal law enforcement and intelligence agencies, including the FBI—states that violent extremists use ghost guns to “circumvent security, avoid some state

available at <https://www.justice.gov/usao-ndca/pr/15-charged-drugs-and-guns-charges-part-anti-gang-sweep-concord-and-surrounding-areas>.

⁹⁵ Richard Winton, *L.A. Gangs stockpile untraceable ‘ghost guns’ that members make themselves*, Los Angeles Times, July 6, 2018, *available at* <https://www.latimes.com/local/lanow/la-me-la-gangsters-homemade-guns-20180706-story.html>.

⁹⁶ *Id.* (explaining that Southern California gangs are making their own weapons because they cannot buy them legally or are paying others to make them for them to get around gun laws).

⁹⁷ See Everytown for Gun Safety, *Ghost Guns: A Weapon of Choice for White Supremacists Arrested Ahead of Virginia Rally*, Jan. 27, 2020, *available at* <https://www.everytown.org/press/ghost-guns-a-weapon-of-choice-for-white-supremacists-arrested-ahead-of-virginia-rally/>.

government regulations, and evade detection.”⁹⁸ As Mike Sena, the director of the Northern California Regional Intelligence Center, has explained, the “go-to” for individual extremists, whether they are “international terrorists, domestic terrorists, or violent extremists,” is to “try to get a hold of a [ghost gun] because of the belief that [law enforcement] will never be able to figure out where [the] weapon came from.”⁹⁹ Indeed, terrorists and other violent extremists can acquire and use “ghost versions” of military-grade weapons, such as AR-15 assault rifles, even when such weapons are banned under state law.¹⁰⁰ Dangerous extremists have been able to acquire deadly weapons in the highly-accessible ghost gun market that they likely would not have been able to obtain had the Final Rule been in place at the

⁹⁸ *First Responder’s Toolbox*, NCTC, DHS & FBI, June 22, 2021, at 3, available at <https://www.documentcloud.org/documents/21037764-privately-made-firearms>. The authenticity of this report has been confirmed by The Trace and NBC Bay Area through federal law enforcement sources. See Alain Stephens, *The Feds are Increasingly Worried About Extremists Acquiring Ghost Guns, Leaked Report Shows*, The Trace, Aug. 6, 2020, available at <https://www.thetrace.org/2021/08/ghost-gun-government-report-3d-print-extremism-terrorism/>.

⁹⁹ See Stephens, *supra* n. 60.

¹⁰⁰ Assault weapons are banned in California, Connecticut, Maryland, New Jersey, and New York (and, as such, are banned in the following Amici Cities: Baltimore, Hartford, Los Angeles, Oakland, San Francisco, Newark, New York, Rochester, and Syracuse. See Cal. Penal Code §§ 30500-30685; Conn. Gen. Stat. §§ 53-202a to 53-202c; Md. Code, Crim. Law §§ 4-301 to 4-306; N.J. Stat. Ann. §§ 2C:39-1 to 2C:39-20, N.Y. Penal Law §§ 265.00-265.55.

time—weapons that they have gone on to use in mass shootings and other violent crimes.

Prosecutors and law enforcement in the Amici jurisdictions have seen this become an all-too-common occurrence. For example:

- On November 20, 2022, a man arrested in connection with online threats to attack a New York city synagogue was arraigned and found to be in possession of a ghost gun with an extended 30 round magazine and a laser sight designed to aid target acquisition.¹⁰¹
- In late 2022, a Pasadena man who allegedly sympathized with the anti-government extremist “Boogaloo” group allegedly brandished a loaded ghost gun near a South Los Angeles high school.¹⁰² The Boogaloo Movement, is “a right-wing extremist group that harbors a mistrust of law enforcement and

¹⁰¹ John Miller, Brynn Gingras, Samanta Beech, and Alaa Elassar, *2 Men Charged, 1 With Nazi Arm-Band, In Connection With Threats To Attack New York Synagogue*, CNN, Nov. 20, 2022, available at <https://www.cnn.com/2022/11/19/us/nyc-jewish-threat-community-arrest/index.html>.

¹⁰² DOJ Press Release, Pasadena Man Who Allegedly Adheres to Extremist Anti-Government Ideology Charged in Federal Complaint with Possessing Machine Gun, Jan. 26, 2023, available at <https://www.justice.gov/usao-cdca/pr/pasadena-man-who-allegedly-adheres-extremist-anti-government-ideology-charged-federal>.

government and anticipates a second American Civil War.”¹⁰³

- On March 31, 2022, a Columbus man previously charged with threatening a Jewish school was arrested and charged with making and selling ghost guns.¹⁰⁴
- In July 2021, a grand jury in North Carolina indicted a 21-year-old New Jersey National Guardsman for allegedly supplying ghost guns to members of a white nationalist group who had appeared in videos giving the “Heil Hitler” salute.¹⁰⁵
- In 2020, a California man affiliated with the same movement shot and murdered a federal

¹⁰³ *Alleged Oakland, Ben Lomond Gunman Steve Carrillo Linked to Far Right ‘Boogaloo’ Movement*, CBS SF Bay Area, June 16, 2020, available at <https://sanfrancisco.cbslocal.com/2020/06/16/steven-carrillo-david-underwood-murder-santa-cruz-deputy-fatal-shooting-fatal-oakland-federal-building-shooting/>.

¹⁰⁴ DOJ Press Release, *Former National Guard Member Who Made Antisemitic & Violent Statements Online Sentenced To Nearly 6 Years In Prison For Making, Selling ‘Ghost Guns,’* Feb. 28, 2023, available at <https://www.justice.gov/usao-sdoh/pr/former-national-guard-member-who-made-antisemitic-violent-statements-online-sentenced#:~:text=Court%20documents%20detail%20that%20Thomas,guns%20to%20sell%20for%20profit>.

¹⁰⁵ See Stephens, *supra* n. 60; see also Justin Rohrlich, *NJ National Guardsman Charged in Neo-Nazi ‘Ghost Gun’ Conspiracy*, The Daily Beast, July 2, 2021, available at <https://www.thedailybeast.com/new-jersey-national-guardsman-joseph-maurino-charged-in-neo-nazi-ghost-gun-conspiracy>.

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security officer and a sheriff's deputy using a "homemade" AR-15 style rifle.¹⁰⁶

- In May 2020, law enforcement in Queens arrested two men who were assembling an arsenal of weapons, including "an AR-15 style assault rifle 'ghost' gun with a silencer attachment and high capacity magazine."¹⁰⁷ One of the men's social media posts suggested that these weapons were likely intended for use in a mass shooting: he had advocated for a "racial civil or holy war"; posted a picture of himself giving a Nazi salute with the caption that he "hate[s] women jews and n----rs"; posted a picture where he displayed a large knife with the caption that read, "overthrowing [Jews] is our Christian duty"; posted a photograph of a Planned Parenthood location being blown up by the comic book character The Joker; commented in response to a bloody crime scene photograph from the December 2019 machete attack at a synagogue in Monsey, New York that it was "pretty f-----g exciting"; and "posted Instagram messages

¹⁰⁶ Stephen Stock and Jeremy Carroll, *Ghost Guns Sought by Violent Extremists, Tied to Thousands of Potential Crimes, Feds Warn*, NBC Bay Area, Aug. 7, 2021, available at <https://www.nbcbayarea.com/investigations/ghost-guns-sought-by-violent-extremists-tied-to-thousands-of-potential-crimes-feds-warn/2624959/>.

¹⁰⁷ U.S. Attorney's Office, Eastern District of New York Press Release, *Two Queens Men Charged After Buying Three Illegally Defaced Firearms and Two Assault Rifles*, U.S. Dep't Justice (May 13, 2020), available at <https://www.justice.gov/usao-edny/pr/two-queens-men-charged-after-buying-three-illegally-defaced-firearms-and-two-assault>.

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displaying suicidal ideations” and fantasies
“about ‘martyring’ himself and ‘going out in a
blaze of glory’ in a mass shooting.”¹⁰⁸

The Final Rule is essential to keep untraceable
ghost guns out of the hands of dangerous extremists.

¹⁰⁸ See U.S. Attorney’s Office, Eastern District of New York Press
Release, *supra* n. 66.

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CONCLUSION

There can be no doubt that ghost gun kits have enabled countless individuals in cities across the country to flout some of the most fundamental gun regulations, including the laws prohibiting convicted felons and domestic abusers from possessing firearms; have led to a substantial increase in guns and gun violence in cities across the country; and have undermined the efforts of law enforcement agencies across the country to deter and prosecute gun violence. As early statistics demonstrate, the Final Rule is absolutely necessary to curb the dangerous proliferation of ghost guns and to promote public safety. For the foregoing reasons, Amici urge the Court to overturn the Fifth Circuit’s decision invalidating the Final Rule.

Dated: July 2, 2024

Respectfully submitted,

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Detailed Report

Document

Rule Name	Status	Description
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Image-only PDF	Passed	Document is not image-only PDF
Tagged PDF	Failed	Document is tagged PDF
Logical Reading Order	Needs manual check	Document structure provides a logical reading order
Primary language	Failed	Text language is specified
Title	Failed	Document title is showing in title bar
Bookmarks	Failed	Bookmarks are present in large documents
Color contrast	Needs manual check	Document has appropriate color contrast

Page Content

Rule Name	Status	Description
Tagged content	Failed	All page content is tagged
Tagged annotations	Passed	All annotations are tagged
Tab order	Failed	Tab order is consistent with structure order
Character encoding	Passed	Reliable character encoding is provided
Tagged multimedia	Passed	All multimedia objects are tagged
Screen flicker	Passed	Page will not cause screen flicker
Scripts	Passed	No inaccessible scripts
Timed responses	Passed	Page does not require timed responses
Navigation links	Passed	Navigation links are not repetitive

Forms

Rule Name	Status	Description
Tagged form fields	Passed	All form fields are tagged
Field descriptions	Passed	All form fields have description

Alternate Text

Rule Name	Status	Description
Figures alternate text	Failed	Figures require alternate text
Nested alternate text	Failed	Alternate text that will never be read
Associated with content	Failed	Alternate text must be associated with some content
Hides annotation	Failed	Alternate text should not hide annotation
Other elements alternate text	Failed	Other elements that require alternate text

Tables

Rule Name	Status	Description
Rows	Failed	TR must be a child of Table, THead, TBody, or TFoot

TH and TD	Failed	TH and TD must be children of TR
Headers	Failed	Tables should have headers
Regularity	Failed	Tables must contain the same number of columns in each row and rows in each column
Summary	Skipped	Tables must have a summary

Lists

Rule Name	Status	Description
List items	Failed	LI must be a child of L
Lbl and LBody	Failed	Lbl and LBody must be children of LI

Headings

Rule Name	Status	Description
Appropriate nesting	Failed	Appropriate nesting

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National Opioid Settlement: Kroger Co.

Boulder County, CO

Rubris Reference Number: CL-789949

***TO LOCAL POLITICAL SUBDIVISIONS:
THIS NOTICE CONTAINS IMPORTANT INFORMATION ABOUT A NEW
NATIONAL OPIOID SETTLEMENT.***

KROGER CO. SETTLEMENT OVERVIEW

A proposed nationwide settlement agreement (“Settlement”) has been reached that would resolve the legal claims of states and local political subdivisions against regional supermarket pharmacy Kroger Co. related to alleged misconduct related to opioids.

The Settlement requires Kroger Co. to pay over a billion dollars to abate the opioid epidemic. Of this amount, approximately \$1.2 billion will be used by participating states and subdivisions to remediate and abate the impacts of the opioid crisis. Depending on participation by states and subdivisions, the Settlement requires payments over eleven years after its effective date.

The Settlement also contains injunctive relief governing opioid dispensing practices and requires Kroger Co. to implement safeguards to prevent diversion of prescription opioids.

The proposed settlement has two key participation steps.

First, each eligible state decides whether to participate in each Settlement. A list of participating states for each settlement can be found at <https://nationalopioidsettlement.com>.

Second, eligible subdivisions within each participating state decide whether to participate in the Settlement. The more subdivisions that participate, the more funds flow to that state and its subdivisions. Any subdivision that does not participate cannot directly share in any of the settlement funds, even if the subdivision’s state is settling and other participating subdivisions are sharing in settlement funds. If the state does not participate, the subdivisions in that state are not eligible to participate in the Settlement.

WHO IS RUBRIS INC. AND WHAT IS THE IMPLEMENTATION ADMINISTRATOR?

The Settlement provides that an Implementation Administrator will provide notice and manage the collection of participation forms. Rubris Inc. is the Implementation Administrator for this new Settlement and was also retained for the prior national opioid settlements.

WHY IS YOUR SUBDIVISION RECEIVING THIS NOTICE?

Your state has elected to participate in the Settlement, and therefore your subdivision may participate in that Settlement. This notice is also sent directly to counsel for such subdivisions if the Implementation Administrator has their information.

*If you are represented by an attorney with respect to opioid claims, please contact them. **Subdivisions can participate in the Settlement whether or not they filed a lawsuit or are represented.***

WHERE CAN YOU FIND MORE INFORMATION?

Detailed information about the Settlement, including each settlement agreement, may be found at: <https://nationalopioidsettlement.com>. This website also includes information about how the Settlement are being implemented in most states and how funds will be allocated within your state.

You are encouraged to review the settlement agreement terms and discuss the terms and benefits with your counsel, your Attorney General's Office, and other contacts within your state. Information and documents regarding the Settlement and your state allocation can be found on the settlement website at <https://nationalopioidsettlement.com>.

Your subdivision will need to decide whether to participate in the proposed Settlement, and subdivisions are encouraged to work through this process before the **August 12, 2024**, deadline.

HOW DO YOU PARTICIPATE IN THE SETTLEMENT?

The Settlement requires that you take affirmative steps to "opt in" to the Settlement.

In the next few weeks, you will receive documentation and instructions from the Implementation Administrator or, in some cases, your Attorney General's Office. In order to participate in a settlement, a subdivision must sign and return the required Participation Form.

Please add the following email addresses to your "safe" list so emails do not go to spam / junk folders: dse_na3@docusign.net and opioidsparticipation@rubris.com. Please monitor your email for the Participation Form and instructions.

All required documentation must be signed and returned on or before **August 12, 2024**.

Accessibility Report

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Detailed Report

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Lbl and LBody	Passed	Lbl and LBody must be children of LI

Headings

Rule Name	Status	Description
Appropriate nesting	Failed	Appropriate nesting

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TITLE: Water Resources Maintenance and Fuels Mitigation Specialist

SUMMARY

Under general supervision, the Water Resources Maintenance and Fuels Mitigation Specialist assists the department and its Water Resources Program to oversee all aspects of water resources infrastructure maintenance and fuels mitigation along irrigation ditches in the grassland urban interface (GUI). This position understands the system-wide water infrastructure needs on Parks and Open Space lands. The person trusted with this role will plan for and coordinate water delivery infrastructure maintenance activities (such as ditch burning, fuels removals, debris pile removals and invasive plant removals) across the Parks and Open Space land system and lead contractors and/or field crews in ditch maintenance and fuels mitigation activities. This position coordinates with stakeholders such as community members, invasive weeds staff, neighbors, ditch companies, ecological staff, and the fire community to use the latest information and technologies available and to collaborate with others on following maintenance and fuels mitigation strategies and best practices. This position will also look at ways to extend ditch fuels management and mitigation onto private lands associated with ditches. This will involve completing education and outreach efforts geared towards private landowners. The position is overseen by the Water Program Supervisor and may supervise seasonal employees, volunteers, or outside work crews.

ESSENTIAL DUTIES AND RESPONSIBILITIES

Coordinate and conduct inventories and condition assessments. (20%)

- Perform condition assessments of irrigation infrastructure and wildland fuels identifying and prioritizing treatments plans in strategic ditch corridors.
- Use ArcGis and Collector and Cartograph software to catalog water resources delivery infrastructure across the BCPOS agricultural lands system.
- Observe, track, and recommend new maintenance and fuels mitigation needs on the system.
- Identifying and mapping of List A and List B Noxious Weed Species for their eradication or assigned control found in ditch corridors.
- Identifying and mapping invasive tree species for control.

Plan and implement fuels mitigation projects in priority irrigation ditch corridors. (30%)

- Assess maintenance and fuel mitigation needs across the system and prioritize in collaboration with staff, fire community, consultants, and others.
- Plan project logistics such as methods, access, equipment needs, time allocation requirements, and use of external resources to accomplish project tasks.
- Proactively engage stakeholders; coordinate with ditch company personnel, neighbors, and other stakeholders prior to performing work.
- Advise Water Program Supervisor of maintenance and fuels mitigation budget requirements.
- Participate on departmental fuels mitigation teams and in team meetings.
- Seek out and apply for grant funding for wildfire fuels mitigation work and infrastructure improvements.
- Obtain proper internal approvals, 811 utility locates, and permitting as needed.
- Help develop and follow ecological and ditch maintenance BMPs.
- Seek ways to perform work while also meeting climate goals and objectives.

Administer contracts and temporary work crews to conduct maintenance and fuels mitigation projects. (30%)

- Develop project Scopes of Work (SOW) and Request for Proposals (RFP) to solicit contracts for proposed work.
- Work through contract selection process to hire competent and cost-efficient contractors. Ensure contractors are working efficiently, effectively, and in a safe and legal manner, and anticipate unsafe circumstances and take precautions to prevent accidents.
- As a project manager, oversee contracted work to conduct ditch infrastructure maintenance.
- In addition, Ready-to-Work crews, jail crews, BCPOS staff and volunteers can be enlisted and coordinated to complete work.
- Work closely with ditch companies to make sure all rules, regulations, and BMP's are followed.

Conduct ditch fuel mitigation and water delivery infrastructure maintenance field work. (10%)

- Conduct various treatments including weed whipping, manual removal of vegetation with shovels or clippers, mowing using tractors and attached mow decks, herbicide applications, and tree and shrub cut stump/chain saw treatments.
- Use heavy equipment (if allowed) such as backhoes and mini excavators, performing technical ditch maintenance on ditch infrastructure including ditches, laterals, and headgates.
- Coordinate hauling and removal of material generated from maintenance and fuels mitigation activities.
- Maintaining records of work performed, equipment and materials used, including photo documentation, use of excel spreadsheets, annual reports, and other systems.
- Remaining alert to conditions and events occurring on the land system; anticipating needed actions; and reporting such needs to the supervisor and appropriate staff.
- Assist with ditch burns and slash pile burns where appropriate.

Other duties: (10%)

- Performs related duties as required to meet the needs of BCPOS.
- Assist with operations and monitoring of reservoirs, ditches, stream gaging and other water assets.
- Identify invasive weeds in ditch corridors and coordinate with Invasive Weed staff for removals.
- Attend ditch company meetings and at times serve as a board member.
- Respond to locate calls for BCPOS irrigation infrastructure.
- Make sure to address bank stabilization efforts and concerns while completing all work.
- Take proper safety precautions, including use of all proper safety (protective) equipment as prescribed by the department; report all accidents and damage to city property, and/or policy infractions.
- Responsible for knowing and complying with all city and department policies; participating in professional training and development opportunities; and adhering to attendance and workplace policies.

REQUIRED QUALIFICATIONS

EXPERIENCE or EDUCATION

- Boulder County is looking for well qualified candidates to fill our positions. Any combination of relevant education and experience is encouraged. In this position, we are looking for a minimum of **6 years** of combined education and experience.
- Experience supervising contractors or other's work. Working with hand tools such as weed whips and chainsaws.

PREFERRED QUALIFICATIONS

- Previous experience with field-based, natural resource management work.
- Demonstrated experience working in agricultural landscapes or irrigation ditch maintenance experience.
- Skill in communication orally and in writing with people within and outside the department, representing the department in public, other government agencies, and other external organizations.
- Ability to work independently in a safe manner.
- High level of professionalism, diplomacy, and tact.
- Valid drivers' license and the ability to maintain an acceptable motor vehicle record.
- Bachelor's degree.
- Familiarity with forestry, tree work, and/or fuels mitigation work.
- Knowledge of wildland fire behavior, fire ecology and vegetation management techniques.
- Skill in geographic systems including the ESRI suite of software (ArcGIS).
- Knowledge of local government business practices, regulations, and applicable laws.
- Ability to operate heavy equipment such as backhoes and mini excavators.
- Certification at the FFT2 level qualification by the National Wildfire Coordinating Group or ability to obtain qualification in the first year of employment.
- Ability to tow trailers and haul equipment.
- Experience collecting field data and entering into apps or databases.
- Understanding of Colorado Water Rights and Prior Appropriation

SUPPLEMENTAL INFORMATION

KNOWLEDGE, SKILLS, AND ABILITIES

- Working knowledge of general ecological or agricultural principles and resource or land management techniques. Expertise in at least one field of agricultural, natural science, or environmental education.
- Working knowledge of relevant computer software programs. Skill in planning, organization, and time management.
- Ability to work and communicate effectively with other employees, agencies, and the public.

WORKING CONDITIONS AND PHYSICAL REQUIREMENTS

- Works in a clean, comfortable environment, and works in an outdoor environment year-round. Potential exposure to dangerous wildlife (e.g., rattlesnakes, mountain lions, stinging insects), toxic chemicals (e.g., pesticides), and dangerous weather conditions (e.g., heat, cold, lightning).
- Ability to perform a wide range of physical and manual tasks in an outdoor environment. Physical ability to stand, bend, walk, and kneel.

- Level 2 Physical: Frequently lifts up to 50 lbs. and carries up to 100 feet (may be performed by two person lift); occasionally lifts up to 80 lbs. from floor to waist; frequently lifts up to 32 lbs. from shoulder to overhead; occasionally pushes and pulls items weighing up to 100 lbs.; frequently lifts and lowers wheelbarrow with 160 lbs. load; occasionally performs bi-lateral lift of 60 lbs. and carries up to 50 ft.; frequently lifts up to 35 lbs. from waist level and lowers to floor. Frequently bends at waist, squats, kneels, shovels, and rakes. Occasionally climbs ladder; must be able to stand and balance on ladder; occasionally walks over uneven terrain.
- Ability to work under stress from demanding deadlines, public contact, and changing priorities and conditions.
- Uses standard office equipment including personal computers, cell phones, and copy machines.
- Work may include extended periods of time viewing a computer video monitor and operating a keyboard.
- Ability to attend evening meetings and work early or late or unconventional hours as necessary.



Parks & Open Space

5201 St. Vrain Road • Longmont, Colorado 80503
303.678.6200 • Fax: 303.678.6177 • www.BoulderCountyOpenSpace.org

DATE: June 26, 2024

TO: Commissioner Claire Levy
Commissioner Marta Loachamin
Commissioner Ashley Stolzmann

FROM: Therese Glowacki, Director
Sharla Benjamin, Project Manager

SUBJECT: Waiver of Bid Requirements for WSP USA Inc.

PROJECT: IRFP No. 4080-24; Boulder County Cardinal Mill
Water Treatment System Design and Installation Project

BACKGROUND:

This Bid Waiver request is to continue working with an existing Contractor, WSP USA Inc., who is currently under contract with Boulder County Parks and Open Space (BCPOS) for water quality monitoring services at Cardinal Mill. The Scope of Work in this proposal was substantial enough to warrant a new Contract, and will operate, under BCPOS Supervision, in parallel to the existing Contract.

REQUEST:

The Cardinal Mill property was purchased in 2003, and a Brownfields Project was implemented in 2005 that installed a toe drain at the base of the mill among other improvements. Colorado Department of Public Health & Environment (CDPHE) attached a Certification to Discharge #COG318106 to the outlet of the toe drain, "New Cardinal Mill to: Coon Track Creek." BCPOS performed the required monitoring through the use of Continuing Services Contractors. In 2021, CDPHE revised the permits and the updated Certification #COG318106 was issued on 11/15/2021, effective 1/1/2022, and substantially modified the permit limitations and monitoring requirements for this location.

In order to meet final limits for Potentially Dissolved Cadmium, Potentially Dissolved Copper, Potentially Dissolved Lead, and Potentially Dissolved Zinc, the permit certification included a compliance schedule. Included in this compliance schedule is the due date of 1/1/2025 for achieving final compliance with discharge limits.

The project described by BCPOS IRFP No. 4080-24 (Attachment A1 and A2) and the proposal from WSP USA Inc. (Attachment B) is intended to meet the due date of 1/1/2025 for achieving final compliance with the COG318106 discharge limits. Since this is not enough time to obtain County permits on a non-emergency schedule, discussions with Boulder County Community Planning & Permitting are underway that could lead to an approved temporary treatment

system installation in 2024. A permanent treatment system installation in the future will need to follow normal County permit procedures.

The Scope of Work described in Attachments A1, A2 and B includes three Tasks in order to install and operate a temporary water quality treatment facility by the permit due date. WSP USA Inc. has only provided costs for Task 1 at this time, and will give a detailed proposal for Tasks 2 and 3 once 50% Design in Task 1 has been achieved.

1. 2024 Design of the Treatment System, proposed cost \$397,916.00
2. 2024 Installation of the Treatment System (referenced in the Attachment B Enclosure A Schedule (page 12), costs not yet provided)
3. 2024 and 2025 Operation, Maintenance and Optimization of the Treatment System (referenced in the Attachment B Enclosure A schedule (page 12), costs not yet provided)

JUSTIFICATION:

BCPOS previously attempted to bid out this project to the six Engineering Consultants currently under Contract. No proposals were received, and feedback from this attempt led to a split of the original Scope of Work into two different projects. This Bid Waiver is for the Sole Source project, while a competitive bid for parallel work is being advertised now with proposals due mid-July. Due to the extremely tight schedule and the familiarity of WSP USA Inc. with the site and the permit, BCPOS chose to solicit a Sole Source bid from their global mining team (including resource geologists, aquatic biologists, mine planners, and cultural scientists).

Staff is concerned that if this Bid Waiver is not approved, the time that would be needed to bring a new Consultant to the same level of understanding as WSP USA Inc. would put the County substantially past the due date for the temporary solution implementation. The urgency of this Project is further necessitated by the imposing fines the County faces starting 1/1/2025. The fines amount to \$61,000.00 per each day the County is non-compliant with the permit.

BCPOS has requested a permit compliance schedule modification from CDPHE, but to obtain any consideration of assistance from the State will first require substantial County investment of effort and funds with the clear intent of meeting the current compliance schedule as noted.

As a County, we have also requested federal monetary assistance for this project (Congressionally Directed Spending (CDS \$767,329), however, that assistance, if approved will not start until October 1, 2024. The Cost Share provided by the County was projected to be \$929,519 and will include part of the temporary treatment system installation which BCPOS anticipates starting prior to October 1, in August or September of 2024.

ANNUAL BUDGET:

The cost for these services, anticipated to begin in 2024 and to be completed by December 31, 2025, will be not to exceed the amount of \$397,916.00 for Task 1 as specified in IRFP No. 4080-24.

BOCC ACTION REQUESTED:

Approve the Bid Waiver as requested in favor of WSP USA Inc., to be addressed as a new contract, in the amount, not to exceed \$397,916.00.

APPROVALS

 _____
Therese Glowacki, Director

 _____
Date

 _____
Courtney Gabriel, Procurement Manager

 _____
Date

 _____ – *Receipt acknowledged by the Clerk to the Board of County Commissioners*

 _____
Chair, Board of County Commissioners

 _____
Date

ATTEST:  _____
Clerk to the Board of County Commissioners

Accessibility Report

Filename: 2024_CM_BOCC_BID_Waiver_Request_WSP.pdf

Report created by: [Enter personal and organization information through the Preferences > Identity dialog.]

Organization:

Summary

The checker found problems which may prevent the document from being fully accessible.

- Needs manual check: 2
- Passed manually: 0
- Failed manually: 0
- Skipped: 1
- Passed: 20
- Failed: 9

Detailed Report

Document

Rule Name	Status	Description
Accessibility permission flag	Passed	Accessibility permission flag must be set
Image-only PDF	Passed	Document is not image-only PDF
Tagged PDF	Failed	Document is tagged PDF
Logical Reading Order	Needs manual check	Document structure provides a logical reading order
Primary language	Passed	Text language is specified
Title	Passed	Document title is showing in title bar
Bookmarks	Passed	Bookmarks are present in large documents
Color contrast	Needs manual check	Document has appropriate color contrast

Page Content

Rule Name	Status	Description
Tagged content	Failed	All page content is tagged
Tagged annotations	Failed	All annotations are tagged
Tab order	Failed	Tab order is consistent with structure order
Character encoding	Failed	Reliable character encoding is provided
Tagged multimedia	Passed	All multimedia objects are tagged
Screen flicker	Passed	Page will not cause screen flicker
Scripts	Passed	No inaccessible scripts
Timed responses	Passed	Page does not require timed responses
Navigation links	Passed	Navigation links are not repetitive

Forms

Rule Name	Status	Description
Tagged form fields	Failed	All form fields are tagged
Field descriptions	Failed	All form fields have description

Alternate Text

Rule Name	Status	Description
Figures alternate text	Failed	Figures require alternate text
Nested alternate text	Passed	Alternate text that will never be read
Associated with content	Passed	Alternate text must be associated with some content
Hides annotation	Passed	Alternate text should not hide annotation

[Other elements alternate text](#)

Failed

Other elements that require alternate text

Tables

Rule Name	Status	Description
Rows	Passed	TR must be a child of Table, THead, TBody, or TFoot
TH and TD	Passed	TH and TD must be children of TR
Headers	Passed	Tables should have headers
Regularity	Passed	Tables must contain the same number of columns in each row and rows in each column
Summary	Skipped	Tables must have a summary

Lists

Rule Name	Status	Description
List items	Passed	LI must be a child of L
Lbl and LBody	Passed	Lbl and LBody must be children of LI

Headings

Rule Name	Status	Description
Appropriate nesting	Passed	Appropriate nesting

[Back to Top](#)



Community Planning and Permitting

Courthouse Annex • 2045 13th Street • Boulder, Colorado 80302 • Tel: 303.441.3930 • Fax: 303.441.4856
Mailing Address: P.O. Box 471 • Boulder, Colorado 80306 • www.bouldercounty.gov

BOULDER COUNTY BOARD OF COUNTY COMMISSIONERS PUBLIC HEARING

July 2, 2024 at 01:00 p.m.

All Commissioners' public hearings and meetings will be offered in a hybrid format where attendees can join **through Zoom** or **in-person** at the Boulder County Courthouse, 3rd Floor, 1325 Pearl Street, Boulder.

PUBLIC HEARING

STAFF PLANNER: Sam Walker

Docket LU-24-0009: Marshall Mesa Mitigation and Trailhead Earthwork

- Proposal: Limited Impact Special Use Review to permit 364,000 cubic yards of earthwork for subsurface coal fire mitigation and redevelopment of the Marshall Mesa trailhead.
- Location: 1842 S. Foothills Highway, at the southeast corner of the intersection of SH 170 and SH93 in Section 21, Township 1S, Range 70.
- Zoning: Agricultural (A) and Business (B) Zoning District
- Applicant: City of Boulder Open Space & Mountain Parks (OSMP)
- Agent: Adam Gaylord

STAFF RECOMMENDATION:

Staff recommends that the Board of County Commissioners conditionally approve docket LU-24-0009 Marshall Mesa Mitigation and Trailhead Earthwork.

PACKET CONTENTS:

Item	Pages
o Staff Recommendation	1 – 16
o Application Materials (Attachment A)	A1 – A420
o Referral Responses (Attachment B)	B1 – B13
o Public Comments (Attachment C)	C1 – C47

SUMMARY AND RECOMMENDATION:

This application for Limited Impact Special Use Review proposes approximately 364,000 cubic yards of non-foundational earthwork to mitigate a subterranean coal seam fire and redevelop the Marshall Mesa trailhead located on the same parcel. Limited Impact Special Use Review is required for the proposed earthwork, and it is therefore analyzed pursuant to the Special Use Standards outlined in Boulder County Land Use Code (the Code) Art. 4-601.

Staff recommends conditional approval of the proposal because, as conditioned, staff finds the proposed earthwork can meet the Limited Impact Special Review Criteria described in the Boulder County Land Use Code (the Code).

DISCUSSION:

The subject property is owned by the City of Boulder and currently houses the Marshall Mesa Trailhead, a popular trailhead that provides connections to many of the other Open Space lands located generally south of the City of Boulder. The property is also one of several potential ignition points identified following the Marshall Fire event of 2021. During the fire, fencing and vault restrooms on the property were completely burned.

The application proposes substantial earthwork to mitigate two active subterranean coal seam fires on the property which were identified as potential ignition sources for the Marshall Fire, as well as redevelopment and improvements to the trailhead area. The proposed mitigation earthwork will take place on the property at 1842 S. Foothills Highway, located on the south side of the intersection of Foothills Highway (SH 93) and Marshall Drive (SH 170).

As shown in Figure 2 below, the initial phase of the proposal, involving the remediation of the coal seam fire, will involve two large areas extending across most of the western area of the parcel. The second phase, redevelopment of the existing trailhead site, is shown in Figure 3 and will happen in largely the same location as the existing trailhead although the vehicular access point will be shifted further east along Marshall Drive and there will be a small expansion to the west of the existing limit of disturbance.

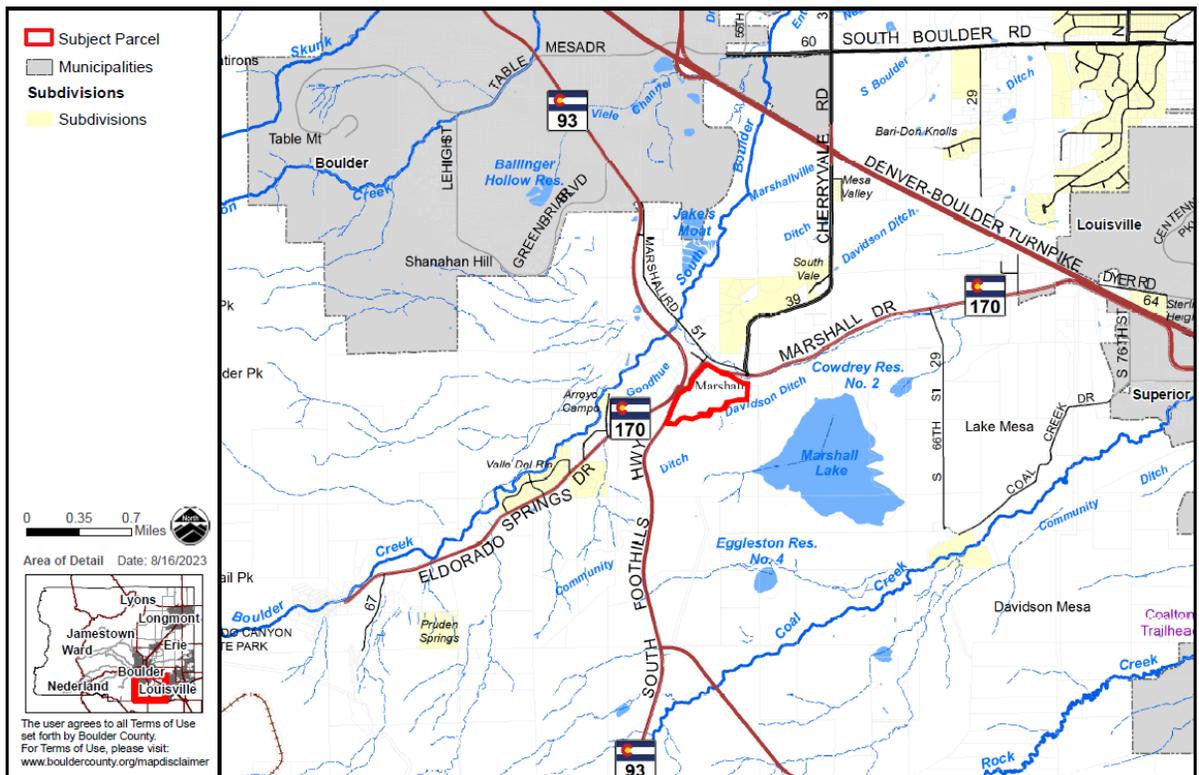


Figure 1: Vicinity Map showing location of the subject parcel.

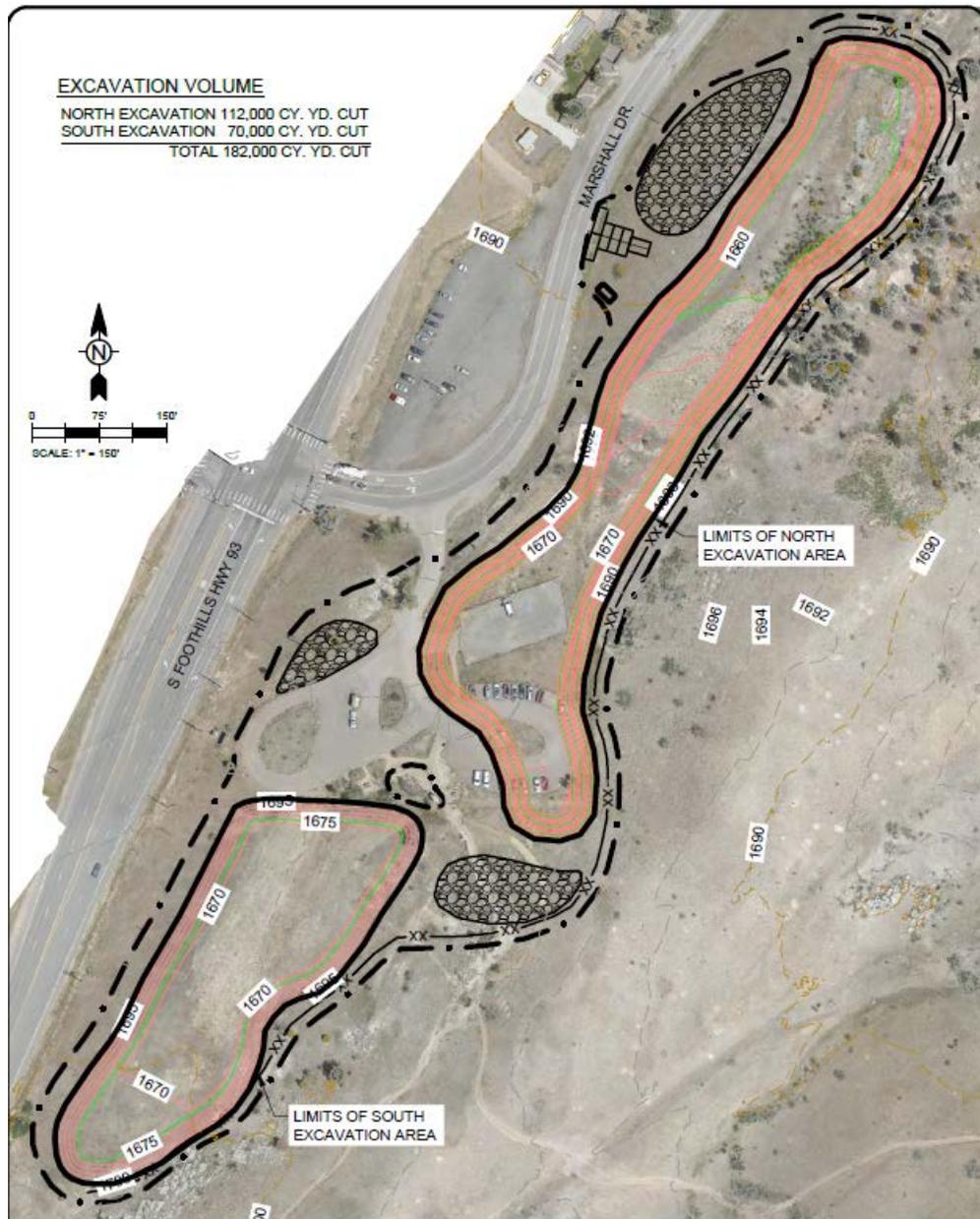


Figure 2: Coal seam fire remediation areas.

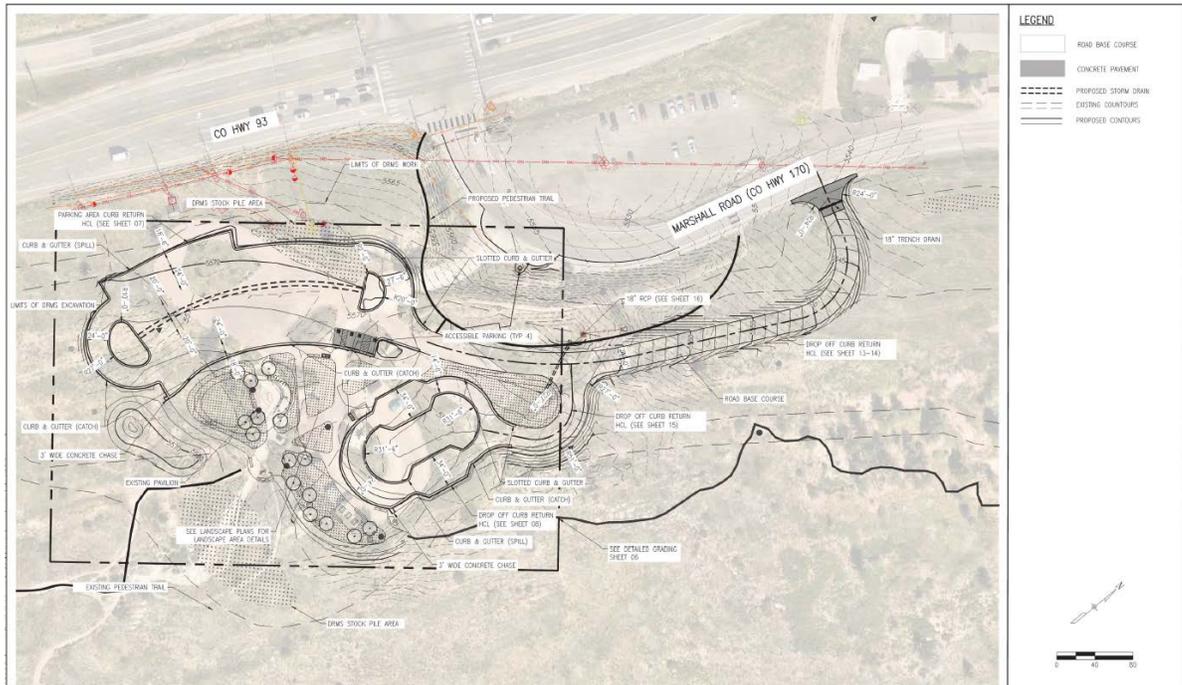


Figure 3: Trailhead redevelopment site plan.

Per discussion between staff and the applicant, fire remediation will take place in an incremental fashion with small cut areas excavated and then re-filled with the removed material before a new cut area is excavated. Between the initial excavation and backfill in the same area, excavated earth will be blended and cooled above grade. At no point will there be large open pits on the property.

The trailhead on the property was originally approved through SPR-06-0078 City of Boulder Change of Use. The project narrative for this proposal noted a 27,000-thousand gallon cistern on the site that was originally intended to support fire suppression for a commercial building that was deconstructed in 2005. The narrative states that the City’s intent at the time was to return the cistern to a functional state and keep it full for use by the Fire Protection District although a requirement to keep the cistern full was not included by staff as a condition of approval for the SPR. The SPR was then superseded by an application for Special Use Review, SU-07-0005, for a Public or Quasi-Public Facility (other than specifically listed in the Land Use Code) that included a trailhead parking lot. The SU-07-0005 application narrative also described the existing 27,000 gallon cistern and a proposal that the Rocky Mountain Fire Authority (now Rocky Mountain Fire Protection District) would keep the cistern filled and use it for wildfire operations in the area. However, the cistern was not mentioned in the conditions of approval adopted by the Board of County Commissioners for SU-07-0005, and it does not appear that the cistern was ever restored to operational condition or filled.

As shown in Figure 4, below, the Boulder County Comprehensive Plan (“the Plan”) identifies many resources of note on the parcel, including Rare Plant Areas, the Boulder Mountain Park and South Boulder Environmental Conservation Areas, Areas of Very High Biodiversity Significance, Wetlands, and View Protection Scores ranging from 1 to 2.11 on roads in the area. Potential impacts to these identified resources are discussed under Special Use criteria three below.

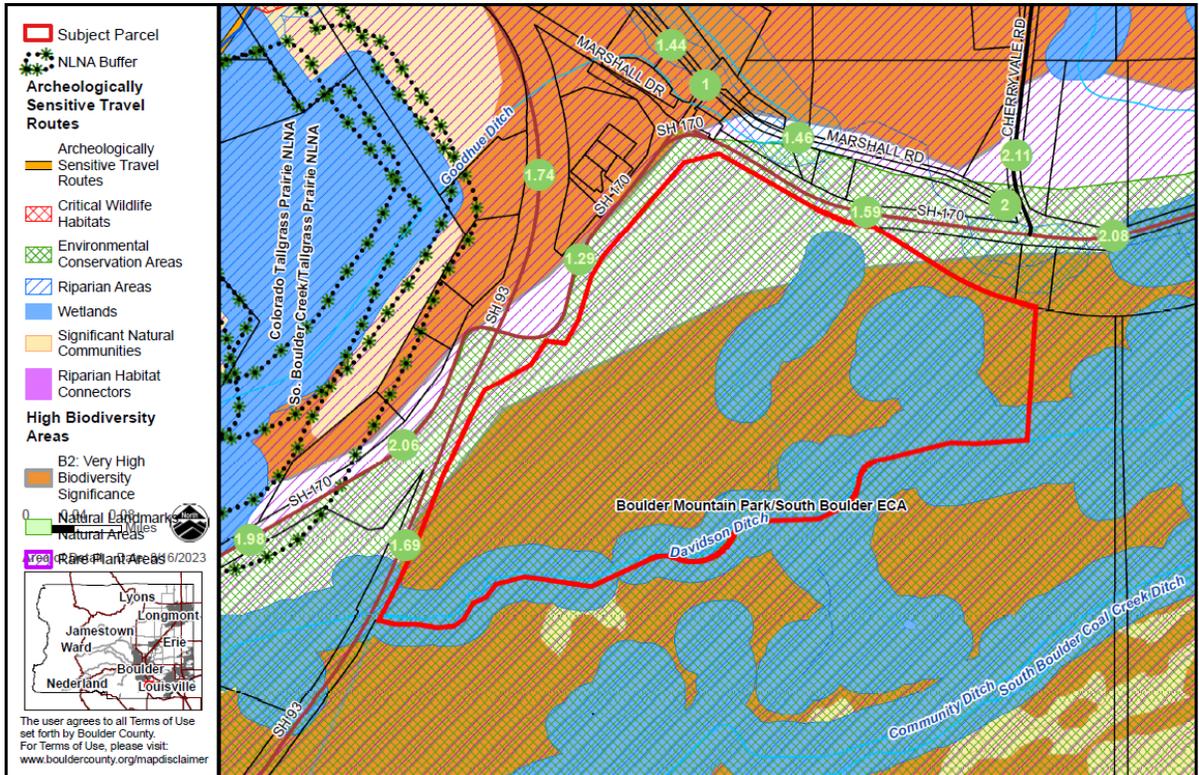


Figure 4: Boulder County Comprehensive Plan layers located on the Subject Parcel.

Significant earthwork is required to mitigate the existing on-site coal seam fires and can assist with the redevelopment of the existing trailhead, and staff finds that the proposed earthwork can meet the applicable standards and criteria for approval as described in the Land Use Code.

REFERRALS:

This application was referred to the typical agencies, departments, and nearby property owners. All responses received are attached and summarized below.

Boulder County Building Safety and Inspection Services Team: Boulder County Building Safety and Inspection Services reviewed the proposal and expressed no conflicts. A grading permit, plan review, and inspection approvals are required for the proposed grading, and the newly redeveloped trailhead area must meet commercial accessibility requirements. Observation Reports by a qualified design professional are also required during construction.

Colorado Division of Public Health and Environment (CDPHE): The CDPHE referral response indicated that odor control measures may be required during site grading, and that measures to mitigate fugitive dust may also be required.

Development Review Team – Access & Engineering: Boulder County Development Review Team – Access & Engineering (DRT A&E) reviewed the proposal and found that legal access to the project area was demonstrated. DRT A&E also indicated that parts of the submitted plan set lacked sufficient detail or illustrated designs that do not meet the Multimodal Transportation Standards (MMTS), and recommended several changes to the plan set for permit submittal. DRT A&E concurred with the findings of the submitted Traffic Impact Study but noted that CDOT approval is required for implementation of the recommendations made in the study, required the submittal of a drainage letter, noted a requirement for a Stormwater Quality Permit, and recommended that all construction staging happen on the subject property during construction.

Boulder County Public Health (BCPH): The BCPH referral response noted that the previously existing vault privy on the site had been permitted appropriately, and that a new permit will be required for the replacement privy described in the application materials.

Xcel Energy: The Xcel referral response noted the presence of electrical and natural gas distribution facilities within the project area and noted requirements for working around those resources.

Colorado Geological Survey: The Colorado Geological Survey referral response expressed support for the proposal.

Adjacent Property Owners: 57 application notices were mailed to nearby property owners, and CPP staff did not receive any comments in response.

Agencies that responded with no conflicts: Boulder County Historic Preservation Team.

Agencies that did not respond include: Boulder County Long Range Planning, Boulder County Wildfire Mitigation Team, Eldorado Springs LID, Boulder County Assessor, Boulder County Attorney Office, Boulder County Parks & Open Space Conservation Easement Team, Boulder County Parks & Open Space Real Estate Team, Boulder County Parks & Open Space Natural Resource Planner, Boulder County Sheriff, Boulder County Treasurer, Boulder County Public Works Road Maintenance Team, Boulder County Public Works Stormwater Quality Team, Nature Conservancy of Colorado, Eldorado Springs Community Association, Eldorado Artesian Springs Inc., City of Boulder Planning & Development Services, City of Boulder Open Space & Mountain Parks, City of Louisville Planning Department, Town of Superior Planning & Building Department, Boulder Valley & Longmont Conservation Districts, History Colorado, Eldorado Canyon State Park, Colorado Department of Transportation, US Fish & Wildlife Service, Mountain View FPD.

LIMITED IMPACT SPECIAL REVIEW SUMMARY:

CPP staff reviewed the conditions and standards for approval of a Limited Impact Special Review as they apply to the proposed non-foundational earthwork per Article 4-601 of the Code and finds the following:

- (1) ***Complies with the minimum zoning requirements of the zoning district in which the use is to be established, and will also comply with all other applicable requirements;***

The subject parcel is within the Agricultural and Business zoning districts, and is a legal building lot. Non-foundational earthwork in excess of 500 cubic yards can be permitted as an accessory use in the Agricultural zoning district (Article 4-101), pending approval of a Limited Impact Special Review and subject to the additional provisions outlined in Article 4-516.Q.5 of the Code. The proposed non-foundational earthwork is considered an accessory use to the recreational use of the public facility approved as part of SU-05-0007.

Staff recommend a condition of approval requiring the necessary grading permit be obtained for the proposed non-foundational earthwork. With the required permits and as conditioned, staff finds that this criterion can be met.

Additional Provisions for grading of more than 50 cubic yards under Article 4-516.Q.5 include the following:

- a. ***While it may be exempt from these provisions, grading which impacts a floodplain is not exempt from applying for and receiving a Floodplain Development Permit.***

No part of the proposed project area is located within the Floodplain Overlay district, and no Floodplain Development Permit is required for the proposal.

Therefore, this criterion is not applicable.

- b. Normal agricultural grading that is exempt from the definition of this use includes but is not limited to: tilling fields, creating or altering irrigation ditch laterals, field leveling, field access roads for agricultural purposes, and other activities associated with farming and agricultural operations. Agricultural grading does not include terraforming for aesthetic purposes, landscaping ponds, altering wetlands, or other nonessential grading.***

The proposed non-foundational earthwork will not support an agricultural use and is therefore not exempt from the use definition described in Art. 4-516.Q.1. All proposed earthwork has been reviewed according to the Special Use Review criteria without exception.

Therefore, staff have no concerns regarding this criterion.

- c. Ponds to be constructed at a depth of more than 24 inches must obtain a grading permit prior to construction. Ponds used to store/hold water for agricultural purposes (stock ponds, irrigation ponds) shall be exempt from the Site Plan Review or Limited Impact Special Review process unless they require an Individual Floodplain Development Permit.***

The subject proposal will not result in the creation of a pond.

Therefore, this criterion is not applicable.

Additional Provisions for a Public or Quasi-public Facility Other Than Listed under Article 4-514.G.5 include the following:

- a. This use is not required to be located on a building lot, or comply with the minimum lot size requirement for the district in which it is located.***

The proposed use will continue to be located on a building lot that exceeds the minimum lot size for both zoning districts which encompass the parcel.

Therefore, staff find this criterion is met.

- b. Electric transmission lines are not required to comply with the height requirement for the district in which it is located.***

No electric transmission lines are proposed as part of the earthwork or trailhead redevelopment.

Therefore, this criterion is not applicable.

- (2) *Will be compatible with the surrounding area. In determining compatibility, the Board should consider the location of structures and other improvements on the site; the size, height and massing of the structures; the number and arrangement of structures; the design of structures and other site features; the proposed removal or addition of vegetation; the extent of site disturbance, including, but not limited to, any grading and***

changes to natural topography; and the nature and intensity of the activities that will take place on the site. In determining the surrounding area, the Board should consider the unique location and environment of the proposed use; assess the relevant area that the use is expected to impact; and take note of important features in the area including, but not limited to, scenic vistas, historic townsites and rural communities, mountainous terrain, agricultural lands and activities, sensitive environmental areas, and the characteristics of nearby development and neighborhoods;

For purposes of this review, staff considers the area within 1,500 feet of the subject parcel as the applicable surrounding area, which is consistent with the Site Plan Review definition of a neighborhood. The area around the subject parcel is characterized by a broad array of development types, including commercial businesses, single-family residential properties, a mobile home park, large agricultural areas, and public open space areas crisscrossed by hiking trails. Figures 5 and 6 illustrate the broad variety of uses in the area, showing the zoning districts in the area around the parcel and the physical character of development on those lands.

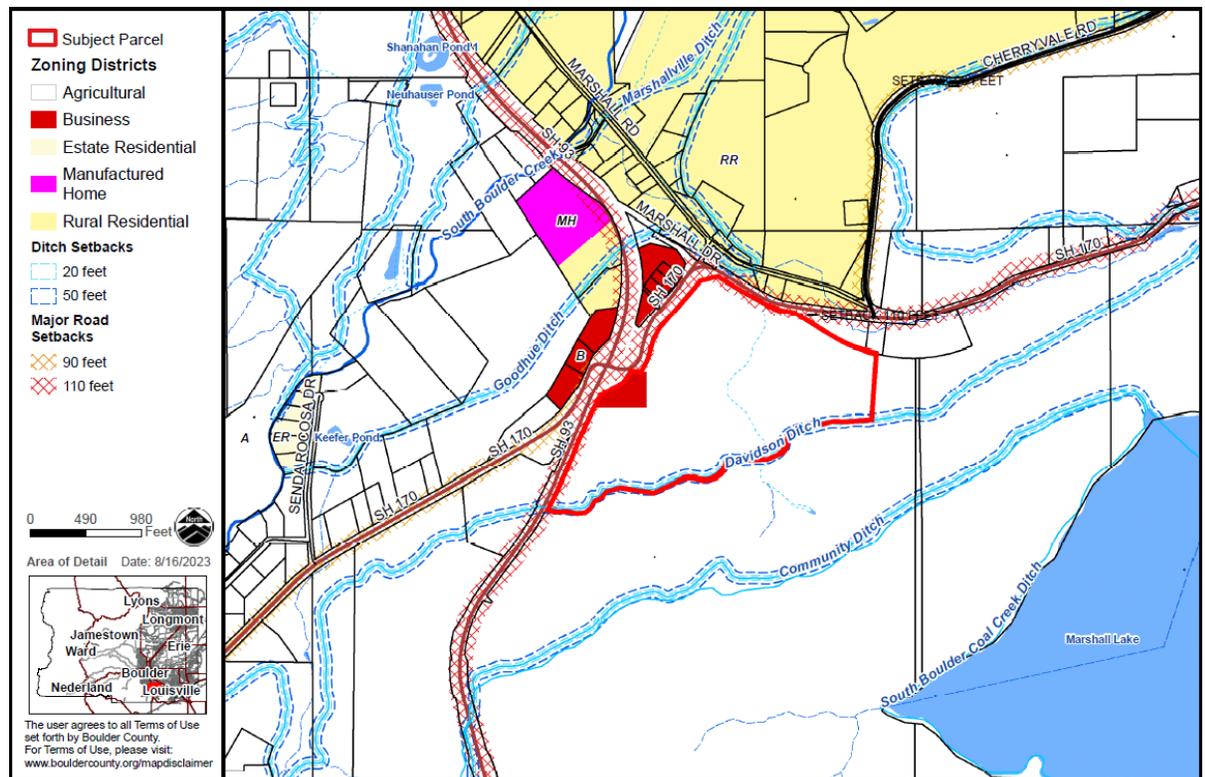


Figure 5: Zoning map



Figure 6: Regional aerial photo

Staff find that the proposed non-foundational earthwork and trailhead redevelopment will be compatible with the surrounding area. Mitigation of the on-site coal seam fires will remove a potential wildfire ignition point, increasing the safety of all other uses in the area. The proposed redevelopment of the trailhead will also increase compatibility with the surrounding uses by improving traffic flow (see discussion under criteria seven below), increasing accessibility to and capacity of the site, and replacing public resources lost during the Marshall Fire.

Therefore, staff finds that this criterion is met.

(3) *The use will be in accordance with the Comprehensive Plan;*

Staff find that the proposed non-foundational earthwork and trailhead redevelopment supports the following Goals, Policies, and Objectives of the Comprehensive Plan:

- Natural Hazards Element Goal 3. Mitigate Existing Areas at Risk
- NH Policy 1.04 Risk Reduction
- NH Policy 1.06 Cooperation and Coordination
- NH 5.04 Interjurisdictional and Interagency Cooperation
- Open Space Element Goal 2. Promote Safe & Healthy Recreation & Connections to Nature

As described above, the proposal is intended to mitigate existing subterranean coal seam fires on the parcel, and redevelop the existing trailhead and parking area. Staff therefore do not have concerns that the proposal will negatively impact the resources on the subject property identified by the Comprehensive Plan, including but not limited to the Boulder Mountain Park and South Boulder Environmental Conservation Areas, Rare Plant Areas, areas of Very High Biodiversity Significance, or Wetlands.

As discussed under Special Use criteria nine below, staff have limited concerns relating to the impacts of the proposed development on the view protection corridors associated with various County Roads in the area.

Therefore, staff finds that this criterion is met.

- (4) ***Will not result in an over-intensive use of land or excessive depletion of natural resources. In evaluating the intensity of the use, the Board should consider the extent of the proposed development in relation to parcel size and the natural landscape/topography; the area of impermeable surface; the amount of blasting, grading or other alteration of the natural topography; the elimination or disruption of agricultural lands; the effect on significant natural areas and environmental resources; the disturbance of plant and animal habitat, and wildlife migration corridors; the relationship of the proposed development to natural hazards; and available mitigation measures such as the preservation of open lands, the addition or restoration of natural features and screening, the reduction or arrangement of structures and land disturbance, and the use of sustainable construction techniques, resource use, and transportation management.***

Although the project will involve significant earthwork, staff are not concerned that the proposal will constitute an over-intensive use of land. The proposed earthwork will mitigate an existing natural hazard risk and improve the trailhead area to better suit the needs of the recreating public. As proposed, the earthwork on-site will be balanced between cut and fill, meaning that there is no import or export of earth. The application narrative also indicates that cut areas will be recontoured to match existing grades (excepting those areas where the redeveloped trailhead and parking areas will extend outside of existing areas of disturbance). Staff therefore recommend approving the total earthwork cut and fill as proposed, with an additional condition requiring that pre-existing grades be reestablished as the mitigation earthwork is completed.

The application materials also included a description of the post-construction revegetation, although a formal revegetation plan was only included for the area immediately around the redeveloped trailhead. Staff recommend a condition of approval requiring the submittal of a revised revegetation plan with the grading permit submittal that accounts for all areas that will be disturbed as part of the site work.

Therefore, as conditioned, staff finds that this criterion is met.

- (5) ***The use will not have a material adverse effect on community capital improvement programs;***

Staff have not identified any material adverse effects of the proposal on community capital improvement programs, and no referral agency responded with such a concern.

Therefore, staff finds that this criterion is met.

- (6) ***The use will not require a level of community facilities and services greater than that which is available;***

Staff are not concerned that the proposal will require a level of community facilities or services greater than that which is currently available, and no referral agency responded with such a concern.

Therefore, staff finds that this criterion is met.

- (7) *Will support a multimodal transportation system and not result in significant negative impacts to the transportation system or traffic hazards;*

The subject property is accessed via Marshall Drive, also known as SH 170, a Colorado Department of Transportation (CDOT) owned and maintained right-of-way (ROW). Legal access is demonstrated via adjacency to both the SH 170 and SH 93 ROW.

Although physical access to the trailhead is proposed to remain on SH 170 after completion of the earthwork, a new location for that access is proposed further east along the ROW than the existing driveway. The new access will roughly align with the entrance to the RTD park-and-ride lot on the north side of the SH 170 ROW. Staff support the relocation of vehicular access to mitigate issues with occasional traffic backups into the intersection and recommend a condition approving the trailhead site plan as proposed.

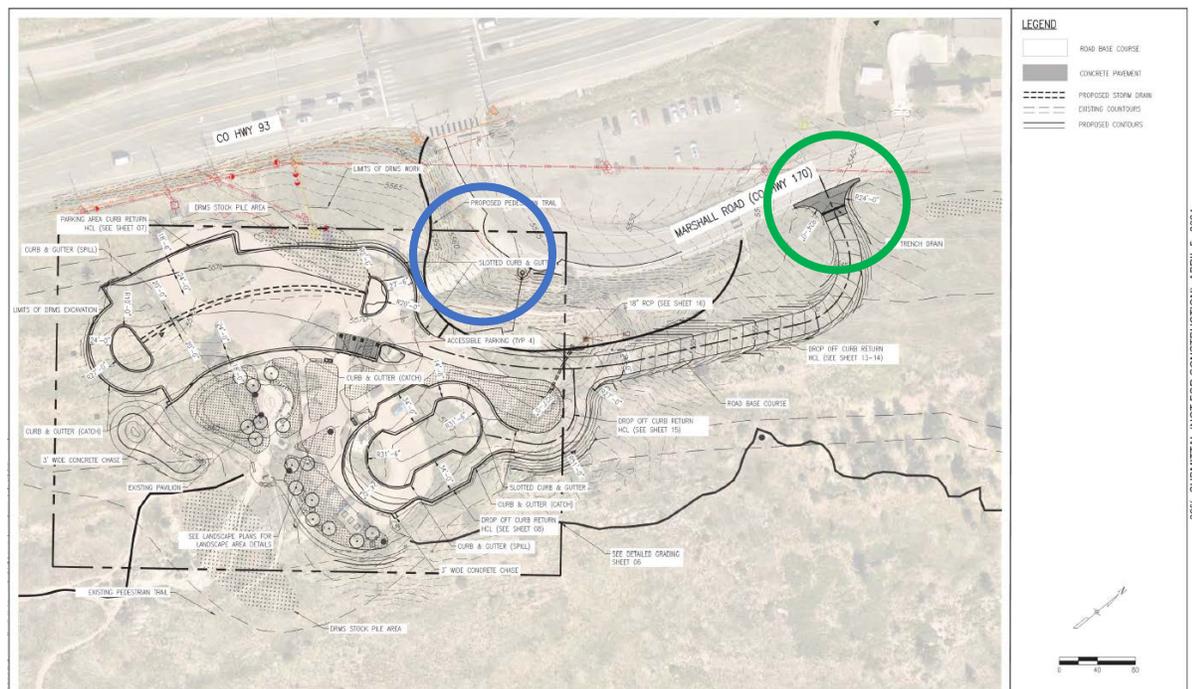


Figure 7: Trailhead site plan with existing vehicle entrance circled in blue, and new vehicle entrance circled in green.



Figure 8: Google Streetview image showing new vehicle entrance area (green circle), with existing RTD park-and-ride lot and crosswalk in view.

The DRT A&E referral response noted that the proposal generally appeared to meet the MMTS, but indicated that there were several issues with the provided plan sets and that no electric vehicle charging stations were shown in the plans. Staff recommend a condition of approval requiring that the permit plans incorporate changes to reflect the comments of and missing information noted by the DRT A&E referral response.

During the application review, staff received several public comments requesting improvements to the existing crosswalk that extends between the RTD park-and-ride and the subject property across SH170. A traffic study included with the application materials also concluded that improvements to this crosswalk should be made, and the DRT A&E referral response concurred with the study's findings. However, the requested improvements would be located in CDOT-owned ROW and staff did not receive a referral response from CDOT, nor is there a clear indication that CDOT will support or implement those improvements. Staff strongly recommend that the applicants work with CDOT to implement the changes to the pedestrian crosswalk described in the submitted traffic report and DRT A&E comments.

To mitigate the potential for traffic impacts during construction, staff also recommend a condition of approval requiring that all construction parking and staging be located on the subject property.

Therefore, as conditioned, staff finds this criterion can be met.

(8) Will not cause significant air, odor, water, or noise pollution;

There is no indication that the proposal will cause significant air, odor, water, or noise pollution once the proposed earthwork and trailhead redevelopment are completed. However, the proposal involves more than one acre of site disturbance and therefore a Boulder County Stormwater Quality Permit (SWQP) is required. Staff recommend conditions of approval requiring the submittal of the SWQP along with the grading permit to reflect these requirements.

The CDPHE referral response noted that odor control equipment or fugitive dust mitigation measures may be required while earthwork and site construction take place, but noted that it is the responsibility of involved parties (City of Boulder and contractors) to determine what regulations they are subject to and follow them accordingly. Staff therefore recommend a condition of approval requiring that the applicants obtain any applicable local, state, or federal permits for the proposed earthwork prior to commencing physical work on the site.

Therefore, as conditioned, staff finds this criterion can be met.

(9) *Will be adequately buffered or screened to mitigate any undue visual impacts of the use;*

The Plan identifies View Protection Scores that range from 1 to 2.11 along various roads near the project area (including SH 93, SH 170, and Cherryvale Road). However staff are not concerned that the proposed earthwork will result in the creation of any undue visual impacts. Once mitigation work is completed and the area revegetated, the vast majority of the project area will look effectively the same as it does currently. The redeveloped trailhead area will be visible to drivers travelling northbound along SH 93, but staff have no concerns that the proposed redevelopment will change or increase visual impacts for those drivers or the wider area around the trailhead.

Therefore, staff finds this criterion is met.

(10) *The use will not otherwise be detrimental to the health, safety, or welfare of the present or future inhabitants of Boulder County;*

There is no indication that the proposed earthwork or trailhead redevelopment will be detrimental to the health, safety, or welfare of the present or future inhabitants of the county, and no referral agency responded with such a concern. On the contrary, the proposed earthwork will likely increase the safety of county inhabitants by mitigating a potential wildfire ignition source, while the proposed trailhead redevelopment will increase traffic safety by relocating the vehicular access point and improving internal traffic flows.

However, staff has concerns related to the cistern on the property, which was not filled at the time of the Marshall Fire and is apparently in a state of disrepair. As indicated in the project narrative, Mountain View FPD and the City have agreed to install a new cistern on site as part of the trailhead redevelopment (staff note that there was not a referral response from Mountain View FPD, but that the new cistern was described in the project narrative and shown on the trailhead site plan). Construction and maintenance of a new cistern on the property would help to mitigate the increased intensity of the on-site trailhead use, and would improve first responders' ability to fight any future wildfires in the area. Staff recommend a condition of approval requiring that the materials submitted for permitting include additional details regarding the cistern's construction and any maintenance agreements between the City of Boulder and Rocky Mountain Fire Protection District.

Staff are also concerned that there is a risk of wildfire ignition if a high wind event were to occur while the proposed coal seam fire mitigation earthwork is ongoing, and therefore recommend two conditions of approval requiring the same emergency practices in use by DRMS at the nearby Lewis Mine Fire site, namely halting earthwork and covering hot excavated materials during Red Flag Warnings.

Therefore, staff finds this criterion can be met.

- (11) ***The use will establish an appropriate balance between current and future economic, environmental, and societal needs by minimizing the consumption and inefficient use of energy, materials, minerals, water, land, and other finite resources;***

Staff finds that the proposed earthwork strikes an appropriate balance by mitigating an on-site hazard without increasing the impacts of the existing development on the surrounding area, while simultaneously increasing the public's ability to use the site.

Therefore, staff finds this criterion can be met.

- (12) ***The use will not result in unreasonable risk of harm to people or property – both onsite and in the surrounding area – from natural hazards. Development or activity associated with the use must avoid natural hazards, including those on the subject property and those originating off-site with a reasonable likelihood of affecting the subject property. Natural hazards include, without limitation, expansive soils or claystone, subsiding soils, soil creep areas, or questionable soils where the safe-sustaining power of the soils is in doubt; landslides, mudslides, mudfalls, debris fans, unstable slopes, and rockfalls; flash flooding corridors, alluvial fans, floodways, floodplains, and flood-prone areas; and avalanche corridors; all as identified in the Comprehensive Plan Geologic Hazard and Constraint Areas Map or through the Special Review or Limited Impact Special Review process using the best available information. Best available information includes, without limitation, updated topographic or geologic data, Colorado Geologic Survey landslide or earth/debris flow data, interim floodplain mapping data, and creek planning studies.***

The Comprehensive Plan identifies areas of Landslide Susceptibility, Moderate to High Swelling Soil Potential, and Extent of Abandoned Coal Mines across the entire project area. However, staff concerns related to these hazards are extremely limited. The purpose of the project is to excavate and then fill the abandoned mine areas and then redevelop the existing trailhead and parking area. The proposed work will effectively mitigate the risks posed by the existing mine areas, and staff concerns related to the landslide susceptibility and swelling soils areas are limited due to the primary physical development proposed being parking areas. Development in swelling soils and landslide areas is common throughout the county.

Therefore, staff finds that this criterion is met.

- (13) ***The proposed use shall not alter historic drainage patterns and/or flow rates unless the associated development includes acceptable mitigation measures to compensate for anticipated drainage impacts. The best available information should be used to evaluate these impacts, including without limitation the Boulder County Storm Drainage Criteria Manual, hydrologic evaluations to determine peak flows, floodplain mapping studies, updated topographic data, Colorado Geologic Survey landslide, earth/debris flow data, and creek planning studies, all as applicable given the context of the subject property and the application.***

Staff find that the proposed earthwork will alter some aspects of site drainage, but that the overall pattern of drainage across the parcel will not be dramatically changed (as most of the site will be returned to existing grades as part of the proposed mitigation work). However, the DRT A&E referral response noted that a drainage letter was not included with the application materials to show that the proposed drainage improvements in the parking area have been appropriately sized for anticipated flows. Staff therefore recommend a condition of approval requiring that the permit plans include a drainage letter and hydraulic calculations.

Therefore, as conditioned, staff finds that this criterion is met.

RECOMMENDATION:

Staff has determined that, as conditioned, the proposal can meet all the applicable criteria of the Boulder County Land Use Code for Limited Impact Special Review. Therefore, staff recommend that the Board of County Commissioners **CONDITIONALLY APPROVE** Docket *LU-24-0009: Marshall Mesa Mitigation and Trailhead Earthwork*, subject to the following conditions:

1. The development is subject to the requirements of the Boulder County Building Safety and Inspection Services Team and adopted County Building Codes, as outlined in the referral comments, including, but not limited to required grading permit, observation reports, and plan review.
2. 364,000 cubic yards of earthwork (184,000 cut, and 184,000 fill) are approved as proposed.
3. Plans submitted for permitting must note existing grades across the entire excavation area, and the excavated area must be returned to pre-existing grade except for those areas where the redeveloped trailhead will extend.
4. *At grading permit submittal*, a revised revegetation plan is required. The plan must incorporate mapped delineation of all areas disturbed as part of the proposed coal seam fire mitigation earthwork as well as the trailhead redevelopment areas, construction staging, and stockpiling areas, and include information regarding native grass species to be used, an explanation of the treatment of excavated topsoil, tree protection details, locations of silt fences or erosion control logs down slope of disturbed areas, and matting requirements on steeper slopes.

Prior to the final inspection, the full installation of the approved Revegetation and Plan must be inspected and approved by the Community Planning & Permitting Department. If weather is not conducive to seeding or if adequate revegetation efforts have not occurred and vegetation is not adequately established at the time of final inspection request, an irrevocable letter of credit or monies deposited into a County Treasurer account will be required to assure the success of revegetation. You should consider the following well in advance of your revegetation inspection:

Whether you are applying for a Certificate of Occupancy, final inspection, or the return of funds held in escrow for completion of revegetation, some level of germination and growth of grass seed is required.

Keep in mind that the steeper the slopes and dryer the soil, the greater the attention needed to establish a level of germination adequate to obtain revegetation approval.

Areas of disturbance found at inspection not included on the revegetation plan are still subject to reseeding and matting.

5. The site plan for the redeveloped trailhead dated April 05, 2024, is approved as proposed.
6. At grading or building permit submittal, the submitted plans must include revisions to address the issues raised in the DRT A&E referral response dated June 14, 2024, including but not limited to grades and curves that exceed MMTS requirements, parking space dimensions, provision of circulation signage, and provision of electrical vehicle charging stations.
7. During construction, all vehicles, materials, machinery, dumpsters, and other items shall be staged on the subject property; no items shall be stored or staged on Marshall Drive (SH170).

8. ***At grading permit***, the Stormwater Quality Permit application must be submitted and obtained prior to any work beginning on the project. A drainage report and Stormwater Management Plan must be submitted with the SWQP application materials.
9. ***Prior to grading permit issuance***, the proposed development must meet all local, state, and federal regulations, including but not limited to those for odor control and fugitive dust mitigation.
10. Permit plans for the proposed cistern must include additional details not provided with the application materials, including but not limited to location, dimensions, and cut/fill required. The permit submittal must also include details regarding any maintenance or other intergovernmental agreement regarding the cistern's permitting or use between the City of Boulder and Rocky Mountain Fire Protection District.
11. Blending and excavation activities must be halted if a Red Flag warning is issued by the United States National Weather Service for the area where the proposal is located.
12. In the event that blending and excavation activities are halted for high winds, any material exceeding 100 degrees Fahrenheit shall be immediately covered with a minimum of two feet of cold overburden.
13. At building permit, the applicant must submit hydraulic calculations for the proposed culverts and associated drainage facilities for County review and approval.
14. The Applicants are subject to the terms, conditions, and commitments of record and in the file for Docket *LU-24-0009 BCPOS Marshall Mesa Mitigation and Trailhead Earthwork*.



Boulder County Land Use Department

Courthouse Annex Building
 2045 13th Street • PO Box 471 • Boulder, Colorado 80302
 Phone: 303-441-3930
 Email: planner@bouldercounty.org
 Web: www.bouldercounty.org/lu
 Office Hours: Mon., Wed., Thurs., Fri. 8 a.m. to 4:30 p.m.
 Tuesday 10 a.m. to 4:30 p.m.

<i>Shaded Areas for Staff Use Only</i>
Intake Stamp

Planning Application Form

The Land Use Department maintains a submittal schedule for accepting applications. Planning applications are accepted on Mondays, by appointment only. Please call 303-441-3930 to schedule a submittal appointment.

Project Number		Project Name	
<input type="checkbox"/> Appeal <input type="checkbox"/> Correction Plat <input type="checkbox"/> Exemption Plat <input type="checkbox"/> Final Plat <input checked="" type="checkbox"/> Limited Impact Special Use <input type="checkbox"/> Limited Impact Special Use Waiver <input type="checkbox"/> Location and Extent	<input type="checkbox"/> Modification of Site Plan Review <input type="checkbox"/> Modification of Special Use <input type="checkbox"/> Preliminary Plan <input type="checkbox"/> Resubdivision (Replat) <input type="checkbox"/> Rezoning	<input type="checkbox"/> Road Name Change <input type="checkbox"/> Road/Easement Vacation <input type="checkbox"/> Site Plan Review <input type="checkbox"/> Site Plan Review Waiver <input type="checkbox"/> Sketch Plan <input type="checkbox"/> Special Use/SSDP	<input type="checkbox"/> Special Use (Oil & Gas development) <input type="checkbox"/> State Interest Review (1041) <input type="checkbox"/> Subdivision Exemption <input type="checkbox"/> Variance <input type="checkbox"/> Other:
Location(s)/Street Address(es) 1842 South Foothills Hwy, Boulder, CO			
Subdivision Name TR, 194-198 - COMMERCIAL			
Lot(s)	Block(s)	Section(s) 21	Township(s) 1S
Area in Acres 71.53	Existing Zoning A - Agricultural	Existing Use of Property Recreation and cattle grazing	Range(s) 70
Proposed Water Supply	Proposed Sewage Disposal Method		

Applicants:

Applicant/Property Owner City of Boulder OSMP c/o Adam Gaylord		Email gaylorda@bouldercolorado.gov	
Mailing Address 2520 55th St			
City Boulder	State CO	Zip Code 80301	Phone 303-495-8982
Applicant/Property Owner/Agent/Consultant		Email	
Mailing Address			
City	State	Zip Code	Phone
Agent/Consultant		Email	
Mailing Address			
City	State	Zip Code	Phone

Certification (Please refer to the Regulations and Application Submittal Package for complete application requirements.)

I certify that I am signing this Application Form as an owner of record of the property included in the Application. I certify that the information and exhibits I have submitted are true and correct to the best of my knowledge. I understand that all materials required by Boulder County must be submitted prior to having this matter processed. I understand that public hearings or meetings may be required. I understand that I must sign an Agreement of Payment for Application processing fees, and that additional fees or materials may be required as a result of considerations which may arise in the processing of this docket. I understand that the road, school, and park dedications may be required as a condition of approval. I understand that I am consenting to allow the County Staff involved in this application or their designees to enter onto and inspect the subject property at any reasonable time, without obtaining any prior consent.

All landowners are required to sign application. If additional space is needed, attach additional sheet signed and dated.

Signature of Property Owner <i>Dan Burke</i>	Printed Name Dan Burke	Date 4/8/24
Signature of Property Owner <i>JPR</i>	Printed Name Nuria Rivera-Vandermyde	Date 5/1/2024

The Land Use Director may waive the landowner signature requirement for good cause, under the applicable provisions of the Land Use Code.

Janet Michels



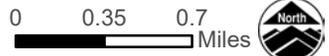
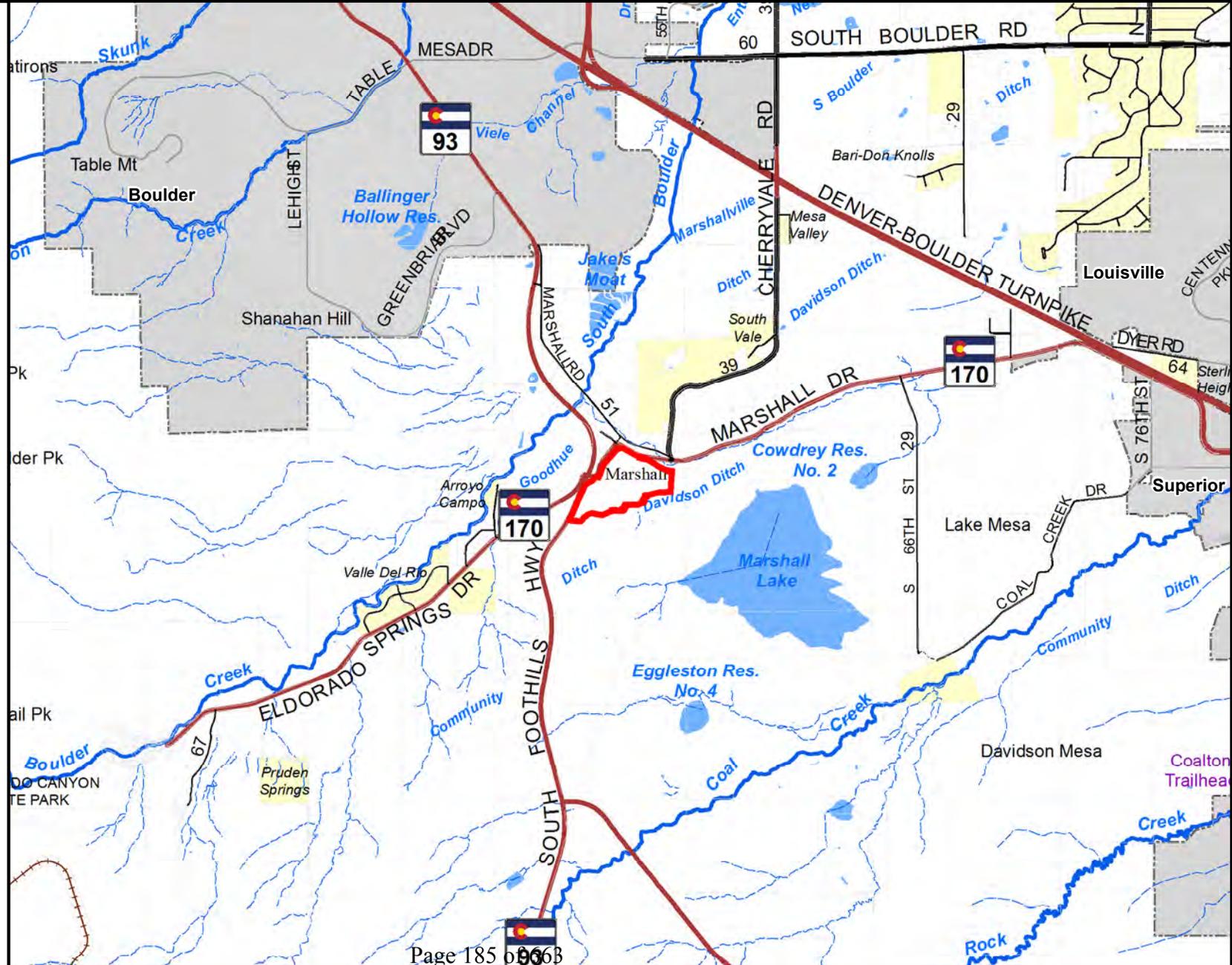
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Vicinity

1842 S FOOTHILLS HWY

-  Subject Parcel
-  Municipalities
- Subdivisions**
-  Subdivisions



Area of Detail Date: 8/16/2023



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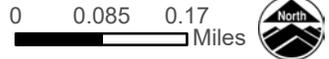
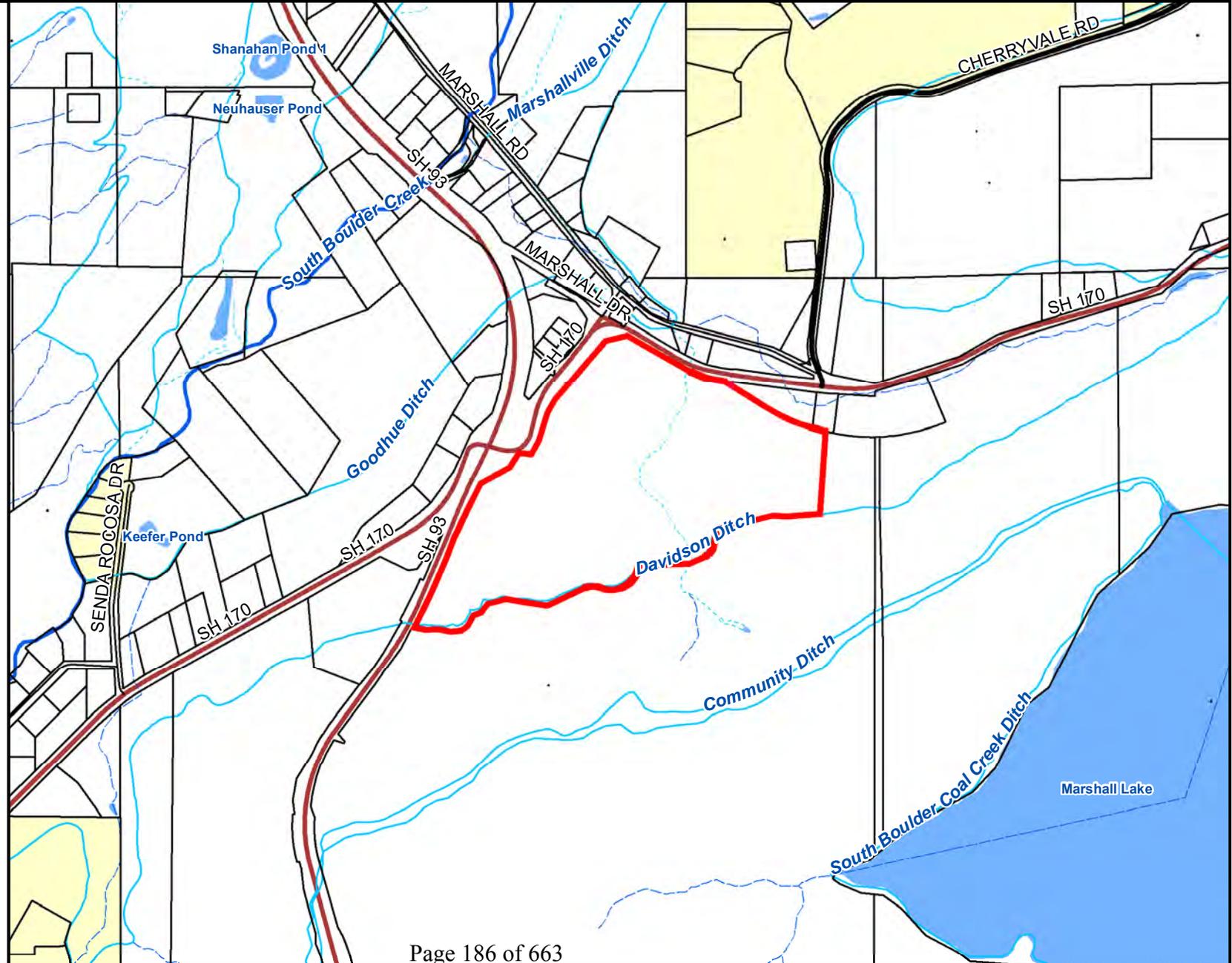
Location

1842 S FOOTHILLS HWY

Subject Parcel

Subdivisions

Subdivisions



Area of Detail Date: 8/16/2023



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Aerial

1842 S FOOTHILLS HWY

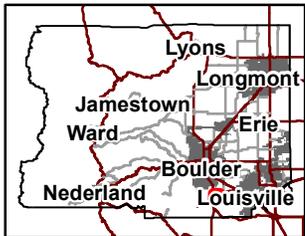
 Subject Parcel



0 0.04 0.08 Miles



Area of Detail Date: 8/16/2023



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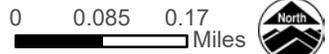


Community Planning & Permitting

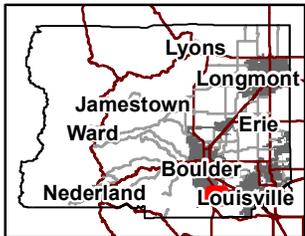
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Aerial
1842 S FOOTHILLS HWY

 Subject Parcel



Area of Detail Date: 8/16/2023



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Comprehensive Plan

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Subject Parcel

NLNA Buffer

Archeologically Sensitive Travel Routes

Archeologically Sensitive Travel Routes

Critical Wildlife Habitats

Environmental Conservation Areas

Riparian Areas

Wetlands

Significant Natural Communities

Riparian Habitat Connectors

High Biodiversity Areas

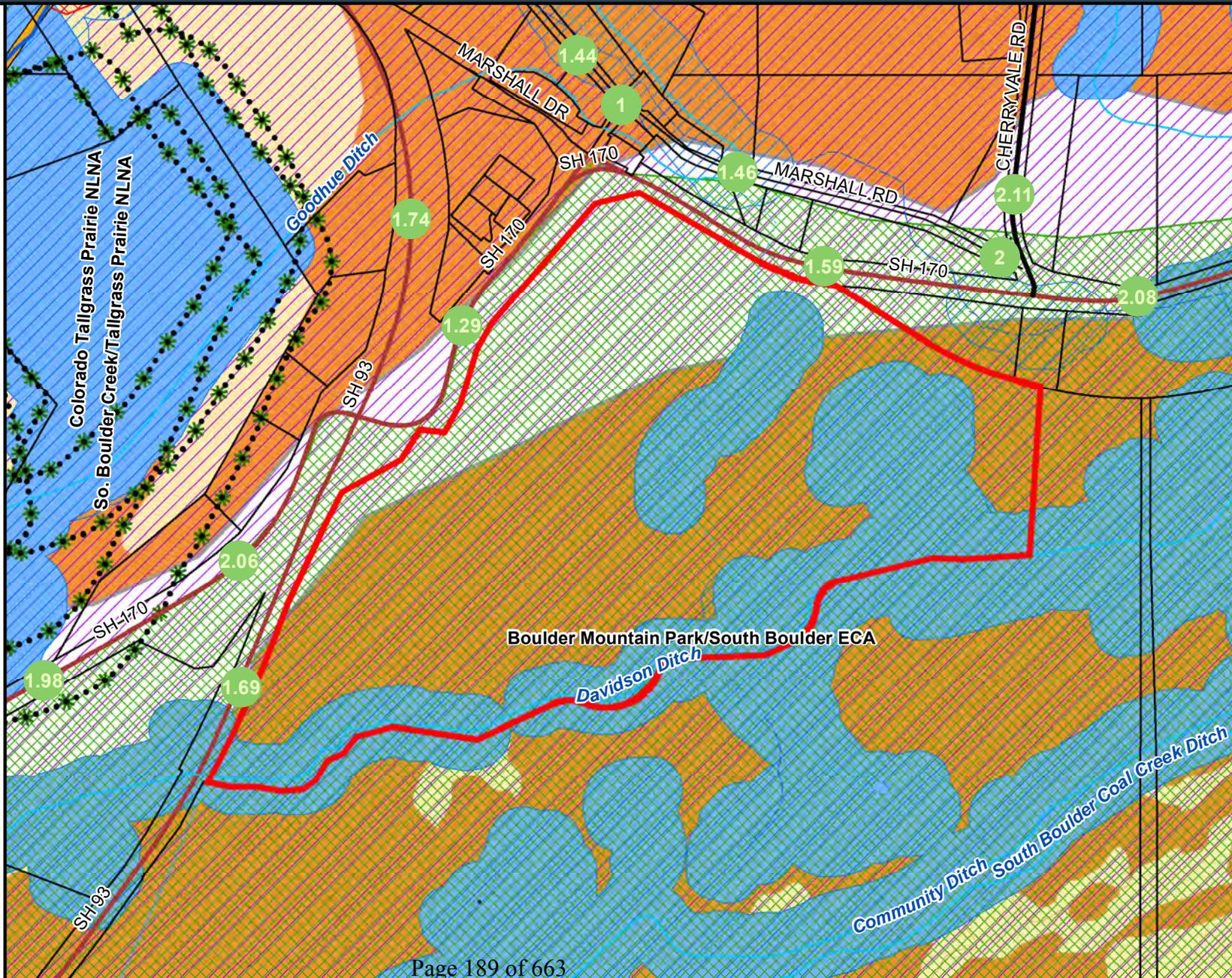
B2: Very High Biodiversity Significance

Natural Landmarks
 Natural Areas

Rare Plant Areas



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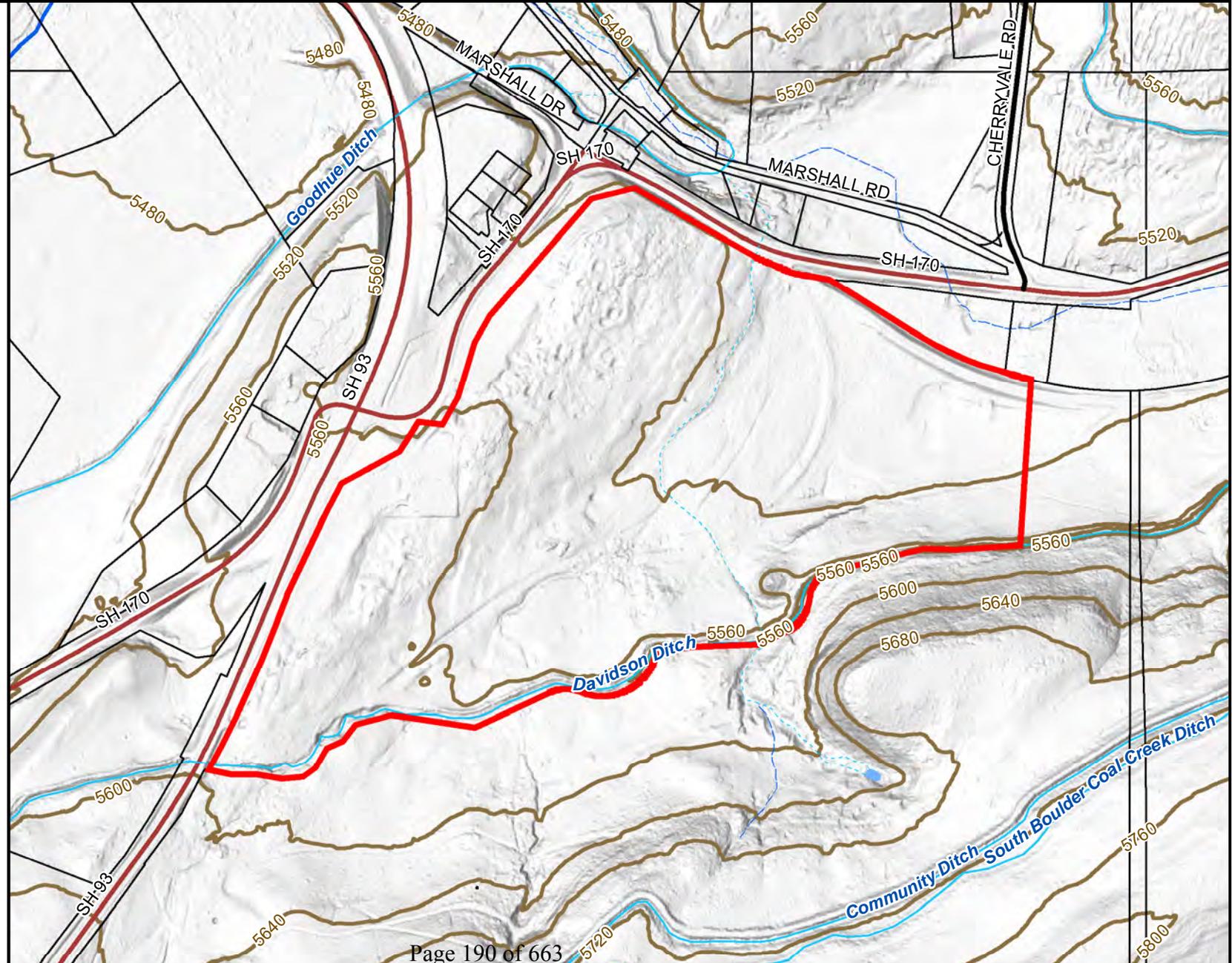
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Elevation Contours

1842 S FOOTHILLS HWY

- Subject Parcel
- Contours 40'



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Geologic Hazards

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Geologic Hazard & Constraint Areas
Geology Element

Slope Stability

Debris flow susceptibility area

Rockfall susceptibility area

Landslide susceptibility area

Landslide Inventory

Heaving Bedrock

Steeply Dipping, Heaving Bedrock

Boulder Coal Field

Extent of Abandoned Coal Mines

Soil and Bedrock Swell Potential

Very High

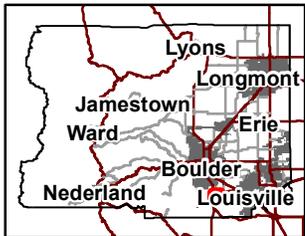
High

Moderate

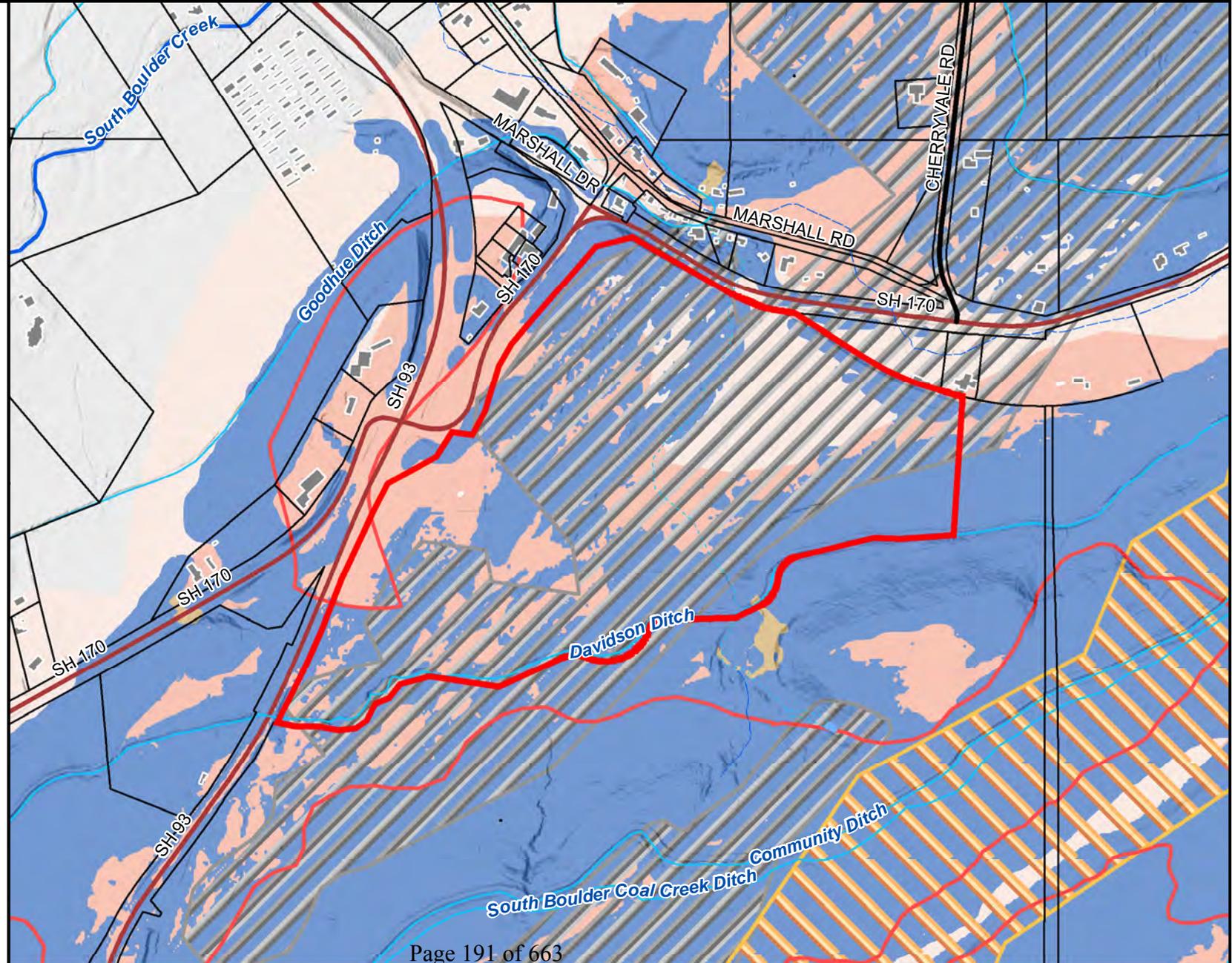
0 290 580 Feet



Area of Detail Date: 8/16/2023



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Planning Areas

1842 S FOOTHILLS HWY

Subject Parcel

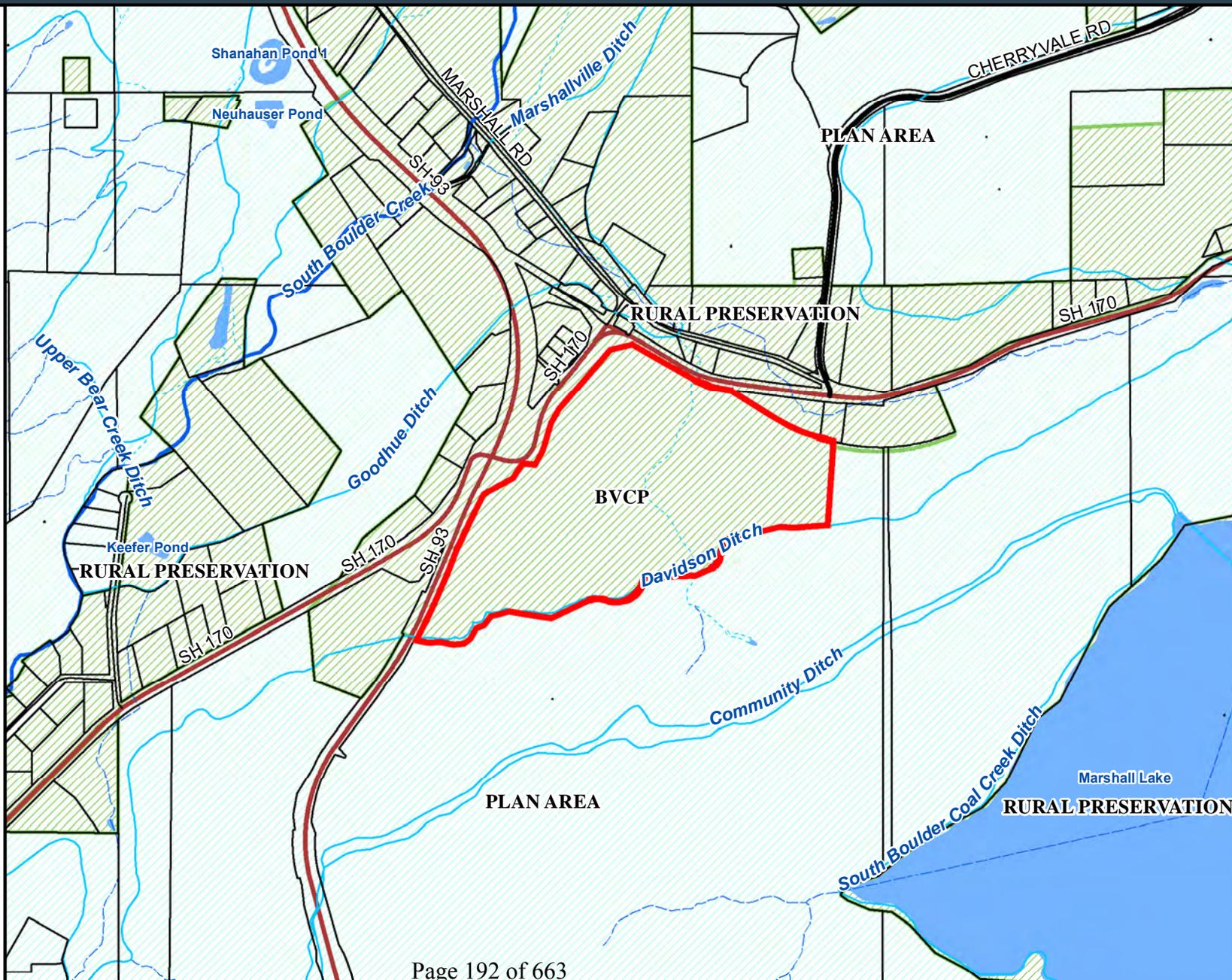
Active IGA Boundary

Active IGA Designation

RURAL PRESERVATION

BVCP

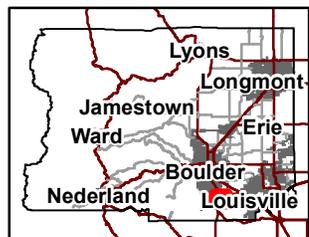
PLAN AREA



0 0.085 0.17 Miles



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Prebles

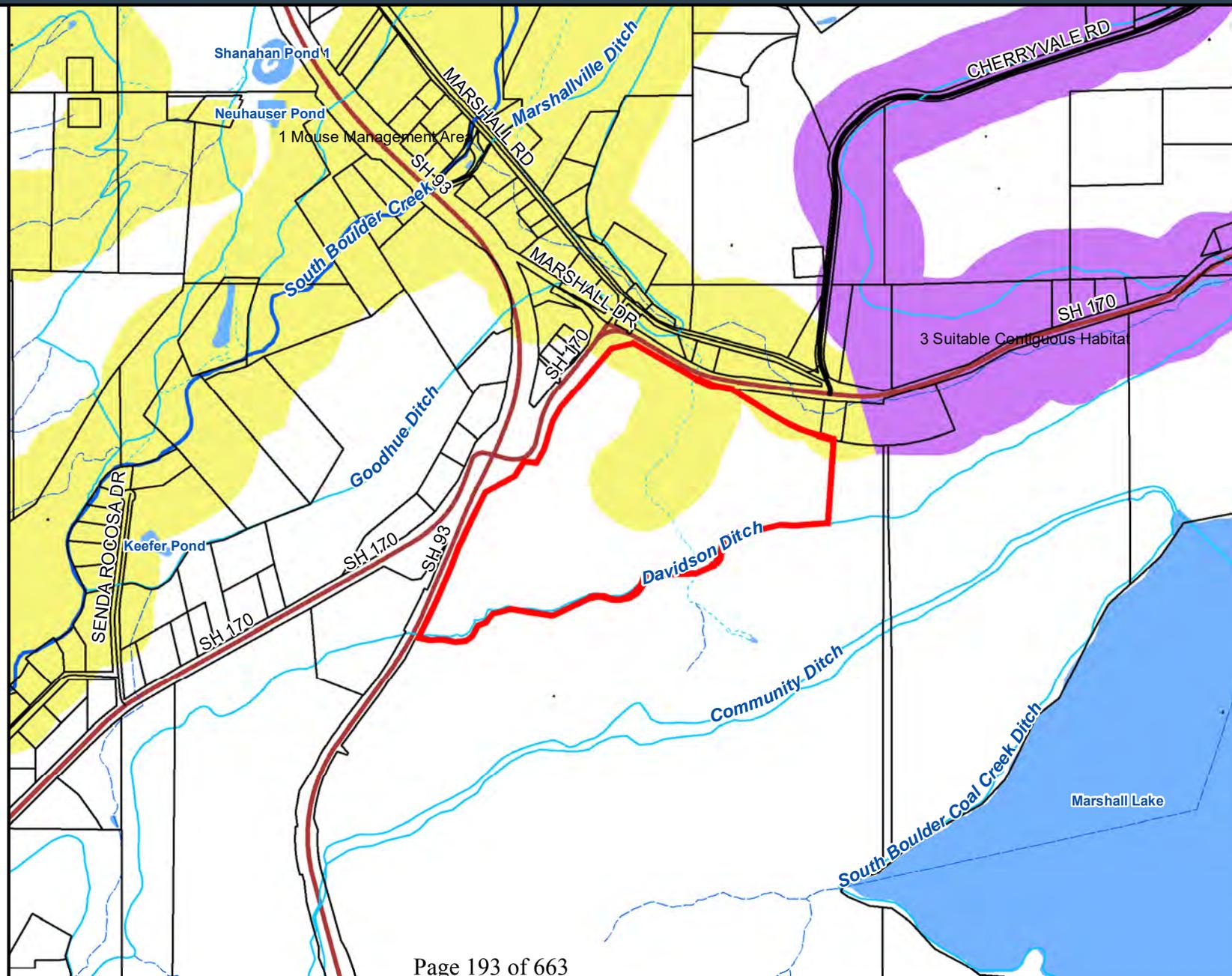
1842 S FOOTHILLS HWY

Subject Parcel

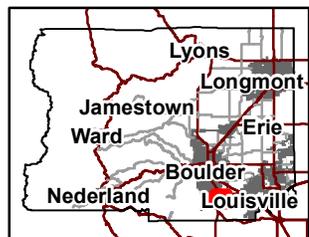
Note: This map's legend shows all Preble's Priority Zones as mapped by Boulder County. The subject property may not contain all zones. Refer to the USFWS Memo dated 9/17/03 to determine when projects require review by USFWS for Preble's.

Prebles

- Zone 1 Mouse Management Area
- Zone 3 Suitable Contiguous Habitat



Area of Detail Date: 8/16/2023



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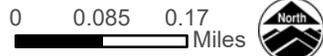
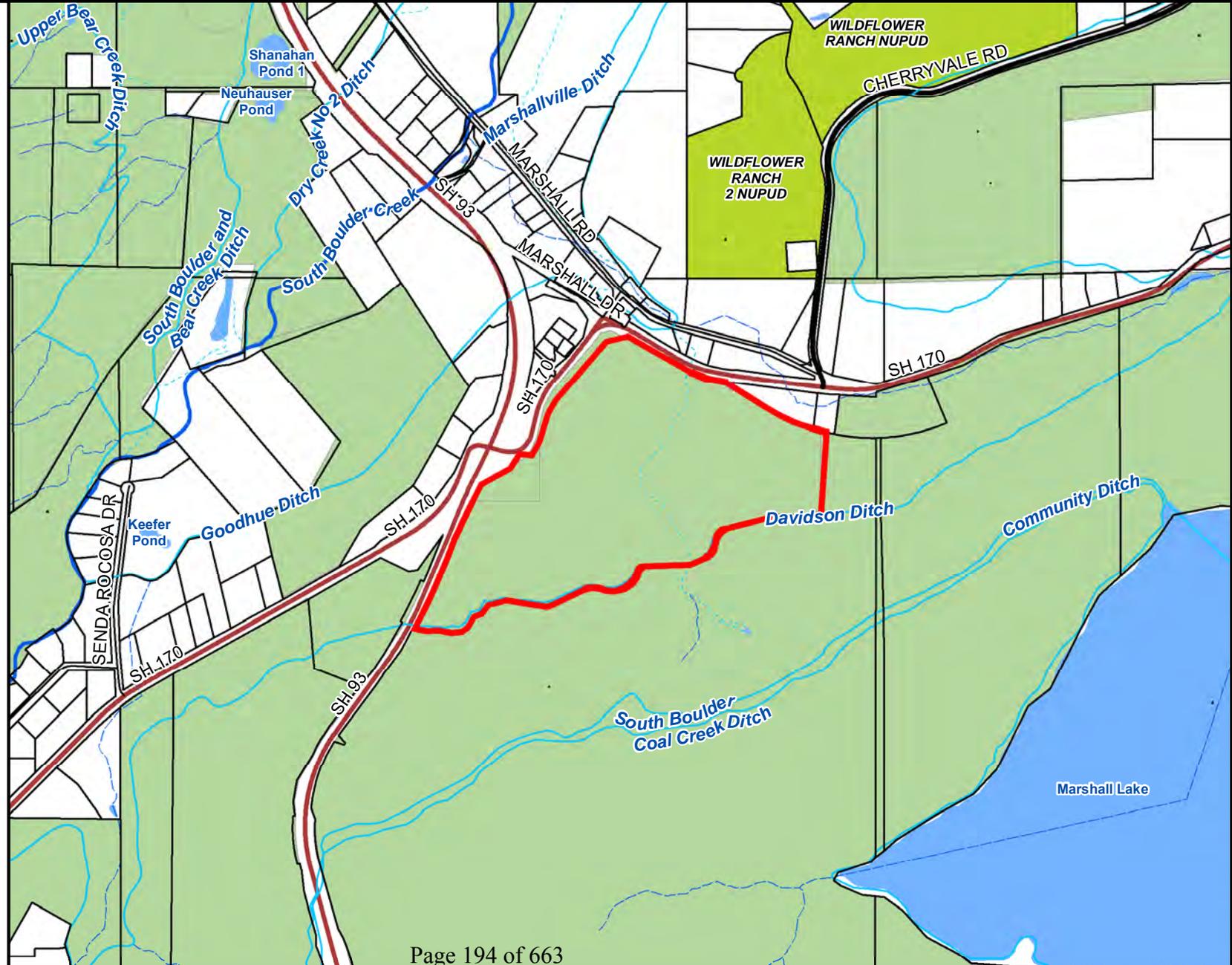
Public Lands & CEs

1842 S FOOTHILLS HWY

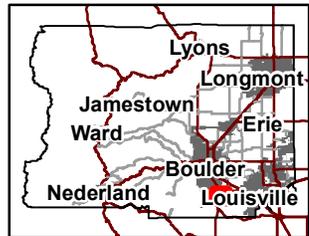
Subject Parcel

Boulder County Open Space

- County Conservation Easement
- OSMP Properties



Area of Detail Date: 8/16/2023



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Zoning

1842 S FOOTHILLS HWY

Subject Parcel

Zoning Districts

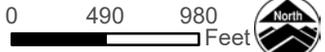
- Agricultural
- Business
- Estate Residential
- Manufactured Home
- Rural Residential

Ditch Setbacks

- 20 feet
- 50 feet

Major Road Setbacks

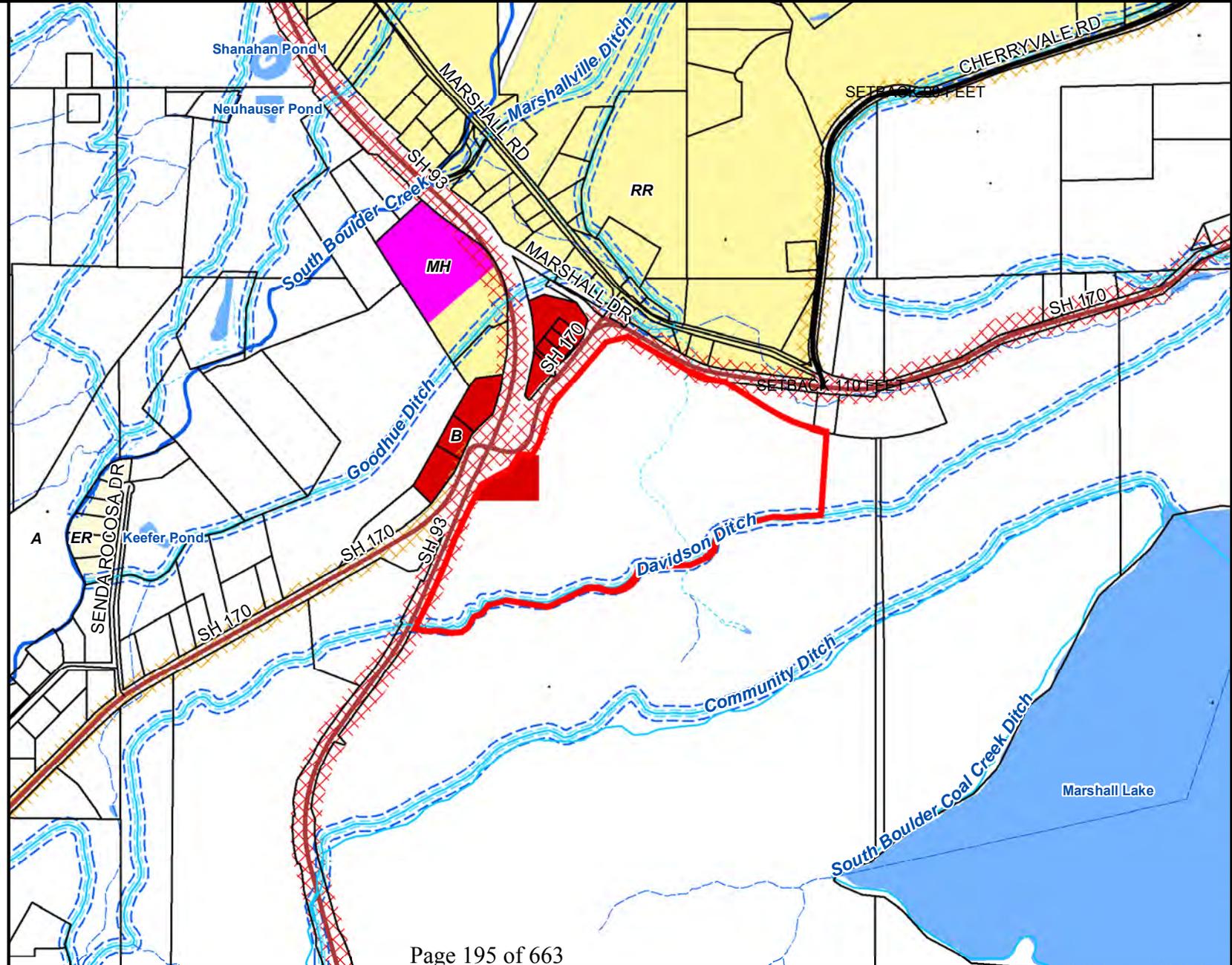
- 90 feet
- 110 feet



Area of Detail Date: 8/16/2023



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Limited Impact Special Use Review Fact Sheet

Project Identification

Project Name: Marshall Mesa Reclamation and Trailhead
Property Address/Location: 1842 South Foothills Hwy
Current Owner:
Size of Property in Acres:

The applicant(s) is/are required to complete each section of this Limited Impact Special Use Review Fact Sheet even if the information is duplicated elsewhere in the application. Completed Fact Sheets reduce the application review time which helps expediate the Director's Determination. Please make duplicates of this Limited Impact Special Use Review Fact Sheet if the project involves more than two structures.

Determining Floor Area

If an existing wall(s) and/or roof(s) are removed and a new wall(s)/roof(s) are constructed, the associated floor area due to the new wall(s)/roof(s) are considered new construction and must be included in the calculation of floor area for the Limited Impact Special Use Review and shown on this Fact Sheet.

Structure #1 Information

Type of Structure: (e.g. residence, studio, barn, etc.)			
Total Existing Floor Area: (Finished + Unfinished square feet including garage if attached.)		sq. ft.	Deconstruction: sq. ft.
Are new floor areas being proposed where demolition will occur?			
<input type="checkbox"/> Yes (include the new floor area square footage in the table below)			
<input type="checkbox"/> No			
Proposed Floor Area (New Construction Only)			
	Finished	Unfinished	Total
Basement:	sq. ft.	sq. ft.	sq. ft.
First Floor:	sq. ft.	sq. ft.	sq. ft.
Second Floor:	sq. ft.	sq. ft.	sq. ft.
Garage: <input type="checkbox"/> Detached <input type="checkbox"/> Attached	sq. ft.	sq. ft.	sq. ft.
Covered Deck:	sq. ft.	sq. ft.	sq. ft.
Total:	sq. ft.	sq. ft.	sq. ft.
			Height (above existing grade)
			Exterior Wall Material
			Exterior Wall Color
			Roofing Material
			Roofing Color
			Total Bedrooms

Structure #2 Information

Type of Structure: (e.g. residence, studio, barn, etc.)			
Total Existing Floor Area: (Finished + Unfinished square feet including garage if attached.)		sq. ft.	Deconstruction: sq. ft.
Are new floor areas being proposed where demolition will occur?			
<input type="checkbox"/> Yes (include the new floor area square footage in the table below)			
<input type="checkbox"/> No			
Proposed Floor Area (New Construction Only)			
	Finished	Unfinished	Total
Basement:	sq. ft.	sq. ft.	sq. ft.
First Floor:	sq. ft.	sq. ft.	sq. ft.
Second Floor:	sq. ft.	sq. ft.	sq. ft.
Garage: <input type="checkbox"/> Detached <input type="checkbox"/> Attached	sq. ft.	sq. ft.	sq. ft.
Covered Deck:	sq. ft.	sq. ft.	sq. ft.
Total:	sq. ft.	sq. ft.	sq. ft.
			Height (above existing grade)
			Exterior Wall Material
			Exterior Wall Color
			Roofing Material
			Roofing Color
			Total Bedrooms

Grading Calculation

Cut and fill calculations are necessary to evaluate the disturbance of a project and to verify whether or not a Limited Impact Special Use Review (LISR) is required. A Limited Impact Special Use Review is required when grading for a project involves more than 500 cubic yards (minus normal cut/fill and backfill contained within the foundation footprint).

If grading totals are close to the 500 yard trigger, additional information may be required, such as a grading plan stamped by a Colorado Registered Professional Engineer.

Earth Work and Grading

This worksheet is to help you accurately determine the amount of grading for the property in accordance with the Boulder County Land Use Code. Please fill in all applicable boxes.

Note: Applicant(s) must fill in the shaded boxes even though foundation work does not contribute toward the 500 cubic yard trigger requiring Limited Impact Special Use Review. Also, all areas of earthwork must be represented on the site plan.

Earth Work and Grading Worksheet:

	Cut	Fill	Subtotal
Driveway and Parking Areas			
Berm(s)			
Other Grading	182,000	182,000	364,000
Subtotal			364,000 <small>Box 1</small>

* If the total in Box 1 is greater than 500 cubic yards, then a Limited Impact Special Review is required.

	Cut	Fill	Total
Foundation			
Material cut from foundation excavation that will be removed from the property			

Excess Material will be Transported to the Following Location:

Excess Materials Transport Location:
All cut and fill will be used on site. No excess material is anticipated.

Is Your Property Gated and Locked?

Note: If county personnel cannot access the property, it could cause delays in reviewing your application.

Certification

I certify that the information submitted is complete and correct. I agree to clearly identify the property (if not already addressed) and stake the location of the improvements on the site within four days of submitting this application. I understand that the intent of the Site Plan Review process is to address the impacts of location and type of structures, and that modifications may be required. Site work will not be done prior to issuance of a Grading or Building Permit.

Signature	<i>Adam J Gaylord</i>	Date	4/8/24
-----------	-----------------------	------	--------

Marshall Mesa Trailhead Redesign
Boulder County Limited Impact Special Use Review Narrative
April 8, 2024

1.0 Introduction

Marshall Mesa Trailhead serves as one of the southern gateways to the City of Boulder Open Space and Mountain Parks (OSMP) system. The trailhead is located south of the intersection of Marshall Road and South Foothills Highway in unincorporated Boulder County south of Boulder, CO (Appendix 1, Cover Sheet). OSMP and the State of Colorado Department of Natural Resources Division of Reclamation, Mining, and Safety (DRMS) are proposing a mitigation effort to remove, to the extent practicable, hazards associated with long-burning subsurface coal fires and, upon completion of this mitigation work, installation of a new trailhead to replace the existing Marshall Mesa Trailhead.

2.0 Project Area

The site is wholly owned and managed by OSMP and consists of the Marshall Mesa Trailhead, access road, and surrounding area. The existing trailhead was constructed in 2007 and includes parking for 48 vehicles (including three ADA spaces), four designated horse trailer spaces, a vault restroom, and three picnic tables north of the parking areas. The area surrounding the trailhead is characterized by xeric tallgrass habitat (Photo 1) composed of a mix of native and non-native grasses such as big bluestem (*Andropogon gerardii*), smooth brome (*Bromus inermis*), western wheatgrass (*Pascopyrum smithii*), and crested wheatgrass (*Andropogon cristatum*) with patches of native shrubs such as yucca (*Yucca glauca*) and three-leaf sumac (*Rhus trilobata*). In December 2021, a destructive wildfire, now known as the Marshall Fire, started near the trailhead and burned eastward through the site, damaging trailhead fencing, the restroom, and burning most of the vegetation surrounding the trailhead. Since then, OSMP has replaced some of the fencing, installed temporary restrooms (Photo 2), and implemented restoration efforts to help habitats recover such as weed management and seeding.



Photo 1. Xeric tallgrass habitat south of Marshall Mesa Trailhead (facing south).



Photo 2. Temporary restrooms installed after Marshall Fire (standing at trailhead entrance facing south).

3.0 Project Description

DRMS will conduct mitigation of underground coal fires including extensive excavation. After mitigation activities are complete, OSMP will replace and reconfigure the existing trailhead to support multimodal access, improve erosion issues, and improve visitor safety. Improvements will also be made to the interior of the South Mesa Spur loop to improve visitor experience and facilitate education and outreach opportunities.

3.1 Subsurface Coal Fire Mitigation

Following the Marshall Fire, the State of Colorado Department of Natural Resources Division of Reclamation, Mining, and Safety (DRMS) and consultants completed a series of investigations on a 7.5-acre area in and around the trailhead to quantify the extents of subsurface heat associated with underground coal fires that have been burning in the area for over 50 years. Please see the attached 'Marshall Mine Underground Coal Fire Report of Investigations' (Appendix 2) for a detailed report of the results of these investigations. DRMS determined that excavating two coal seam areas with elevated subsurface temperatures (greater than 80° F) is appropriate to mitigate risk of future subsurface ignition and subsidence. Please see Appendix 3 for a description of proposed mitigation measures and plan set detailing the work.

DRMS contractors will excavate two areas totaling approximately 364,000 cubic yards of cut and fill (Appendix 4). The project will not result in excess cut. No material will be removed from the project area. Excavated material will be staged in one of three stockpile areas. In both locations, the overburden will be removed to expose burned/unburned coal which will then be spread and blended with overburden until coal temperatures drop below 80° F. Excavated material will then be replaced. Once excavation and replacement are complete, both areas will be graded to match existing topography as closely as feasible. DRMS contractors will also rough grade the redesigned trailhead (described below).

OSMP and the Mountain View Fire Protection District (MVFPD) have a mutual interest in wildfire prevention and suppression in the wildland/urban interface area surrounding Eldorado Springs and Marshall. The Marshall Mesa Trailhead renovation includes a fire protection cistern system that will be designed, installed, and maintained by MVFPD. The cistern will be truck filled from the trailhead above. Water will be accessed by MVFPD from a hydrant located adjacent to a wide shoulder along Highway 170. The approximately 8' diameter and 40' long cistern is designed to hold 20,000 gallons.

3.2 Marshall Mesa Trailhead Redesign

An OSMP system-wide trailhead assessment identified the need to renovate Marshall Mesa Trailhead to improve visitor safety, visitor experience, and access to multimodal transport. Given the damage sustained during the Marshall Fire and that the State’s subsurface coal mitigation will necessarily disturb much of the trailhead, OSMP decided to move forward with trailhead renovation upon completion of subsurface mitigation work. In addition to necessary renovations, this project will allow OSMP to implement master plan goals and initiatives such as allowing trailheads to become not just places to access the system, but opportunities for education and outreach, gathering for passive recreation, and demonstration of native plantings and low-impact, sustainable design.

OSMP will reconfigure the existing trailhead largely within the existing footprint and entirely within the limits of disturbance of the proposed subsurface mitigation (Appendix 1). The new design will feature 70 total parking spaces including four designated accessible parking spaces. The new design will also accommodate a shuttle drop off and trailer parking loop. The parking area will be gravel road base over compacted subgrade except for the accessible parking spots, the driveway apron, and some of the access drive, which will be concrete. To prevent erosion and material loss, the parking area will be surrounded by curb and gutter that will direct water to a bioretention area on the south side of the trailhead.

The new trailhead will include bike racks, a rain garden, picnic tables and an updated double vault restroom. To improve visitor safety and decrease traffic congestion at the intersection of CO 93 and Marshall Road and allow full turn movements in and out of the trailhead, a new access road will be constructed with an entrance north of the existing access road, which will be closed and restored.

3.2 Cut and Fill Estimates

The subsurface mitigation will require excavation of approximately 182,000 cubic yards of material. Upon completion of mitigation work, cut material outside of the footprint of the proposed trailhead will be recontoured to match existing grades. Within the footprint of the new trailhead, DRMS contractors will rough grade the proposed design and then OSMP contractors will finish the fine grading. As such, all excavated material will be used on site and the total cut/fill for the project will be approximately 364,000 cy. No material will be transported off site.

3.3 Access and Staging

The project area will be accessed from Marshall Drive. A construction access will be installed across the street (east) of the existing driveway for the Eldorado Shuttle parking area west of Marshall Drive. Upon completion of underground mitigation work, the construction access will be graded to serve as the future trailhead access drive. A temporary vehicle tracking control pad will also be installed within the footprint of the existing trailhead during construction. Material staging will be located in three areas within the project area. Vehicle and equipment staging will be located within the limits of disturbance.

3.5 Project Timeline

Pending on-going regulatory review and permit issuance, DRMS is expected to begin subsurface mitigation in Fall of 2024. Mitigation work is projected to take approximately 12-16 weeks. Upon completion of the mitigation work, OSMP will begin construction of the new trailhead. Trailhead construction is expected to be completed by Fall 2025.

3.6 Best Management Practices

During construction, OSMP will follow all applicable Best Management Practices outlined in Wetland Protections Program Best Management Practices (City of Boulder 1995) and OSMP’s Ecological Best Management Practices (City of Boulder 2013). Grading limits will be clearly marked. No dewatering will be necessary. No equipment will need to access the water. Prior to transporting equipment to the site, all machinery will be cleaned to remove weed seeds. A “spill kit” for emergency pollutant isolation, and written clean-up procedures, will be onsite at all times during construction activity.

Please see Sheets 23-25 (Appendix 1) for an erosion control plan for the proposed trailhead. The DRMS contractor will install and maintain erosion control for the underground mitigation work, then OSMP contractors will maintain erosion control during trailhead construction until final stabilization of the site occurs. The following general erosion control measures will be implemented:

- Silt fences shall be placed on the downhill (north/west) sides of the site during construction.
- Certified weed-free coconut fiber logs/waddles shall be installed in key locations around the site to limit runoff.
- Erosion control mats, filter logs, rock checks, durable mulch or a combination thereof shall be used in areas where concentrated water flow is likely to occur to prevent soil movement.
- Soils tracked from the site by vehicles shall be cleaned daily (or more frequently, as necessary) from paved roadway surfaces throughout the duration of construction.
- Other erosion control BMPs will be utilized as necessary.

After construction is complete, restoration areas and areas of temporary impact will be seeded with native species and covered with 100% biodegradable erosion control blanket. Plant material will be obtained from commercial nurseries and seed suppliers or supplied by OSMP. Only local genotypes will be used. Commercial seed lots will be tested for viability and purity and seed lots contaminated with weed seed will be rejected. OSMP supports a volunteer seed collection program where staff-led volunteers collect native seed from OSMP land for use in restoration projects. Any cuttings used for the project will be harvested from OSMP land, preferably within the area of impact for the project. Restoration, including seeding and plantings, will be monitored by an OSMP ecologist for a minimum of three years.

Maintenance will either be performed in house or contracted. Plantings will be irrigated as necessary based on ecological conditions observed during periodic monitoring events. The primary maintenance activity necessary for the long-term success of the project is management of weeds and other undesirable vegetation. The continued control of non-native species including crack willow will be important to allow native trees and shrubs to colonize and persist.

4.0 Regional and Federal Clearances

The proposed project requires clearances from Boulder County and the City of Boulder.

4.1 Boulder County

During the pre-application meeting for this application, Boulder County planning staff requested that OSMP submit a traffic report and updated title information. Please find these materials attached in Appendix 5 and 6, respectively.

OSMP and DRMS will submit separate applications for required building, grading, and stormwater permits, OSMP for the trailhead and DRMS for the underground mitigation.

4.2 City of Boulder

No impacts to these regulated areas are proposed. As such, the project does not require a Wetland Permit.

4.3 Federal Clearances

The project will not impact Water of the U.S. and therefore no Clean Water Act coordination with the U.S. Army Corps of Engineers is required.

The project is not located within suitable habitat for any species listed under the Endangered Species Act. No coordination with the U.S. Fish and Wildlife Service is required.

Marshall Mesa Trailhead Redesign
City of Boulder Open Space and Mountain Parks
Appendix 1 – Plan Set
April 8, 2024

TOPOGRAPHIC EXHIBIT

LOCATED IN THE NORTHWEST QUARTER OF SECTION 21,
TOWNSHIP 1 SOUTH, RANGE 70 WEST OF THE 6TH P.M.,
COUNTY OF BOULDER, STATE OF COLORADO

SHEET 1 OF 1

Parcel Description

(PREPARED BY CLIENT)

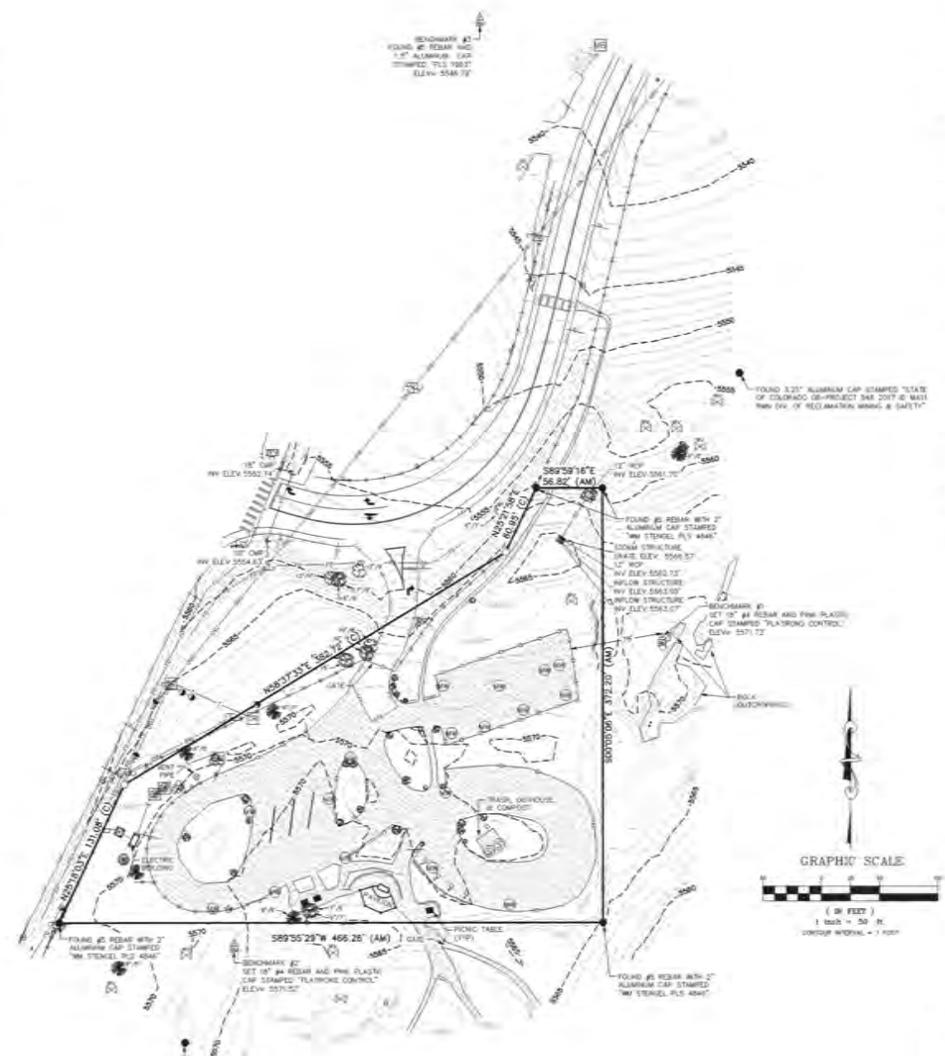
A PORTION OF LAND ON ELDORADO SPRINGS DRIVE AND EAST OF SOUTH FOOTBALLS HIGHWAY COLORADO STATE HIGHWAY 883, LOCATED IN THE NORTHWEST QUARTER OF SECTION 21, TOWNSHIP 1 SOUTH, RANGE 70 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF BOULDER, STATE OF COLORADO.



Vicinity Map
NOT TO SCALE

Legend

- FOUND MONUMENT AS DESCRIBED
- CALCULATED POSITION (NOT FOUND OR SET)
- TEMPORARY BENCHMARK/CONTROL AS DESCRIBED, AND REQUESTED BY CLIENT
- ▭ CONCRETE
- EDGE OF ASPHALT
- GRAVEL
- ▭ BUILDINGS & REPAIR
- FENCE
- HIGH AND RAIL FENCING
- SIGN
- BOLLARD
- /X DECIDUOUS TREE (TRUNK DIAMETER/DRIP LINE RADIUS)
- /X CONIFEROUS TREE (TRUNK DIAMETER/DRIP LINE RADIUS)
- HANDICAP PARKING SPACE
- WATER LINE
- WELL
- MONITOR WELL
- WATER SPROUT
- FIRE DEPARTMENT CONNECTION
- IRRIGATION VALVE
- SANITARY SEWER MANHOLE
- CLEANOUT
- GRATE INLET
- ▭ FLARED END SECTION
- ELECTRIC LINE
- ▭ ELECTRICAL PANEL
- ▭ TRANSFORMER
- LIGHT POLE
- OVERHEAD UTILITY LINE
- UTILITY POLE
- OUT WIRE
- TRAFFIC LIGHT
- TRAFFIC WAULT
- FIBEROPTIC LINE
- TELEPHONE LINE
- ▭ TELEPHONE ROOM
- GAS VALVE
- ▭ MAILBOX
- CONTAINER
- INVERT
- ELEVATION
- TYPICAL



Notes

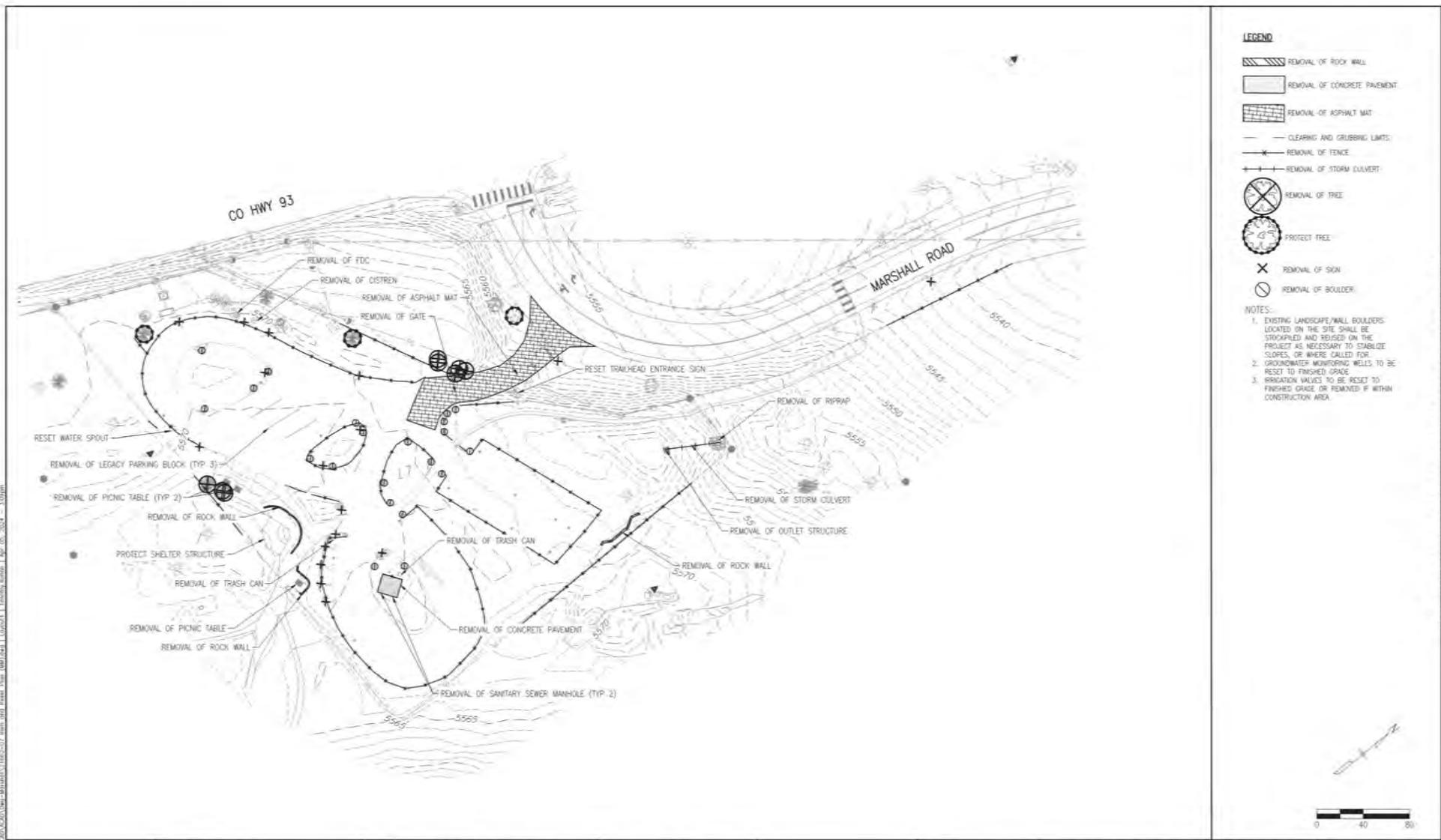
1. THIS EXHIBIT WAS PREPARED WITHOUT THE BENEFIT OF A CURRENT TITLE COMMITMENT AND DOES NOT CONSTITUTE A TITLE SEARCH BY FLATIRON, INC. TO DETERMINE TITLE OR EASEMENTS OF RECORD. THIS EXHIBIT DOES NOT PURPORT TO REFLECT ANY OF THE FOLLOWING WHICH MAY BE APPLICABLE TO THE SUBJECT REAL ESTATE, EASEMENTS, OTHER THAN POSSIBLE EASEMENTS THAT WERE VISIBLE AT THE TIME OF MAKING THIS EXHIBIT: BUILDING SETBACK REQUIREMENTS, SUBDIVISION RESTRICTIONS, ZONING OR OTHER LAND-USE REGULATIONS, AND ANY OTHER FACTS THAT AN ACCURATE AND CURRENT TITLE SEARCH MAY DISCLOSE.
2. ACCORDING TO COLORADO LAW, YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS EXHIBIT WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS EXHIBIT BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATION SHOWN HEREON.
3. THIS EXHIBIT WAS PREPARED FOR THE EXCLUSIVE USE OF CITY OF BOULDER & OTAK, NAMED IN THE STATEMENT HEREON. SAID STATEMENT DOES NOT EXTEND TO ANY UNNAMED PERSON WITHOUT AN EXPRESS STATEMENT BY THE SURVEYOR NAMING SAID PERSON.
4. THIS EXHIBIT IS VALID ONLY IF PRINT HAS SEAL AND SIGNATURE OF SURVEYOR.
5. SOURCE INFORMATION FROM PLANS AND MARKINGS HAVE BEEN COMBINED WITH OBSERVED EVIDENCE OF UTILITIES TO DEVELOP A VIEW OF THOSE UNDERGROUND UTILITIES. HOWEVER, LACKING EDUCATION, THE EXACT LOCATION OF UNDERGROUND FEATURES CANNOT BE ACCURATELY, COMPLETELY AND RELIABLY DEPICTED, WHERE ADDITIONAL OR MORE DETAILED INFORMATION IS REQUIRED. THE CLIENT IS ADVISED THAT EXCAVATION MAY BE NECESSARY. NO EXCAVATIONS WERE MADE DURING THE PROGRESS OF THIS EXHIBIT TO LOCATE BURIED UTILITIES AND STRUCTURES. ALL UNDERGROUND UTILITIES MUST BE FIELD LOCATED BY THE APPROPRIATE AGENCY OR UTILITY COMPANY PRIOR TO ANY EXCAVATION, PURSUANT TO C.R.S. SEC. 9-1.5-103.
6. THE DISTANCE MEASUREMENTS SHOWN HEREON ARE U.S. SURVEY FEET.
7. THE CONTOURS REPRESENTED HEREON WERE INTERPOLATED BY AUTOCAD CIVIL 3D (DIGITAL TERRAIN MODELING) SOFTWARE BETWEEN ACTUAL MEASURED SPOT ELEVATIONS. DEPENDING ON THE DISTANCE FROM A MEASURED SPOT ELEVATION AND LOCAL VARIATIONS IN TOPOGRAPHY, THE CONTOUR SHOWN MAY NOT BE AN EXACT REPRESENTATION OF THE SITE TOPOGRAPHY. THE PURPOSE OF THIS TOPOGRAPHIC MAP IS FOR SITE EVALUATION AND TO SHOW SURFACE DRAINAGE FEATURES. ADDITIONAL TOPOGRAPHIC OBSERVATIONS MAY BE NECESSARY IN SPECIFIC AREAS OF DESIGN. TOPOGRAPHY SHOWN HEREON COMPLEYS WITH NATIONAL MAP ACCURACY STANDARDS.
8. BENCHMARK INFORMATION: SMARTNET NORTH AMERICA CONTINUOUSLY OPERATING REFERENCE STATIONS (CORS) NETWORK WAS USED TO ESTABLISH A GPS DERIVED ELEVATION ON AN ON-SITE BENCHMARK 75 FEET EAST OF THE RECTANGULAR PARKING LOT, BEING A 1/2" #4 REBAR AND PINK PLASTIC CAP STAMPED "FLATIRON CONTROL" WITH AN ELEVATION OF 5571.72 FEET (NAVD 88). THIS POINT C-458, BEING A 3.5" BRASS DISK LOCATED 0.2 MILES SOUTHERLY OF THE INTERSECTION OF HIGHWAY 93 AND ELDORADO SPRINGS DRIVE ALONG THE EAST SIDE OF HIGHWAY 93 FOUND IN A ROCK OUTCROPPING 35 FEET EAST OF THE EDGE OF ASPHALT, WITH A PUBLISHED ELEVATION OF 5592.20 FEET WAS CHECKED WITH AN AS-MEASURED ELEVATION OF 5592.19 FEET. NO DIFFERENTIAL LEVELING WAS PERFORMED TO ESTABLISH THE ELEVATION OF THE ON-SITE BENCHMARK.
9. HORIZONTAL DATUM: COORDINATE VALUES AND DISTANCES SHOWN HEREON ARE ADJUSTED STATE PLANE & ZONE NORTH AMERICAN DATUM 1983 (NAD83/2011) SCALED FROM LATITUDE 39°57'14.24"N, LONGITUDE 105°15'48.86"W AT AN ELLIPSOID HEIGHT OF 5526.77 WITH A COMBINED SCALE FACTOR OF 1.00029251.
10. DATES OF FIELDWORK: JANUARY 24, 2024.
11. BOUNDARY DETERMINATION IS NOT A PART OF THIS EXHIBIT. THIS IS NOT A "LAND SURVEY FLAT" OR "IMPROVEMENT SURVEY FLAT" AND THIS EXHIBIT IS NOT INTENDED FOR PURPOSES OF TRANSFER OF TITLE OR SUBDIVISIONS OF LAND, AND THAT IT IS NOT TO BE RELIED UPON FOR THE ESTABLISHMENT OF A FENCE, BUILDING OR OTHER FUTURE IMPROVEMENT LINES.

Surveyor's Statement

I, JAMES Z. COWAN, A LAND SURVEYOR LICENSED IN THE STATE OF COLORADO, HEREBY STATE FOR AND ON BEHALF OF FLATIRON, INC. TO OTAK, THAT THIS TOPOGRAPHIC EXHIBIT WAS PREPARED BY ME AND DOES NOT REPRESENT A CHANGE, IS IN ACCORDANCE WITH RELIABLE STANDARDS IN THE PRACTICE OF SURVEYING OR WARRANTY, EITHER EXPRESSED OR IMPLIED, SAID STANDARDS AND THE RELATIVE ELEVATIONS SHOWN HEREON ARE ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

JAMES Z. COWAN, COLORADO E.L.S. #29038
VICE PRESIDENT, FLATIRON, INC.

DATE	
REVISION	
TOPOGRAPHIC EXHIBIT PREPARED FOR	
CITY OF BOULDER & OTAK	
CONTRACT NO. 2023-12-00000-0001	
Flatiron, Inc. Land Surveying Services 1000 N. PRESTON SUITE 2000 BOULDER, CO 80502 (303) 440-8997 (303) 440-8997	
DRAFT MAKING COPY ONLY ORIGINAL VERSION AND SIGNATURE WILL BE STAMP AND SIGNATURE	
JOB NUMBER	23-8038
DATE	01-23-2024
DRAWN BY	E. LABRIDA
CHECKED BY	TOP/LAW/JZC
SHEET #	1 OF 1



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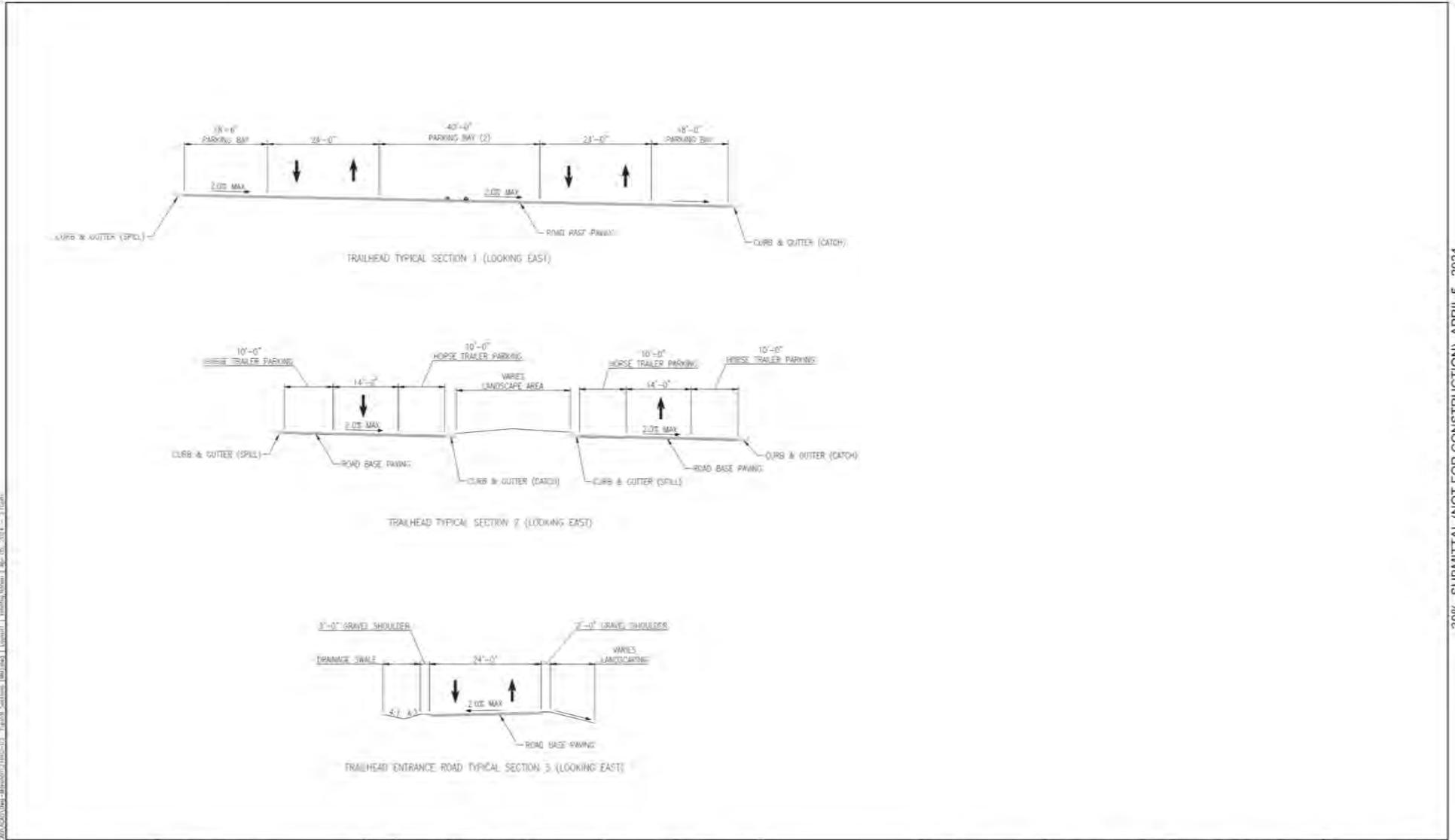
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As Constructed
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MARSHALL MESA TRAILHEAD RENOVATION REMOVAL AND RESET PLAN		
Designer:	T. Rohan	Structure Numbers
Detailer:	R. Condel	
Sheet Subset:	REM	Subst Sheets: 1 of 1

Project No./Code	21662
Sheet Number	04



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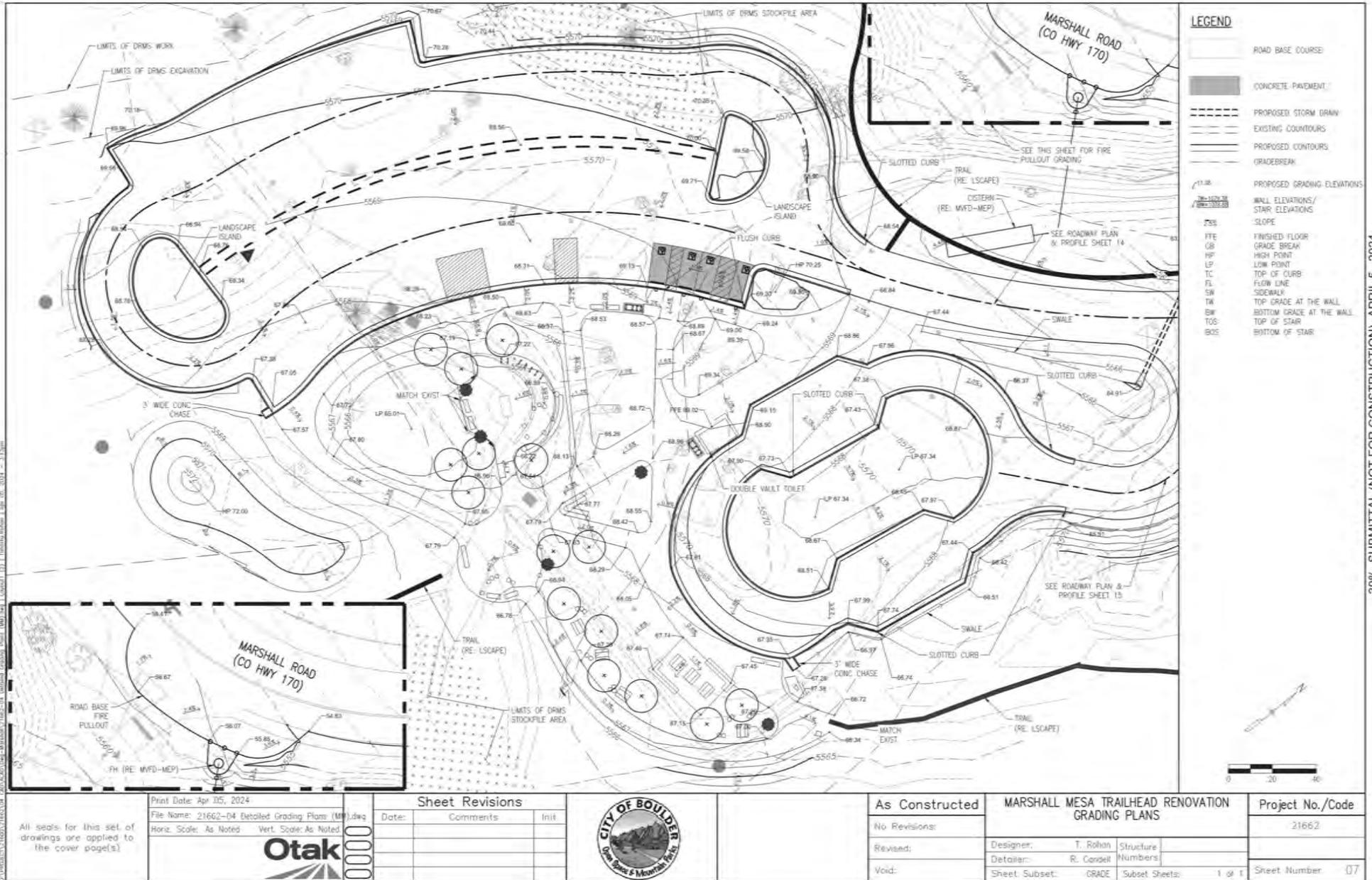
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No Revisions			21662
Revised:	Designer: T. Rohm	Structure Numbers:	
	Detailer: R. Caspel		
	Sheet Subset: TYPSEC	Subst Sheets: 1 of 1	Sheet Number: 05

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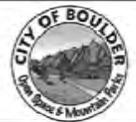
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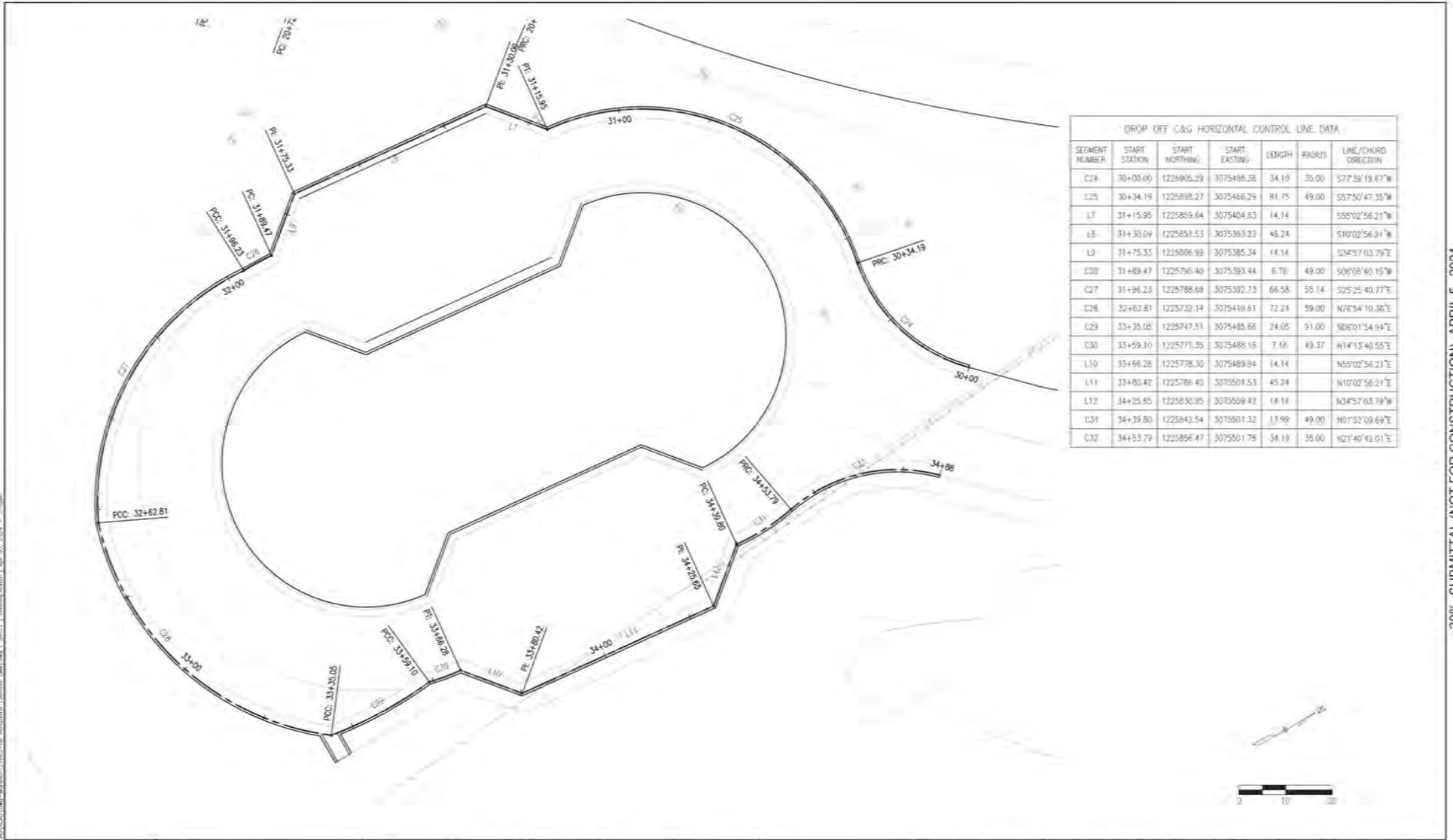
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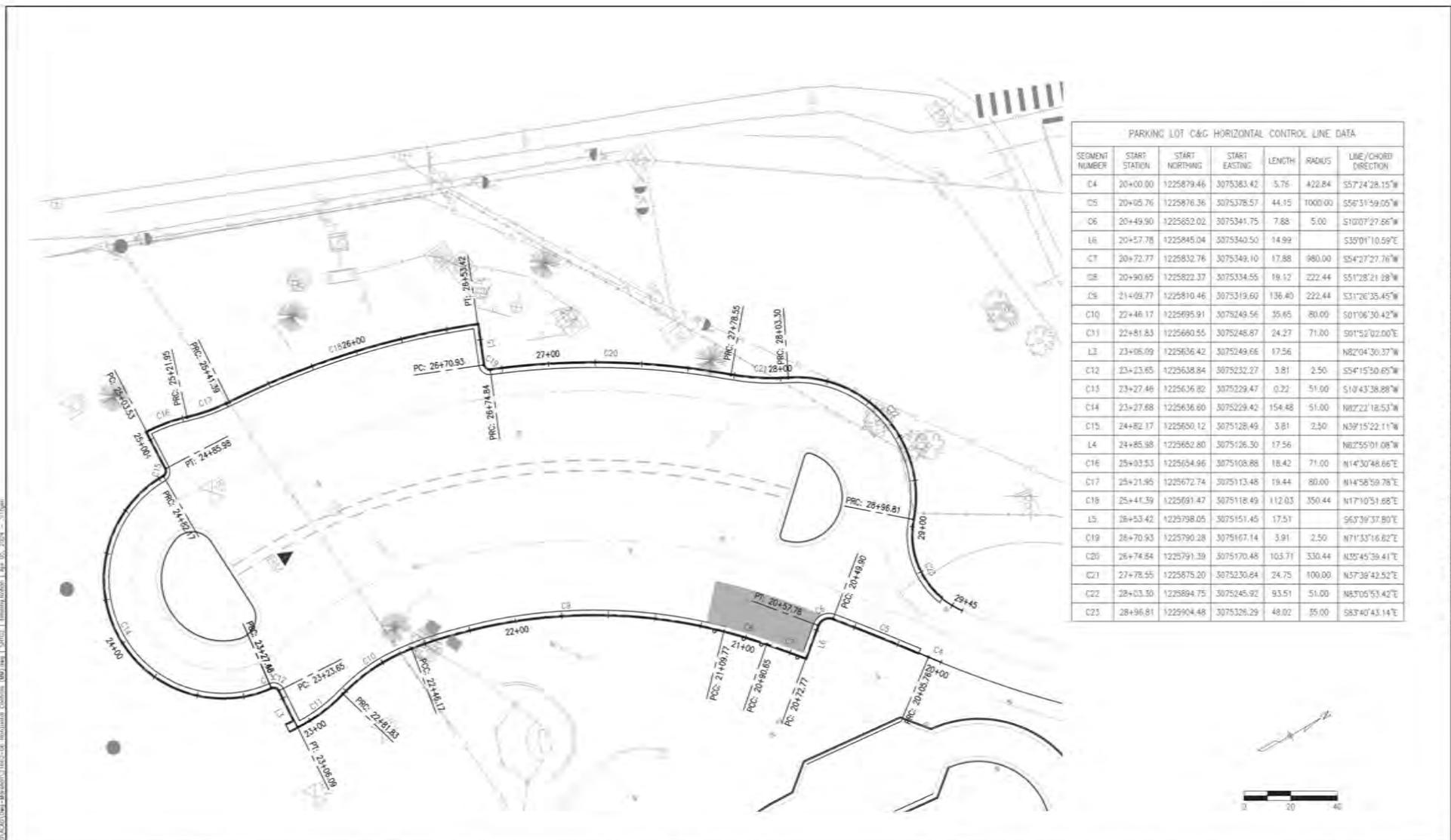
MARSHALL MESA TRAILHEAD RENOVATION GRADING PLANS			
Designer:	T. Rohan	Structure Numbers	
Detailer:	R. Corbett		
Sheet Subset:	GRADE	Subst Sheets:	1 of 1

Project No./Code	21662
Sheet Number	07



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	Date:	Comments:	Init:															
																		



PARKING LOT C&G HORIZONTAL CONTROL LINE DATA						
SEGMENT NUMBER	START STATION	START NORTHING	START EASTING	LENGTH	RADIUS	LINE/CHORD DIRECTION
C4	20+00.00	1225879.46	3075383.42	5.76	422.84	S57°24'28.15"W
C5	20+06.76	1225878.36	3075378.57	44.15	1000.00	S56°31'59.05"W
C6	20+49.90	1225652.02	3075341.75	7.88	5.00	S100°27'28.67"W
L6	20+57.78	1225845.04	3075340.50	14.99		S39°01'10.59"E
C7	20+72.77	1225832.76	3075349.10	17.88	980.00	S54°27'27.76"W
C8	20+90.65	1225822.37	3075334.55	18.12	222.44	S51°28'21.88"W
C9	21+09.77	1225810.46	3075319.60	136.40	222.44	S31°26'35.45"W
C10	22+46.17	1225695.91	3075249.56	35.65	80.00	S01°06'30.42"W
C11	23+81.83	1225660.55	3075248.87	24.27	71.00	S01°52'02.00"E
L3	23+06.09	1225636.42	3075249.66	17.56		N82°04'30.37"W
C12	23+23.65	1225638.84	3075232.27	3.81	2.50	S54°15'30.65"W
C13	23+27.46	1225636.82	3075229.47	0.22	51.00	S10°43'38.88"W
C14	23+27.68	1225636.60	3075229.42	154.48	51.00	N82°22'18.53"W
C15	24+82.17	1225630.12	3075128.49	3.81	2.50	N39°15'22.11"W
L4	24+85.98	1225662.80	3075126.30	17.56		N82°55'01.08"W
C16	25+03.53	1225654.96	3075108.88	18.42	71.00	N14°30'48.66"E
C17	25+21.95	1225672.74	3075113.48	19.44	80.00	N14°58'59.78"E
C18	25+41.39	1225691.47	3075118.49	112.03	350.44	N17°10'51.68"E
L5	28+53.42	1225738.05	3075151.45	17.51		S63°39'37.80"E
C19	28+70.93	1225790.28	3075167.14	3.91	2.50	N71°33'16.82"E
C20	28+74.54	1225791.39	3075170.48	103.71	330.44	N35°45'39.41"E
C21	27+78.55	1225875.20	3075230.84	24.75	100.00	N57°38'42.52"E
C22	28+03.30	1225894.75	3075245.92	93.51	51.00	N85°05'53.42"E
C23	28+96.81	1225904.48	3075326.29	48.02	35.00	S83°40'43.14"E



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SEEDING NOTES

- SEEDING PREPARATION:** Seedbed should be well graded, firm, and broken, to facilitate seed placement or required depth. Grade slopes to minimize future water erosion. Loosen or sweep of compacted soil by machinery or by hand, if hand raking is effective to 6" minimum depth. Break down clumps larger than 3 inches in diameter.
- SEEDING RATES:** Seeding rates are expressed in pure live seed (PLS) pounds per acre and are based on starting a predetermined number of live seeds per square foot to achieve a specific plant density. For conservation purposes, seeding rates have been established to achieve the desired plant density of ground 20-40 live seeds per square foot. The seed mix must be specified or otherwise approved by Open Space and Mountain Parks restoration ecologists. No substitutions are allowed.
- SEEDING METHODS:**
 - DRAWL:** Plant seed with a draw on all slopes of 2:1 or flatter. The draw must meet specifications for the type of seed and seeding rates recommended.
 - BROADCAST:** Seed may be broadcast by hand, by mechanical conveyor, or by hydraulic equipment on areas that are smooth, flat, steep, and/or inaccessible for draw-seeding.
 - HYDROSEEDING:** Hydraulic seeding and mulching in a single operation is appropriate because seedlings suspended in the slurry may die if they are not in good contact with the soil. Seeding and hydro mulching must be done in late separate operations. Note seed in fly from before mulching.
- SEEDING DEPTH:** Seed placed with a drill should be placed between 1/2 inch and 1 inch below the surface. Broadcast seed should be incorporated into the surface soil by raking or harrowing to depths not to exceed 1 inch.
- SEEDING DATES:** October 15 - May 15
- SEEDING CONDITIONS:** Soil should not be frozen or wet at time of seeding.
- MULCHING (When required):** Following seeding, much the area with seed-free material (see notes or list if permitted). Avoid using or excessive blanket (with bio-degradable material ONLY) are recommended for slopes greater than 2 to 1. Hydro-mulch to an acceptable alternative only when applied after seeding.

SOIL PREPARATION:

- Tree of 20' height, excavated soil with 2.0 cubic feet (42.5 gallons) excavated soil, hydraulic mulcher and soilbed of each tree, fully incorporated.
- Native shrub and perennial under 2" depth, excavated soil, hydraulic mulcher and soilbed incorporated into top 2" of soil.
- Non-grass, 1-2" depth, excavated mulch per approved high level material (HML) standards.

SOIL CONDITIONS:

- Excavated plants (except approved shade or approved inputs)
- Material incorporated: Sulfur 3-6-3, or 4-8-4 at 800-1200 pounds per acre.
- Structure: Use manufacturer's recommended rate.
- Domestic nut species, and only as approved by approved staff.
- Mulch: Where specified, 2" depth, nitrogen 11/17" (native sludge) mulch.

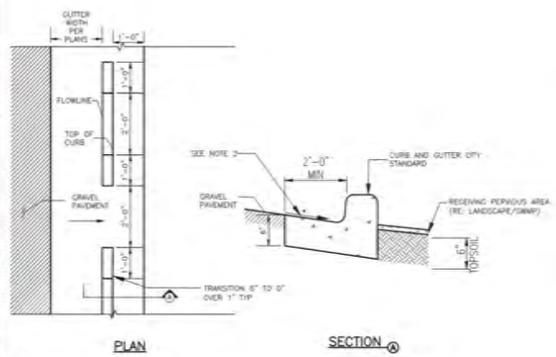
CITY OF BOULDER
PLANTING DETAILS
TRAILHEAD CONSTRUCTION DETAIL

OSMP Low Elevation Grass Seed Mix

Botanical Name	Common Name	Variety	Seeds/lb	PLS/lb per acre (Broadcast rate)
<i>Hordeum jubatum</i>	Jointed brome	Arctic	50	8.6
<i>Elymus canadensis</i>	Canada wildrye	Ontario	10	2.2
<i>Dactylis glomerata</i>	Orchard grass	Prize	10	2.2
<i>Deschampsia cespitosa</i>	Green needlegrass	Latham	10	2.2
<i>Stachys recta</i>	Stachys grass	Battle	10	2.2
<i>Poa annua</i>	Blue grass	Blue River	10	2.2
<i>Schizanthus occidentalis</i>	Little bluestem	Compass	5	1.1
<i>Bouteloua curtipendula</i>	Butterfly grass	Butterfly	5	1.1
TOTAL				23.7

OSMP Shrubland/ Midal Area Grass Seed Mix

Botanical Name	Common Name	Variety	Seeds/lb	PLS/lb per acre (Broadcast rate)
<i>Hordeum jubatum</i>	Jointed brome	Arctic	50	8.6
<i>Elymus canadensis</i>	Canada wildrye	Ontario	10	2.2
<i>Dactylis glomerata</i>	Orchard grass	Prize	10	2.2
<i>Deschampsia cespitosa</i>	Green needlegrass	Latham	10	2.2
<i>Stachys recta</i>	Stachys grass	Battle	10	2.2
<i>Poa annua</i>	Blue grass	Blue River	10	2.2
<i>Schizanthus occidentalis</i>	Little bluestem	Compass	5	1.1
<i>Bouteloua curtipendula</i>	Butterfly grass	Butterfly	5	1.1
TOTAL				23.7



NOTES:

- ALL WORK, INCLUDING FORMWORK, SPLASH PAD, EXCAVATION, AND CONCRETE SHALL BE INCLUDED IN THE COST OF ITEM 506 - CURB SLOT (EACH). SLOTTED CURB LOCATIONS ARE INCLUDED IN THE LENGTH OF THE ESTIMATED STANDARD CURB AND GUTTER PAY ITEMS.
- GUTTER SLOPE SHALL CONFORM TO THE STANDARD CURB AND GUTTER PLANS.

SLOTTED CURB DETAIL- 1/10 N.T.S.

DO NOT DAMAGE OR PRUNE LEADER FOR SINGLE TRUNK TREES ONLY 2 1/2-8" POLES OR CHAINS, 100% OF DROUGHTED NYLON STRAPS ABOVE FIRST BRANCH, POUND STRAPS FLOOR OR BELOW GRADE.

3-1/2" FLANGER BOTTOM RE: PLAN

EXPANDED PLASTER SCALE 1/4"=1'-0"

MAINTAIN 3" SLOPE ON LOWER SIDE OF PLANT SET PLANT 2" ABOVE EXISTING GRADE

MULCH 3" DEPTH AS SPECIFIED UNDISTURBED SURFACE

SCALE 1/4"=1'-0"

PLANTING SOIL PREPARATION NOTES

- SOIL PREPARATION:**
 - Tree of 20' height, excavated soil with 2.0 cubic feet (42.5 gallons) excavated soil, hydraulic mulcher and soilbed of each tree, fully incorporated.
 - Native shrub and perennial under 2" depth, excavated soil, hydraulic mulcher and soilbed incorporated into top 2" of soil.
 - Non-grass, 1-2" depth, excavated mulch per approved high level material (HML) standards.
- SOIL CONDITIONS:**
 - Excavated plants (except approved shade or approved inputs)
 - Material incorporated: Sulfur 3-6-3, or 4-8-4 at 800-1200 pounds per acre.
 - Structure: Use manufacturer's recommended rate.
 - Domestic nut species, and only as approved by approved staff.
 - Mulch: Where specified, 2" depth, nitrogen 11/17" (native sludge) mulch.

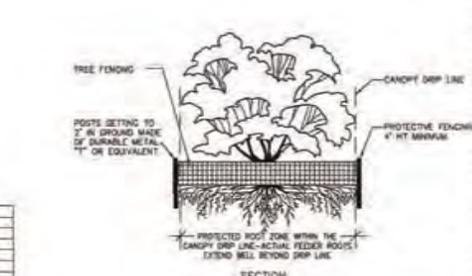
SCALE 1/2"=1'-0"

SCALE 1/4"=1'-0"

CITY OF BOULDER
PLANTING DETAILS
TRAILHEAD CONSTRUCTION DETAIL

TYPICAL TRAILHEAD TREES

KEY	COMMON NAME	BOTANIC NAME	SIZE	HEIGHT	SPREAD
AS	Sambucus	<i>Sambucus racemosa</i>	#3 to 1 1/2" Cal B&B	15'-20'	15'-20'
CL	Common Hawthorn	<i>Crataegus mollis</i>	#5 to 1 1/2" Cal B&B	12'-15'	13'-15'
CS	Western Dogwood	<i>Cornus occidentalis</i>	#5 to 1 1/2" Cal B&B	40'-50'	30'-50'
CO	Redbud	<i>Cercocarpus</i>	#5 to 1 1/2" Cal B&B	50'-60'	40'-50'
CR	Kentucky Coffee-tree	<i>Gymnocladia dioica</i>	#5 to 1 1/2" Cal B&B	50'-60'	40'-50'
CS	Rocky Mountain Juniper	<i>Juniperus</i>	#5 to 6" H&B	20'-30'	6'-12'
BA	Aspen	<i>Picea canadensis</i>	#5 to 1 1/2" Cal B&B	15'-20'	13'-15'
BA	Fir	<i>Abies balsamea</i>	#5 to 1 1/2" Cal B&B	15'-20'	13'-15'
PD	Prince of Wales	<i>Thuja occidentalis</i>	#5 to 1 1/2" Cal B&B	40'-50'	30'-50'
TRF	Common Pear Spruce	<i>Picea canadensis</i>	#5 to 6" H&B	40'-50'	30'-50'
PA	Prickly Pear	<i>Cholla</i>	#5 to 6" H&B	60'-80'	50'-60'
TR	Chokeberry	<i>Aronia arbuscula</i>	#5 to 1 1/2" Cal B&B	8'-20'	8'-12'
GR	Gambel Quail	<i>Quercus gambelii</i>	#5 to 1 1/2" Cal B&B	8'-20'	20'-30'
OW	Bur Oak	<i>Quercus macrocarpa</i>	#5 to 1 1/2" Cal B&B	50'-60'	50'-60'



TREE PROTECTION FENCING (DETAIL 4/10) N.T.S.

TYPICAL TRAILHEAD SHRUBS

KEY	COMMON NAME	BOTANIC NAME	SIZE	HEIGHT	SPREAD
AF	Black Sage	<i>Artemisia tridentata</i>	#1 or #5	4' OC	3'-8'
AF	Pursh's Manzanilla	<i>Artemisia tridentata</i>	#1 or #5	2' H&B	1'-3'
AF	Pursh's Manzanilla	<i>Artemisia tridentata</i>	#1 or #5	3' OC	1'-2'
CS	Yield Red Dogwood	<i>Cornus occidentalis</i>	#1 or #5	4' OC	2'-8'
CS	Yield Red Dogwood	<i>Cornus occidentalis</i>	#1 or #5	4' OC	2'-8'
TR	New Mexico Yucca	<i>Yucca elata</i>	#1 or #5	8' OC	8'-12'
TR	Apache Plume	<i>Fouquieria splendens</i>	#1 or #5	4' OC	3'-8'
AL	Common Yucca	<i>Yucca elata</i>	#1 or #5	3' OC	3'-5'
AL	Manzanilla	<i>Artemisia tridentata</i>	#1 or #5	2' OC	2'-3'
TR	Common Oregon Grape Holly	<i>Illicium angustifolium</i>	#1 or #5	2' OC	2'-3'
TR	Creeping Oregon Holly	<i>Illicium angustifolium</i>	#1 or #5	1' OC	1'-18"
TR	Shrub Yucca	<i>Yucca elata</i>	#1 or #5	3' OC	2'-3'
TR	Creeping Sand Cherry	<i>Prunella verticillata</i>	#1 or #5	4' OC	18"-3'
TR	Creeping Three-Leaf Sumac	<i>Rhus glabra</i>	#1 or #5	6' OC	1'-18"
TR	Shrub Yucca	<i>Yucca elata</i>	#1 or #5	4' OC	3'-8'
TR	Shrub Yucca	<i>Yucca elata</i>	#1 or #5	3' OC	3'-8'
TR	Shrub Yucca	<i>Yucca elata</i>	#1 or #5	2' OC	2'-4'

TYPICAL BANGARDEN PLANTINGS

KEY	COMMON NAME	BOTANIC NAME	SIZE	SPACING
BA	Blue grass	<i>Poa annua</i>	4" Pot	1' OC
BA	Manzanilla	<i>Artemisia tridentata</i>	4" Pot	1' OC
BA	Yield Red Dogwood	<i>Cornus occidentalis</i>	4" Pot	1' OC
BA	Western Blue Dogwood	<i>Cornus occidentalis</i>	4" Pot	1' OC
BA	Yield Red Dogwood	<i>Cornus occidentalis</i>	4" Pot	1' OC
BA	Yield Red Dogwood	<i>Cornus occidentalis</i>	4" Pot	1' OC
BA	Yield Red Dogwood	<i>Cornus occidentalis</i>	4" Pot	1' OC

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MARSHALL MESA TRAILHEAD RENOVATION CONSTRUCTION DETAILS

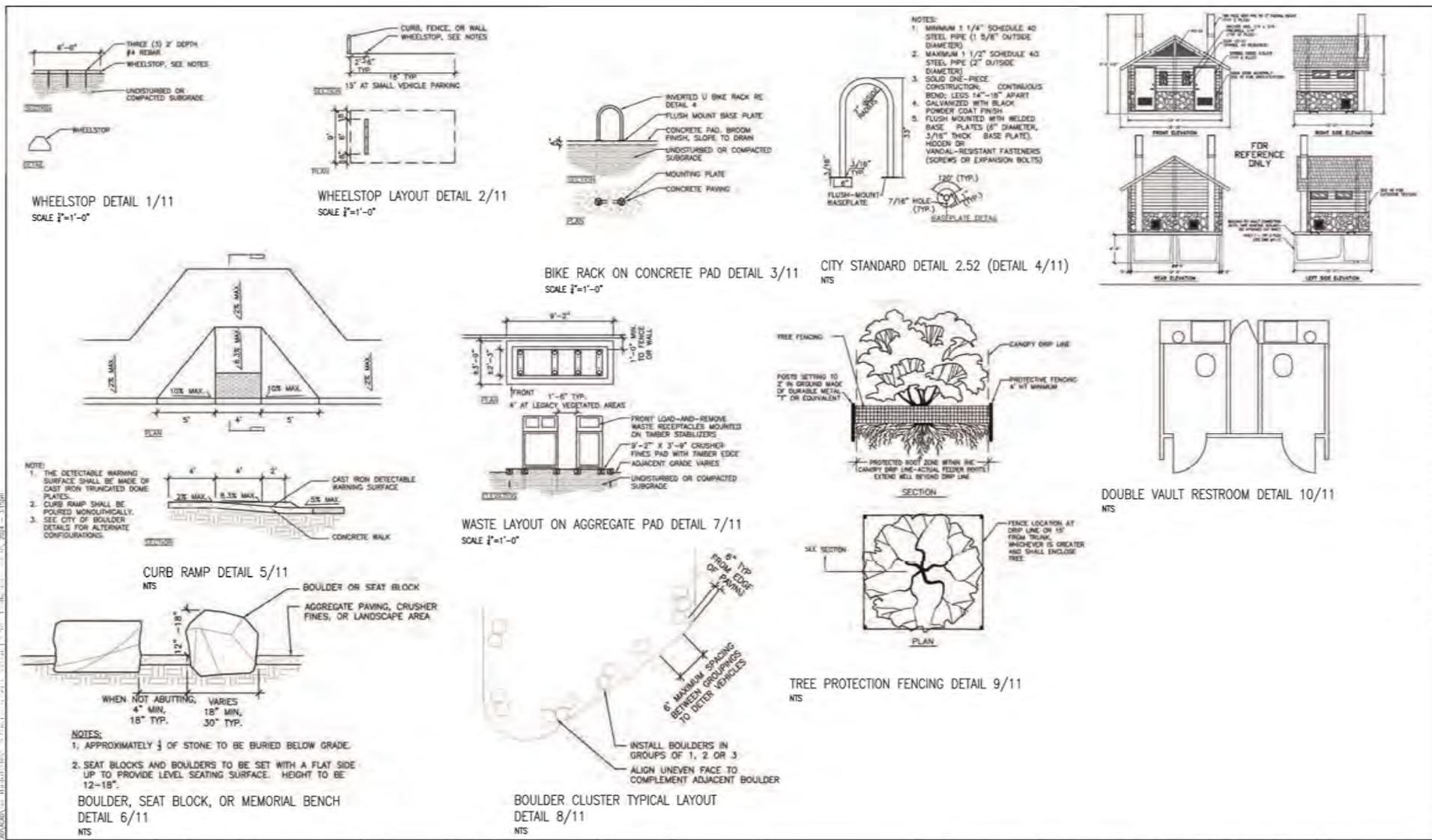
Project No./Code: 21662

Designer: T. Rohan
Detailer: R. Candell

Structure Numbers:
Subst Sheets: 1 of 3

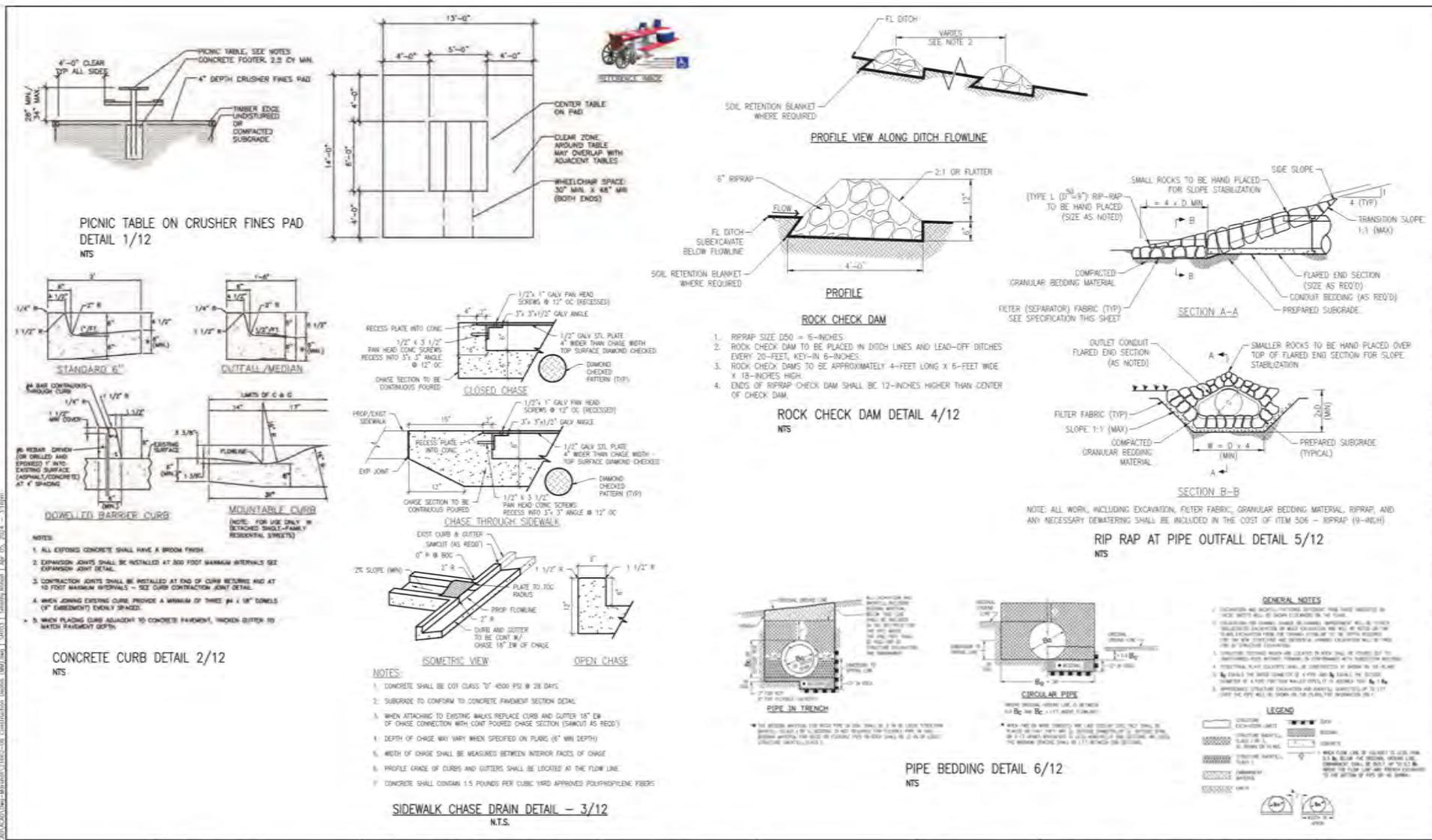
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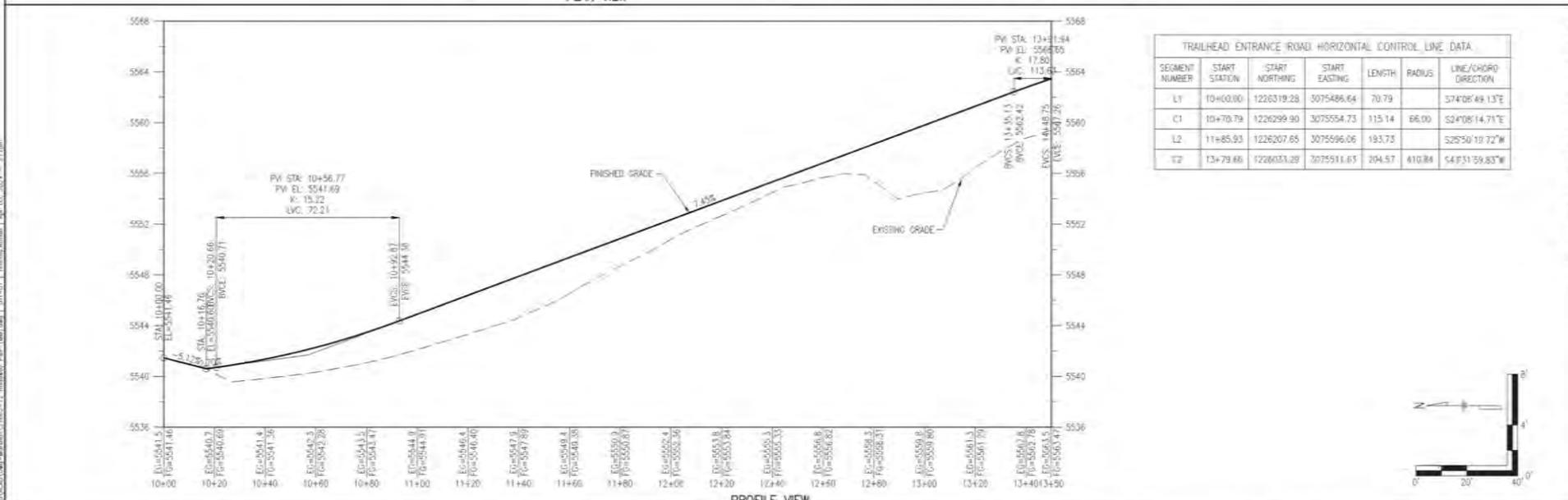
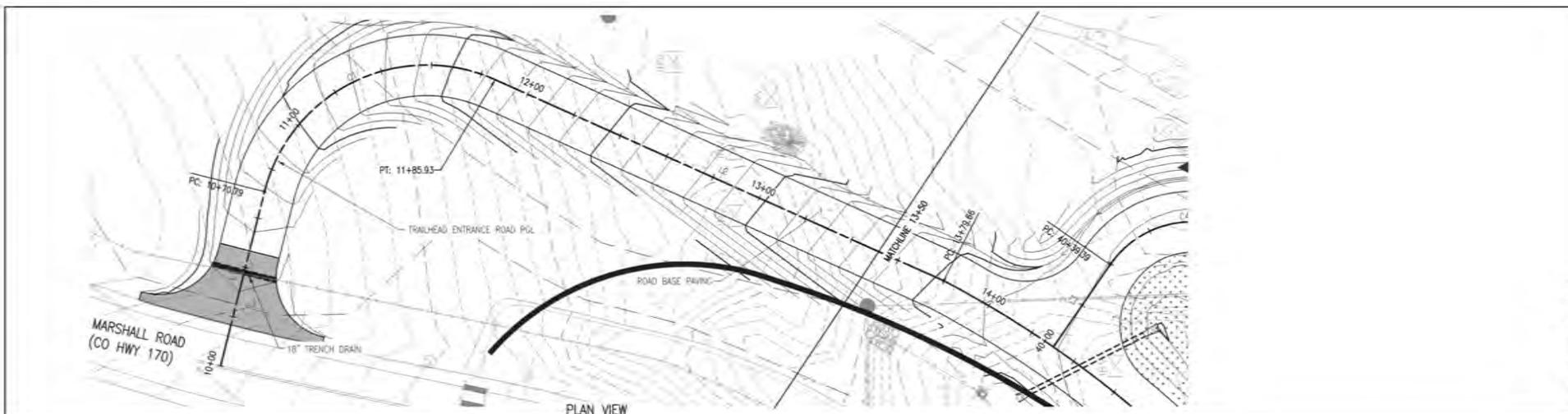
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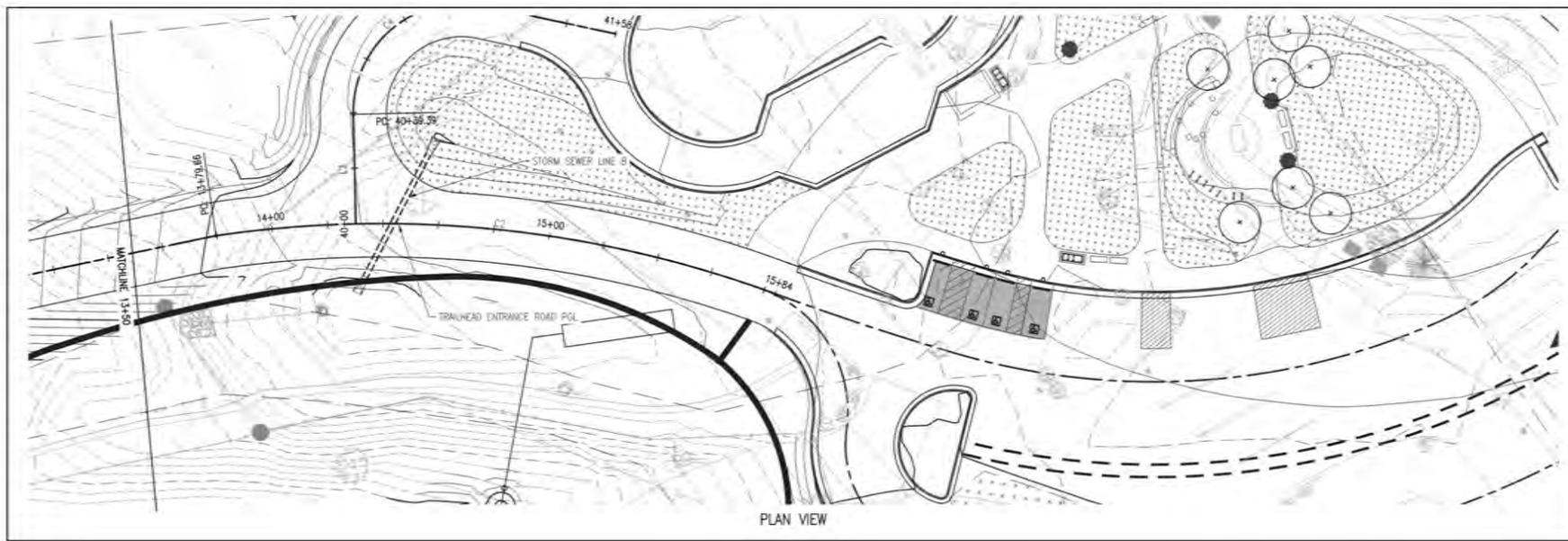
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C1	10+70.79	1226299.90	3075554.73	115.14	66.00	S2°08'14.71"E
L2	11+85.93	1226207.65	3075596.06	193.75		S25°50'10.72"W
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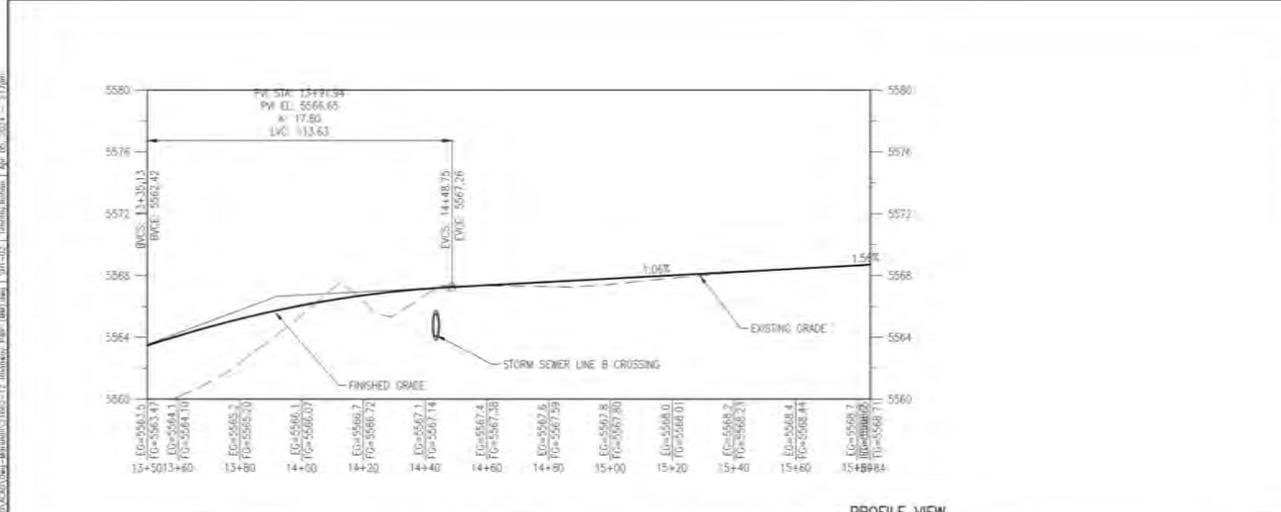
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PLAN VIEW



PROFILE VIEW

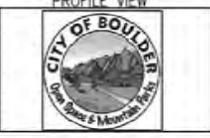
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L2	11+85.93	1226207.85	3075598.06	193.73		S25°50'19.72"W
C2	13+79.66	1226033.29	3075511.63	204.57	410.84	S43°31'59.83"W



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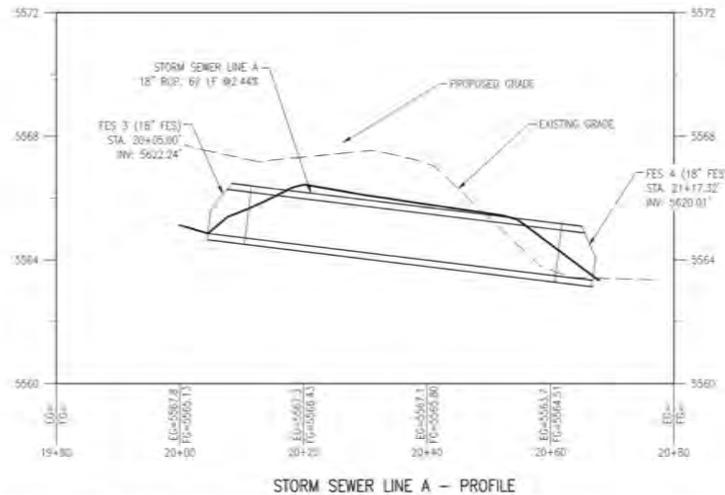
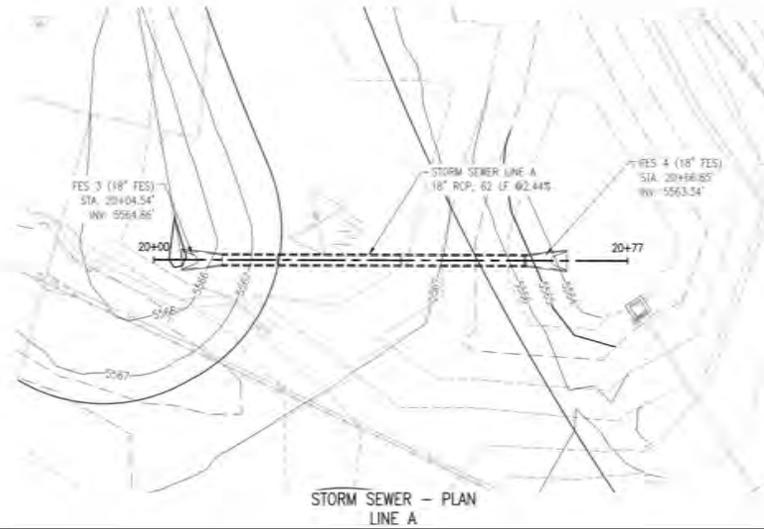
MARSHALL MESA TRAILHEAD RENOVATION ROADWAY PLAN AND PROFILE

Designer: T. Rohan
 Detailer: R. Condit

Structure Numbers:

Sheet Subset: P&P Subst Sheets: 2 of 3

Project No./Code	21662
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**MARSHALL MESA TRAILHEAD RENOVATION
STORM PLAN AND PROFILE**

Designer:	T. Rohan	Structure Numbers:	
Detailer:	R. Condel		
Sheet Subset:	P&P	Subst Sheets:	1 of 1

Project No./Code	21662
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11. NARRATIVES

Control Measure Matrixes During Construction:

- Control measure narratives have been included for the CDOT Standard Specifications and Standard Plan M-208 and M-216 along with any non-standard control measures approved during the design process. If a Non-Standard Control Measure not included in the SWMP is proposed and approved by the Engineer the SWMP Administrator for Construction shall do the following: Place an "X" in the column for non-standard and complete a Non-Standard Control Measure Specification and Narrative covering the what, when, where and why the control measure is being used that be added to the SWMP. The appropriate "X" shall also be added to the implementation phase(s).
- The SWMP Administrator for Construction shall place an "X" in the column In Use On Site when the control measure has been installed.
- A "B" in the Initial Activities Column indicates that the control measure shall be installed **before** construction activity starts. Locations and quantities will be discussed during the Environmental Pre-Construction Conference with the Regional Water Pollution Control Manager.

STRUCTURAL Control Measures that may be potentially used on the project for erosion and sediment control; practices may include, but are not limited to the following:

APPLICATION CONTROL MEASURE	NARRATIVE	M-208 STANDARD or "X" for NON-STANDARD	CONTROL MEASURE IMPLEMENTATION PHASE		
			IN USE ON SITE	INITIAL ACTIVITIES	INTERIM ACTIVITIES
PROTECTION OF EXISTING WETLANDS Fence (plastic) and erosion logs	Fence (plastic) shall be placed in combination with erosion logs to prevent encroachment of construction traffic and sediment into state waters prior to start of construction disturbances. Fence (plastic) shall be placed adjacent to the wetlands; erosion logs shall be placed between the plastic fence and disturbance area. Logs shall be placed to direct flows away from or filter water running into wetlands from disturbance areas.				
PROTECTION OF EXISTING TREES/LANDSCAPING Fence (plastic)	Fence (plastic) shall be used in areas indicated in the plans to prevent encroachment of construction traffic and sediment for the protection of sensitive habitat, mature trees and/or existing landscaping prior to start of construction disturbances.		X	X	X
CHECK DAM/DITCH CHECK Erosion log, silt berm, silt dike, rock check dam	Placed in ditches immediately upon completion of ditch grading to reduce velocity of runoff in ditch. For existing ditches, place prior to start of construction disturbances.	M-208		X	X
Storm Drain Inlet Protection In Paved Roadways (Type 1, 2 and 3 as shown on M-208-1, sheet 5 of 11)	Manufactured storm drain inlet protection placed prior to construction disturbances as detailed in M-208-1, to protect existing inlets or immediately upon completion of new inlets to prevent sediment from entering the inlet throughout construction.	M-208		B or X	X
Storm Drain Inlet Protection In Native Seed Areas (M-604 Standard Inlets Type C and D)	Erosion logs or aggregate bags placed around inlet grate to prevent sediment from entering inlet. Place prior to construction disturbances to protect existing inlets or immediately upon completion of new inlets.	M-208		B or X	
CULVERT INLET/OUTLET PROTECTION Erosion logs, aggregate bags	Placed at mouth of culvert inlets and over top of culvert of inlet and outlet where disturbance may be occurring adjacent to pipe to prevent sediment laden water from entering pipe or drainage. Place prior to the start of construction disturbances.	M-208		B or X	X
TYPE C, TYPE D AND TYPE 13 PROTECTION Erosion logs, aggregate bags, erosion bales	Placed around inlet grate or slope and ditch paving to prevent sediment from entering inlet. Place prior to the start of construction disturbances.	M-208		B or X	X
STOCKPILE PROTECTION Temporary berm, erosion logs, aggregate bags*	Placed within specified distance, in accordance with subsection 208.06, from toe to contain sediment around stockpile. *Aggregate bags are easily moved and replaced for access during the work day. Place prior to start of stockpiling, increase control as the stockpile increases size.	M-208			X
TOE OF FILL PROTECTION Erosion logs, temporary berm, silt fence, topsoil windrow*	Place prior to slope/embankment work to capture sediment and protect and delineate undisturbed areas. *Can be used to stockpile topsoil for salvage.	M-208		X	X
PERIMETER CONTROL Erosion logs, silt fence, temporary berm, topsoil windrow*	Placed prior to construction commencing to address potential run-on water from off site, and to divert around disturbed area. *Can be used to stockpile topsoil for salvage.	M-208		B or X	X
SLOPE CONTROL Silt fence, erosion logs	Placed on the contour of a slope to contain and slow down construction runoff. Place prior to the start of construction disturbances.	M-208		X	X
TEMPORARY SEDIMENT TRAP	Used to capture sediment laden runoff from disturbed areas < 5 acres during construction. Place prior to the start of construction disturbances. Outlets that withdraw water from or near the surface may be installed when discharging from basins and impoundments.	M-208		X	X
TEMPORARY SLOPE DRAIN OUTLET PROTECTION	Placed as a conduit or chute to drain runoff down slope and to prevent erosion of slope.	M-208			X
Riprap, or approved other CONCRETE WASHOUT In-ground or fabricated	Material placed as an energy dissipater to prevent erosion at outlet structure. Construction control, used for waste management of concrete and concrete equipment cleaning. Place prior to the start of concrete activities.	M-601-12 M-208			X X

Template Revised: 2.25.2022

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APPLICATION CONTROL MEASURE	NARRATIVE	M-208 STANDARD or "X" for NON-STANDARD	IN USE ON SITE	CONTROL MEASURE IMPLEMENTATION PHASE		
				INITIAL ACTIVITIES	INTERIM ACTIVITIES	PERMANENT STABILIZATION
VEHICLE TRACKING PAD	Source control, placed to prevent tracking of sediment from disturbed area to offsite surface. Place prior to the start of construction disturbances.	M-208		B or X	X	
Engineered SEDIMENT BASIN	Constructed early in the project, prior to storm sewer/ditches and in accordance with 208.05(p) to capture storm flow. Outlet structure and/or outfall shall be modified for temporary sediment control using an approved non-standard detail. Outlets that withdraw water from or near the surface shall be installed when discharging from basins and impoundments, unless infeasible.			X	X	
DEWATERING (Contractor is responsible for obtaining a permit from Colorado Department of Health and Environment.)	Shall be done in such a manner to prevent potential pollutants from entering state waters.			X	X	
TEMPORARY STREAM CROSSING	Constructed over stream or drainage to prevent discharge of pollutants from construction equipment into water.			X	X	
CLEAN WATER DIVERSION	Placed to divert clean surface or groundwater around the disturbance area to prevent it from mixing with construction runoff.			X	X	
OTHER						

Template Revised: 2.25.2022

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	Date:	Comments	Init															

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NON-STRUCTURAL Control Measures that may be potentially used on the project for erosion and sediment control practices may include, but are not limited to:

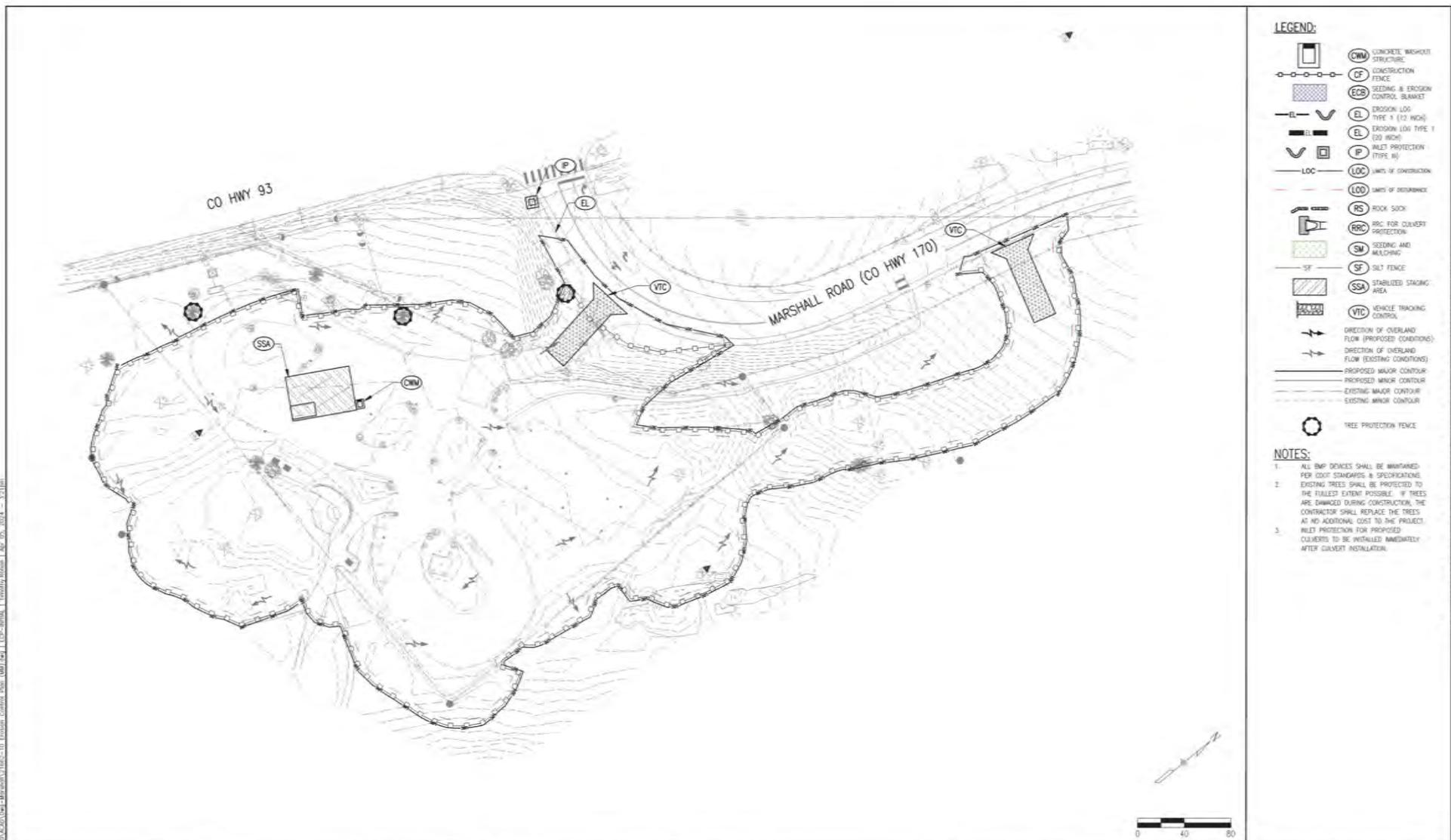
Erosion control devices are used to limit the amount of soil loss on site. Sediment control devices are designed to capture sediment on the project site. Construction controls are control measures related to construction access and staging. Control Measure locations are indicated on the SWMP Site Map.

* **Use of vegetative buffer strip requirements.** The CDPHE Water Quality Control Division Technical Memorandum dated August 27, 2015 clarifies the requirements for utilization of existing vegetation as a buffer type of sediment control measure, while maintaining compliance with the CDP's permit for Stormwater Discharges Associated with Construction Activity - CDFS Permit No. COR4000000. In general, the division does not recommend that vegetated buffers be implemented as a sediment removal control measure for runoff from disturbed areas of construction sites, unless implemented as a "finishing" component of a treatment train comprised of additional, adequate up-gradient Control Measures. The entire memorandum can be found at: <https://www.colorado.gov/pacific/sites/default/files/Vegetative%20Buffer%20Memo.pdf>

APPLICATION CONTROL MEASURE	NARRATIVE	M-STANDARD or "For NON-STANDARD	IN-USE ON SITE	CONTROL MEASURE IMPLEMENTATION PHASE		
				INITIAL ACTIVITY	INTERIM ACTIVITIES	PERMANENT STABILIZATION
* VEGETATIVE BUFFER STRIP	Finishing component for filtering sediment-laden runoff from disturbance area. Area within CDOT ROW or temporary easement to be identified on SWMP prior to construction starting.			X	X	X
GRADING APPLICATIONS (LANDFORM)	Existing or created landforms may be used as a control measure if they prevent sediment from entering or leaving the disturbance area. If a landform directs flow of water to a concentrated outfall point, the outfall point shall be protected to prevent erosion. Area to be identified on SWMP prior to construction starting.	M-208		X	X	
TOPSOIL MANAGEMENT STOCKPILE/SALVAGE Stockpile	Prior to any site disturbance work commencing, existing topsoil shall be scraped to a depth six inches or as specified, and placed in stockpiles or windrows. Upon completion of final grading, topsoil shall be evenly distributed over embankment to a depth of six inches or as specified.	M-208		X	X	X
SURFACE ROUGHENING / GRADING TECHNIQUES	Temporary stabilization of disturbance and to minimize wind and erosion.				X	
SEEDING (TEMPORARY)	Temporary stabilization used for over wintering of disturbance or used to control erosion for areas scheduled for future construction.				X	
BONDED FIBER MATRIX or MULCHING (HYDRAULIC)	Not to be used in areas of concentrated flows, i.e. ditch lines. To be for either Interim or Permanent Stabilization placed as a surface cover for erosion control. May be used as surface cover when work is temporarily halted and as approved by the Engineer for stockpiles.				X	
Straw or Hay MULCH/MULCH TACKIFIER	Interim or Permanent Stabilization placed as a surface cover for erosion control and or seeding establishment. To be installed as Interim Stabilization as a surface cover when work is temporarily halted and as approved by the Engineer.				X	X
SPRAY-ON MULCH BLANKET (Not to be used in areas of concentrated flows, i.e. ditch lines.)	Interim or Permanent Stabilization placed as a surface cover for erosion control and or seeding establishment. To be installed as temporary surface cover when work is temporarily halted and as approved by the Engineer.				X	X
SEEDING PERMANENT (NATIVE PERENNIAL)	Permanent Stabilization of disturbance and to reduce runoff and control erosion on disturbed areas.					X
SOIL RETENTION BLANKET (SRB)	Permanent Stabilization of disturbance and to reduce runoff and control erosion on disturbed areas.	M-216			X	X
TURF REINFORCEMENT MAT (TRM)	Permanent Stabilization of disturbance and to reduce runoff and control erosion on disturbed areas. Placed in channels or on slopes for erosion control, channel liner and seeding establishment.	M-216				X
Sweeping	Source control, used to remove sediment tracked onto paved surfaces and to prevent sediment from entering drainage system. Sweep daily and at the end of the construction shift as needed. Kick brooms shall not be permitted.			X	X	X
OTHER						

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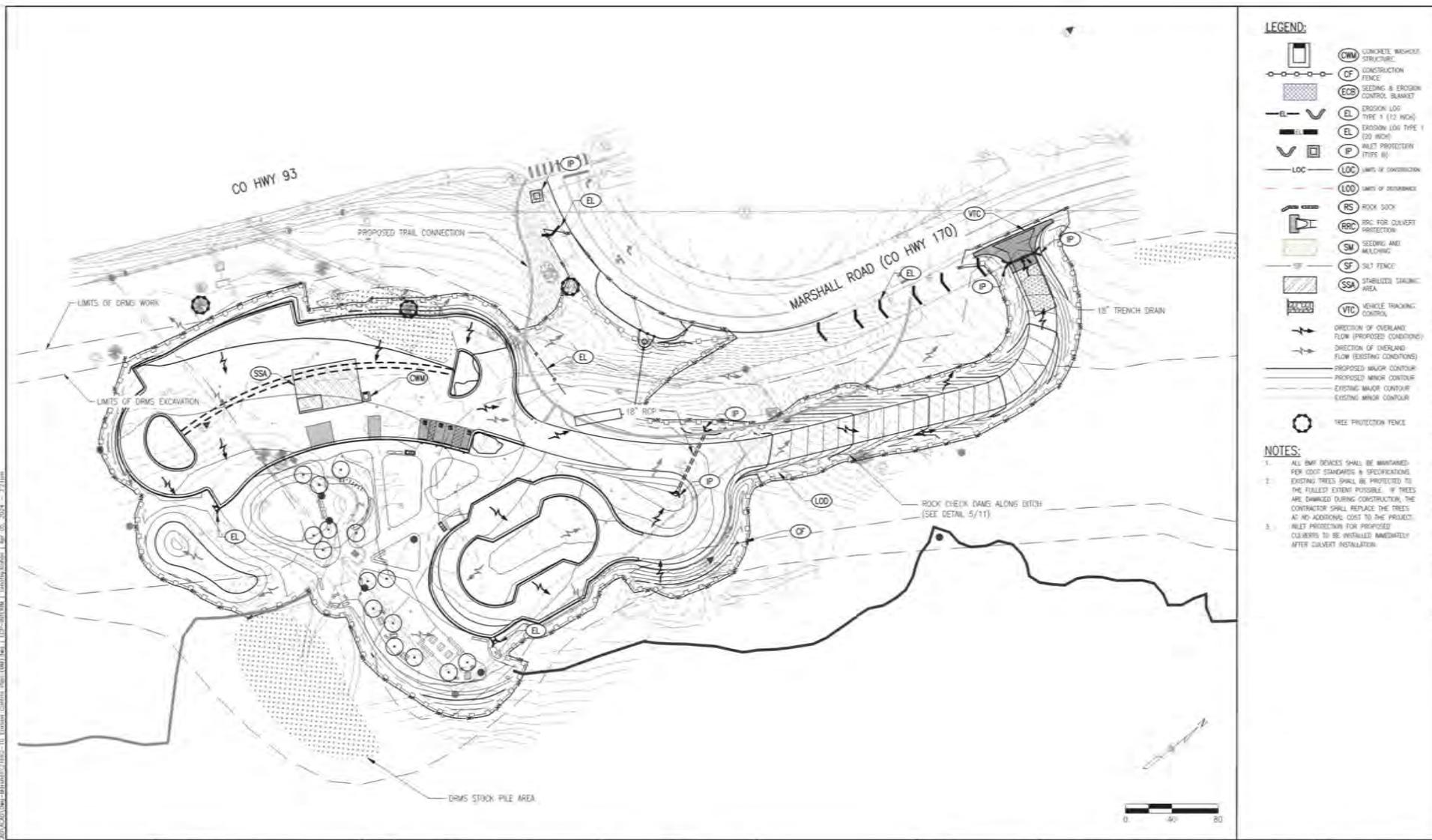
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	ECB SEEDING & EROSION CONTROL BLANKET
	EL EROSION LOG TYPE 1 (12 INCH)
	EL EROSION LOG TYPE 1 (20 INCH)
	P INLET PROTECTION (TYPE II)
	LOC LIMITS OF CONSTRUCTION
	LOD LIMITS OF DISTURBANCE
	RS ROCK SOCK
	BRC BRC FOR CULVERT PROTECTION
	SM SEEDING AND MULCHING
	SF SALT FENCE
	SSA STABILIZED STAGING AREA
	VTC VEHICLE TRACKING CONTROL
	DIRECTION OF OVERLAND FLOW (PROPOSED CONDITIONS)
	DIRECTION OF OVERLAND FLOW (EXISTING CONDITIONS)
	PROPOSED MAJOR CONTOUR
	PROPOSED MINOR CONTOUR
	EXISTING MAJOR CONTOUR
	EXISTING MINOR CONTOUR
	TREE PROTECTION FENCE

- NOTES:**
1. ALL BMP DEVICES SHALL BE MAINTAINED PER SDOT STANDARDS & SPECIFICATIONS. EXISTING TREES SHALL BE PROTECTED TO THE FULLEST EXTENT POSSIBLE. IF TREES ARE DAMAGED DURING CONSTRUCTION, THE CONTRACTOR SHALL REPLACE THE TREES AT NO ADDITIONAL COST TO THE PROJECT.
 2. INLET PROTECTION FOR PROPOSED CULVERTS TO BE INSTALLED IMMEDIATELY AFTER CULVERT INSTALLATION.

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- LEGEND:**
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 - ROCK SOCK (RS)
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 - SEEDING AND MULCHING (SM)
 - SILT FENCE (SF)
 - STABILIZED GRADING AREA (SSA)
 - VEHICLE TRACKING CONTROL (VTC)
 - DIRECTION OF OVERLAND FLOW (PROPOSED CONDITIONS)
 - DIRECTION OF OVERLAND FLOW (EXISTING CONDITIONS)
 - PROPOSED MAJOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - TREE PROTECTION FENCE
- NOTES:**
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 - MUD PROTECTION FOR PROPOSED CULVERTS TO BE INSTALLED IMMEDIATELY AFTER CULVERT INSTALLATION.

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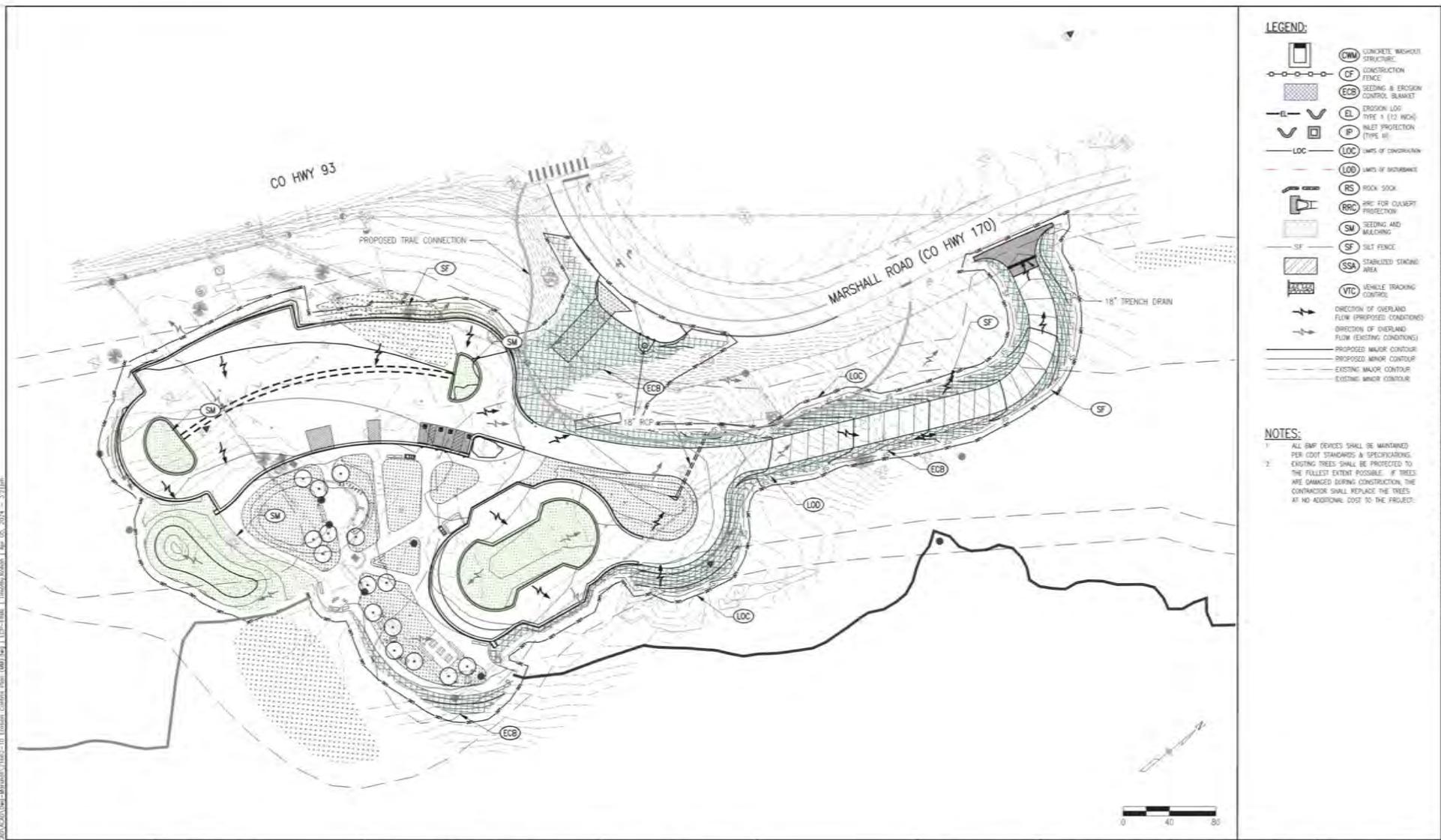
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- EROSION LOG TYPE 1 (12 INCH)
- INLET PROTECTION (TYPE II)
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Marshall Mesa Trailhead Redesign
City of Boulder Open Space and Mountain Parks
Appendix 2 – Marshall Mine Underground Coal Fire
Report of Investigations
April 8, 2024

Project Number: 117-8295005

Marshall Mine Underground Coal Fire Report of Investigations



Colorado Department of Natural Resources
Division of Reclamation, Mining, and Safety



September 15, 2023



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Acronyms/Abbreviations

Acronyms/Abbreviations	Definition
ags	above ground surface
AML	Abandoned Mine Lands
amsl	above mean sea level
AOI	Area of Interest
bgs	below ground surface
CO ₂	Carbon Dioxide
CO	Carbon monoxide
DRMS	Colorado Department of Natural Resources Division of Reclamation, Mining, and Safety
ft	feet
°F	Degrees Fahrenheit
GPS	Global Positioning System
Hwy	highway
H ₂ S	Hydrogen sulfide
LEL	Lower explosive limit
Preliminary Report	<i>Report of Preliminary Investigations Marshall Underground Coal Fire</i>
Site	Marshall Mesa Underground Coal Fire site
SOW	Scope of Work
UAV	Unmanned Aerial Vehicle or System

1. Introduction

This report presents the findings of Tetra Tech, Inc.'s (Tetra Tech) investigations of the Marshall Mesa Underground Coal Fire site (Site) evaluations of options for fire management and/or mitigation. The work completed on the site was authorized by the State of Colorado Department of Natural Resources Division of Reclamation, Mining, and Safety (DRMS).

On December 30, 2021, a destructive wildfire, called the Marshall Wildfire, started near State Highway 93 and Marshall Road (**Figure 1**) and burned eastward through the Site. Following the fire, DRMS requested that Tetra Tech complete a preliminary investigation of the conditions across the approximately 7.5-acre southern portion of the Marshall Mesa Underground Coal Fire site (Marshall Mesa South, **Figure 1**) which is located near the southwest corner of the Marshall Wildfire impacted area. The primary goal of the preliminary investigation was to quantify the extents of subsurface heat and/or fire in the southern area of interest (AOI), which included surface-feature temperature and combustion gas observations, unmanned aerial vehicle (UAV) based infrared thermal/visual scans, drilling investigation, and subsurface temperature monitoring. Initial site evaluation work began in January 2022, and the drilling and thermocouple installations were completed by the end of February 2022. Long-term coal seam temperature monitoring was initiated March 3, 2022. Results of the preliminary investigation were presented to the DRMS on March 16, 2022, in *Report of Preliminary Investigations Marshall Underground Coal Fire* (Preliminary Report). The Preliminary Report is provided in **Appendix A**.

Subsequently, from March 2022 to present, the investigation expanded to include both the southern AOI and the approximately 17.5-acre area north of the Site or northern AOI (Marshall Mesa North, **Figure 1**). The goal of this continuing investigation is to ascertain subsurface conditions and potential mine fire activity and includes Site-wide (both northern and southern AOI's) microgravity geophysical surveys, drilling and geologic investigation, monitoring well installation and hydrogeologic evaluation, and ongoing subsurface temperature monitoring. This report summarizes the findings of the preliminary and continuing investigations and recommendations for future fire monitoring and/or abatement activities.

1.1 Location and Site Characteristics

The Marshall underground coal mine fire site is located on the City of Boulder, Colorado (Marshall Mesa Trailhead Open Space) property located south of Boulder, immediately east State Highway 93 (Hwy 93) and south of State Highway 170 (**Figure 1**). The Site comprises undeveloped, open space land, owned and managed by the City of Boulder bounded by Hwy 93 to the west, Marshall Road to the north, Coal Seam trail to the east, Davidson Ditch to the south, the Marshall Mesa Trailhead (Trailhead) (**Photo 1, Appendix B**) located on the southwest corner of the northern AOI (**Figure 1**) and is the primary access location for the site.

The site sits at an elevation of approximately 5,500 feet above mean sea level (ft amsl) and is generally flat with some hummocky areas due to suspected subsidence features related to historic coal mines and mine fires. A sandstone outcrop cuts across the southern AOI at southwest to northeast trend, underlies most of the Trailhead parking lot (Marshall Mesa Trailhead, **Figure 1**) and continues as a prominent ridge that largely bisects the northern AOI along its major southwest to northeast axis. This sandstone outcrop forms a topographic high which is approximately 15 to 30 feet higher in elevation than in the adjacent lower lying areas to the northwest and southeast. Vegetation is mostly grass with some shrubs and trees. Although much of the site burned during the Marshall Wildfire, vegetation has regrown and currently covers most of the site.

1.2 Previous Site Visits/Assessments

There is an extensive history of underground fires, both in mines and outcrops, at Marshall Mesa documented through historical photographs, reports, and mine maps describing underground fires dated more than 100 years ago. As described in the 2018 Mine Fire Inventory report (Tetra Tech, 2019), the recent, 20-year, history highlights the dynamic, ever-changing conditions at mine fire sites. During a site visit in October 2003, it was reported that the fire was moderately active with ground temperatures ranging from 118°F to 130°F. The smell of coal combustion was noted near the venting fractures (Renner, 2005). These features were located in the northern portion of the Marshall Mesa site in a recently active subsidence feature.

In February 2005, a recently constructed building was inspected for damage caused by subsidence believed to be related to the Marshall Coal Mine. Vents and subsidence features were identified under and around the building (Amundson, 2005). The building was ultimately demolished after the property was acquired by the City of Boulder for construction of the Trailhead area.

On December 20, 2005, a brush fire was reportedly started by a 373°F vent in the northern portion of the Marshall Mesa site. The fire was quickly contained and extinguished. In January 2006, fire abatement was undertaken by the State of Colorado Office of Surface Mining to fill in vents with small rock material to reduce the potential of starting another surface fire. 275 tons of unwashed aggregate was placed over the vent area to a total depth of 18 inches (Blackburn, 2006).

In 2017, two areas of trough subsidence were excavated, compacted, and backfilled to natural grade. Both were in areas where surface expression of the mine fire had been observed (2017 Mitigation Area, [Figure 1](#)). During the subsidence mitigation work, a few small vents were uncovered in both locations. In all cases, the exhaust was warm, moist air with temperature less than 90°F. No new evidence of subsidence or other indicators of the coal mine fire were observed during the completion of the remedial activities. Gas monitoring during construction did not detect gases associated with coal combustion over the background levels.

The site was visited in the morning following a small, overnight, snowstorm in October 2018. No signs of venting, heat, odors, or snowmelt were observed (Tetra Tech, 2019).

1.3 Geologic Setting

Surface and bedrock units in the vicinity consist of late Cretaceous sedimentary rocks (Roberts, 2007). The most prominent and youngest unit in the area is the Laramie Formation, a set of brackish to freshwater deposits up to 800 feet thick. The upper Laramie Formation contains mainly clay and sandy shale, is highly variable laterally, and is easily eroded. Underlying the Laramie Formation in the area is the Fox Hills Sandstone which in turn is underlain by the Pierre Shale.

Most surface rocks across Marshall Mesa are the comparatively erosion-resistant shaly sandstones, comprised of primarily of quartzose and arkosic sandstone benches separated by clay, shale, or coal seams (Spencer, 1961) of the lower 80 to 125 feet of the Laramie Formation. A ubiquitous horizon of varnished, very durable ripple marks up to 1 inch deep at the top of the “C sandstone” member of the lower Laramie Formation outcrops northeast of the site near Marshall Road, providing a stratigraphic marker.

The site lies in the late Cretaceous Laramie Formation, west (on the footwall) of the east-dipping Fox Fault, which is the first major Laramide back thrust east of the Rocky Mountain Front Range ([Figure 2](#)). Units within the Site dip six to twelve degrees to the southeast (e.g., Trudgill, 2015). Between the Fox Fault and the Gorham Fault some 500 meters southeast, multiple anastomosing fault strands create an elliptical anticlinorium elongated to the northeast.

The lower Laramie Formation also contains most of the coal seams mined in the area, with most activity concentrated in the three- to eight-foot-thick No. 3 Seam within the lower 40 feet of the formation, some 20 to 40 feet below the C sandstone. The underlying Fox Hills Sandstone varies from 80 to 250 feet across the Marshall Mesa because of depositional variations, inter-tonguing with the underlying shales, and duplication by faults ([Figure 2](#)).

In addition to the main, mapped faults (Fox, Pine Ridge, Peerless, Pittsburgh, South Gorham, and West Fox; [Figure 2](#)), there are a series of smaller unmapped faults present, further complicating the site.

1.3.1 Stratigraphy

The lower Laramie Formation below the C sandstone comprises alternating sandstone and shale with notable coal seams. Several coal seams have been mined in the lower Laramie. At three to eight feet thick, the No. 3 coal seam is the thickest and most prominent. Near the site, this seam lies approximately ten feet below the top of the lower Laramie, underlying 17 feet of friable shaly and loose sandy material. This erodible unit is capped by up to ten feet of the “C” sandstone (Emmons, 1896) member, with its diagnostic oxide-varnished ripple-marked top and locally abundant oxidized concretions. Few members in this interval resist erosion, creating muddy flats with few outcrops. Erodible shales, sandstones, and some coal streaks in

the lowest portion of the Laramie manifest as low-relief areas between the C sandstone and the massive grey sandstone at the top of the Fox Hills, in the swath from the C sandstone ridge southeast of the site.

1.3.2 Mining and Mine Workings

Coal mining started in the area as early as 1859 and continued through the 1950s. **Figure 3** shows the approximate extents of various coal mines in the immediate vicinity around the Site. Historical maps identifying underground workings are only available for some of these mines, including the Marshall No. 3, Black Diamond, and Eldorado Mines. Others, including the Marshall No. 1 and No. 2, are known to exist to the north of the project areas, but mine maps have not been located for these mines. The No. 3 Mine map shows workings to the south and east of the Marshall Mesa Trailhead, stopping just to the east of the project area. Two adits or airways are shown to extend west across the southern portion of the site to the slope west of Hwy 93.

It should be noted that the accuracy of available mine maps has not been confirmed and may not reflect the final extents and configuration the mines. Mine working extents and locations should therefore be considered approximate.

2. 2022-2023 Site Investigations

Site investigations beginning in January 2022 are summarized in this section and include the preliminary surface and subsurface investigations from January through March 2022, previously reported in the Preliminary Report (**Appendix A**), a Site-wide site microgravity conducted from February through July 2022, and Site-wide site geotechnical and subsurface investigations occurring in March and April 2023, with site-wide monitoring continuing to the present.

2.1 Preliminary Site Surface Investigations

Preliminary site surface investigations, including a site reconnaissance, surficial fracture gas and temperature observations, site thermal, mapping, and snowmelt imagery, are summarized below, with details of the investigations provided in the Preliminary Report (**Appendix A**).

2.1.1 Site Reconnaissance

Initial data collection at the site included a reconnaissance of the southern area as well as the surrounding areas. The Marshall No. 3 Mine workings appear to show two adits extending under Hwy 93, potentially daylighting out of the slope to the west (**Figure 3**). This area was inspected January 7, 2022; no signs of mine openings, recent subsidence, vents, or intakes were observed.

2.1.2 Surficial Fracture Gas and Temperature Observations

Two rounds of gas and temperature readings were completed January 7, 2022 and January 14, 2022 at ten discrete locations within the southern AOI as shown on **Figure 4**. These locations were selected by DRMS to screen for potential connectivity between the surface and underground mine workings suspected to be present in the area. Details of the January 2022 gas and temperature investigation are provided in the Preliminary Report (**Appendix A**).

Tetra Tech performed temperature measurements and obtained gas readings at each location to screen for subsurface temperatures and combustion gases typically associated with oxidizing and/or burning coal. A FLIR Infrared (IR) thermometer, Trimble R2 GPS unit, and a Landtec GEM 5000 gas analyzer with the capability to measure Methane %, Carbon Dioxide % (CO₂), Oxygen % (O₂), hydrogen sulfide (H₂S), and carbon monoxide (CO) were used for the observations. **Photo 2, Appendix B** shows gas and temperature readings being taken.

The Trimble R2 GPS survey antenna was used to survey the ten observation locations (MV1-MV10) identified during the January 7, 2022, site activities. The IR thermometer was aimed at the deepest part of the fracture to take a reading representative of venting atmosphere/gas temperature. In most cases movement of air or gases in or out of the fractures was not apparent. The gas analyzer's silicone inlet tube was inserted as far in the hole as possible in the direction of

suspected air movement and the analyzer was turned on. The analyzer was run long enough (typically 1 to 2 minutes) to purge the suction line, for the gas reading to stabilize and to understand if there were short term fluctuations in gas concentrations. **Table 1** presents the gas concentration and temperature readings of each feature.

Tetra Tech noted slightly elevated temperatures and combustion gases at location MV-10 (**Figure 4**). The presence of CO without heat and CO₂ is typically associated with incomplete combustion or oxidation of subsurface coal. No other indications of mine fire activity were observed including odors, heat, venting gases, or intakes. Fracture temperatures at feature MV01 to MV09 were close to ambient (33°F) and no discernable airflow (intake or vent) was observed.

2.1.3 Site Imaging

Thermal Imaging

On January 8, 2022, Tetra Tech performed a UAV-based thermal inspection and mapping of the southern AOI within the Marshall Mesa Open Space. Details of the January 2022 UAV thermal inspection are in the Preliminary Report (**Appendix A**).

A flight was performed to develop a thermal overlay of the southern AOI to map potential thermal anomalies, or features with sharp contrast, hot or cold, with the surrounding area (**Figure 5**). The colors on **Figure 5** ranges from approximately 10-300°F with the darker blues and purples representing the cooler temps (~20°F) and the brighter orange colors representing the relatively warmer temps (25-30°F). The warm circles (~28°F), primarily on the southern portion of the figure, are conifer trees that trap and hold warmer air. The snowmelt area displayed only slightly elevated temperature (~1-2°F) above the surrounding area and was consistent with on the ground temperature observations. Low altitude video inspections were also performed to provide more detail of the fractures in question and actively search for thermal anomalies that may not be observed from higher altitude thermal mapping; no additional surface coal fire expression features were identified during the detailed imaging. Ground reconnaissance of the hot spot (53 to 300°F, **Figure 5**) features to the east of the Site revealed these were residual heat in vegetation burned during the Marshall Wildfire.

Site Mapping

On February 9, 2022, Tetra Tech completed a UAV-based visual photogrammetry flight of the property to develop baseline aerial imagery for the drilling program. The imagery was captured using a 45-megapixel survey-grade camera flown at approximately 200 feet above ground level. The map was georeferenced using eight ground control points, surveyed using a Trimble R2 GPS antenna with precision RTX.

Snowmelt Imagery

With multiple snowfall events occurring in Boulder during January, February, and March 2022, Tetra Tech was able to visit the southern AOI several times to observe snowmelt patterns. During these visits an area was observed that consistently had snowmelt before the surrounding areas despite similarities in aspect and surface material or other factors that could influence differential melting patterns other than subsurface heat. **Figure 6** provides a perspective image of the consistent snowmelt area during a snowstorm event. The consistent snowmelt area is outlined as typical snowmelt on **Figure 4**. Ground temperature observations with the handheld IR thermometer showed ground temperatures in the snow free areas were just above freezing at 34°F and only 1°F to 3°F warmer than background surface temperatures. No other areas of snowmelt were identified in the southern AOI. **Photos 3 to 10** in **Appendix B** provides additional photographs of snowmelt areas in the southern AOI. In addition, two suspected snowmelt areas were identified in the northern AOI during the snowmelt imaging (Additional Snowmelt Areas, **Figure 4**).

2.2 Microgravity Survey

A comprehensive microGal-precision relative gravity (“microgravity”) survey of the site was conducted from February through July 2022 with the primary goals of mapping the extent of the known subsurface disturbance in the central portion of the site (snowmelt area in **Figure 6**), determining whether that coal seam is continuous with potential voids and the coal interval near the suspected fire origin, and to provide additional details on subsidence features and a natural gas pipeline at

the southern end of the site. The scope was expanded to include the northern AOI with the additional goal to image any voids related to mine workings underlying the Marshall Site.

Data comprised 1760 measurements at 1288 unique locations. The entire Site was sampled at maximum 30-foot spacing. This geometry provides sensitivity to signals from 10 to 60 feet bgs, or approximately the entire coal-bearing stratigraphic interval of the lower Laramie between the surface and the top of the Fox Hills sandstone. Denser data, locally as fine as approximately 5-foot spacing, was acquired in the southern AOI to allow higher-resolution imaging near the suspected wildfire origin, around subsidence features, and surrounding the natural gas pipeline. The gravity data were processed to calculate the Complete Bouguer Anomaly, which was detrended to isolate the residual gravity anomaly.

The primary feature of the residual gravity field is a discontinuous set of north-northeast (NNE)-trending negative residual (low) gravity anomalies ([Figure 7](#)). The most prominent of these low anomalies overlies the known surface heat expression and snowmelt in the southern AOI ([Figure 4](#)), extending NNE through the Trailhead parking lot. Although some of this signal may arise from the sand and gravel fill used to level the lot, the anomaly extends beyond the parking lot, especially to the NNE and east. As illustrated on [Figure 7](#), the majority of boreholes drilled during 2022 and 2023 geotechnical investigations, which are detailed in [Section 2.3](#), were drilled within these low anomalies. In North AOI, several roughly circular low-gravity anomalies occur along a general NNE trend; these lows generally coincide with surface subsidence features. Narrow low-gravity anomalies emanate perpendicularly from several of these circular lows, trending east-southeast.

High-pass filtering of residual gravity anomaly data is used to amplify comparatively shallow signals and is especially useful to identify smaller-scale anomalies when seismic measurement density is relatively high. This was particularly true in the southern AOI. within the coal-bearing stratigraphic interval of the lower Laramie between the surface and the top of the Fox Hills sandstone. Small-scale low gravity anomalies identified in the southern AOI include but are not limited to: those likely due to NNE trending jointing within the sandstone, above the coal-bearing interval; those along the southwestern edge of the southern AOI (adjacent to S. Foothills Hwy, [Figure 7](#)) which coincide with subsidence features and are likely associated with entrances to the Marshall No. 3 Mine and infrastructure surrounding them; and finally, the underground pipeline near the southern end of the Site. Within the area of surface heat expression and snowmelt in the southern AOI, the prominent set of north-northeast (NNE)-trending negative residual anomalies converge with the small-scale anomalies, and several meter- to decameter-scale subsidence features superpose additional low-gravity signals on the signals from natural jointing.

Negative residual (low) gravity anomalies are an indication of a mass deficit in subsurface material relative nearby material; the cause of mass deficits include but are not limited to burning coal or previously burned-out coal interval, open mine workings or rubble zones, jointing in rock, or other lower density geologic materials.

2.3 Geotechnical and Subsurface Investigations

In 2022 and 2023, Tetra Tech performed several subsurface investigations of the Site, including geotechnical drilling, downhole gas monitoring, thermocouple deployment and downhole temperature measurements, monitoring well installation, hydrogeologic testing and evaluation, and a test pit geotechnical investigation.

2.3.1 Borehole Drilling Program

Geotechnical drilling, downhole gas monitoring, thermocouple deployment and downhole temperature measurements, and monitoring well installation were performed to characterize the subsurface conditions. [Photos 11 to 24](#) in [Appendix B](#) record select drilling investigation activities. [Table 2](#) summarizes the borehole data, and the boring logs are included as [Appendix C](#).

All drilling work was completed by Authentic Drilling based in Kiowa, Colorado using either a track mounted CME-55 or Acker Renegade drill rig. Boreholes were drilled using a track-mounted drill rig utilizing a 5.5-inch air-rotary tricone bit. If needed, an ODEX casing advance system was employed to advance through the overburden and into competent rock. This drilling method was effective in advancing through the fractured overburden and rubble zones where fluid-based drilling methods

would be ineffective due to fluid loss. Foam and water were pre-mixed and on standby in-case hot or burning conditions were encountered.

Drilling occurred in two phases. Phase 1 drilling work was performed from February 21, 2022, through February 25, 2022, as a part of the preliminary site investigation with nine boreholes (MM-01 through MM-09) completed within the southern AOI ([Figure 8](#)). The Phase 1 drilling was intended to quantify the extents of subsurface heat and/or fire in the southern AOI, with borehole locations positioned to examine the main snow melt area within the southern AOI. Details of the Phase 1 drilling are provided in in the Preliminary Report ([Appendix A](#)).

Phase 2 drilling work was performed from March 6, 2023, through April 5, 2023, with 67 boreholes (MM-10 through MM-76) completed within both the southern and northern AOIs ([Figure 8](#)). Geotechnical drilling was performed to characterize the site geology, evaluate the extents of the subsurface heat, and potentially identify the extents of mine workings in proximity to current surface expressions of the underground coal fire at the Site. Borehole locations for geotechnical drilling were selected based on the microgravity results (generally low gravity areas are associated with disturbed ground, i.e. rubble, void, ash, etc.), surface expression of the fire, and site geology; preliminary locations were revised as appropriate in light of drilling results.

Tetra Tech geologists logged the lithology encountered during drilling of each hole. Logged data includes depth, classifications, drilling rates, and observations/notes, as appropriate for the drilling methods. Borehole logs are included as [Appendix C](#). Throughout drilling, surface and downhole air monitoring was performed to test for the presence of mine gases hydrogen sulfide (H₂S), carbon monoxide (CO), and lower explosive limit (LEL), as well as oxygen (O₂) percentage using a 4-gas monitor. Light odors and/or venting were observed during drilling from seven open boreholes, and downhole borehole temperatures were also monitored from the surface with an IR thermometer for the presence of mine fire during drilling, and an elevated borehole temperature above 100°F was observed in only two boreholes (MM-21 and MM-74, each 103°F) at time of drilling. Borehole emissions data are summarized in Section 2.33 and provided in [Table 5](#). A downhole camera was used in select boreholes to confirm the lithology and nature of the fractured/void zones.

Monitoring wells were completed in five of the boreholes for evaluation of hydrogeologic conditions of the Site. Boreholes completed as monitoring wells are identified on [Figure 8](#), and well completion data is provided in [Table 3](#). A summary of well completion, well development activities, and Site hydrogeologic conditions is provided in Section 2.2.6.

In general, the stratigraphy at the Site comprises from top to bottom:

- 1) Hard sandstone and/or interbedded shale/sandstone at surface to between about 5 and 30ft bgs. In places the lower sandstone is altered to reddish tan clinker
- 2) Upper coal seam and/or rubble/void zones, from about 3 to 20 feet thick (Upper Coal Interval), likely the No. 3 coal seam; underlain by 5-to-10 feet of shale.
- 3) Coal, typically about 2-feet thick (2nd Coal Interval); underlain by underlain by 5-to-10 feet of shale.
- 4) Coal, typically about 2-feet thick (3rd Coal Interval); underlain by underlain by at least 30 feet of shale.

Three cross-section alignments, providing a graphical representation of the Site stratigraphy, are shown on [Figure 8](#); Section Line A-A' ([Figure 9](#)), which provides a northeast-trending transect along the northwestern length of the Site; Section Line B-B' ([Figure 10](#)), which provides a southeast-trending transect in the southern AOI; and Section Line C-C' ([Figure 11](#)), which provides a southeast-trending transect in the northern AOI.

The Upper Coal Interval (i.e. No. 3 coal Seam) is characterized throughout the Site by intact coal, as well as by evidence of mining and/or mine fire, including voids, rubble, adjacent ash/clinker, and or downhole heat. Evidence of mining activity and or mine fire appears to be limited to the Upper Coal Interval and is not noted in the lower two coal seams at the Site. At the Site the upper coal seam generally dips about 3 to 10 degrees to the east-southeast, in the southern AOI, the elevation of Upper Coal Interval lies between about 5,552 and 5,565 ft amsl (MM-05 to MM-15, [Figure 9](#)) and then drops in elevation both to the northeast (~5,528 ft amsl at MM-42, [Figure 9](#)) and southeast (~5,515 ft amsl at MM-50MW, [Figure 10](#)). [Figure 12](#) shows depth to the base of coal or rubble contours.

The condition of the Upper Coal Interval varies throughout the Site, and can be broadly categorized as :

- 1) Intact coal with no evidence of mining and/or underground coal fire;
- 2) actively burning or smoldering, as indicated by elevated subsurface temperatures measured by installed thermocouple monitoring (see Section 2.3.2) or venting observed during drilling;
- 3) burned out with clinker/baked zones, rubble, and/or voids; and
- 4) mined area, indicated as zone with rubble but no adjacent clinker or baked rock.

As shown on [Figure 13](#), these upper coal seam intervals occur in distinct zones spatially at the Site. In general, evidence of actively burning or smoldering coal in the upper coal interval is limited to two areas: one in the southern AOI and a second in the Trailhead parking lot area. At a third, smaller area approximately 300 feet northeast of the Trailhead parking lot, upper coal seam temperatures at 12 ft bgs in two boreholes (MM-31 and MM-57) are slightly elevated relative to that in surrounding boreholes and may also indicate some coal smoldering activity. These actively burning or smoldering upper coal intervals are sandwiched between an area to the northwest where the upper coal interval is intact and broad area to the southeast where the upper coal interval has burned out, with only clinker/baked zones, rubble, and/or voids remnants. In some boreholes to the southeast (i.e. MM-46, M-54, MM-55), rubble was encountered but there was no evidence of any clinker or baking, these rubble zones may be an artifact of mining activities. The Upper Coal Interval, or remnants thereof, was not encountered in the northeast corner of the northern AOI as the ground surface here is below the bottom elevation of the upper coal seam interval.

2.3.2 Thermocouple Installations

Type K thermocouples were installed in upper coal seam/rubble/clinker interval at 74 borehole locations within the upper coal seam/rubble/clinker interval. Additional thermocouples were installed in the 2nd coal seam in 5 of the 74 boreholes. The thermocouples were installed at or near the top of a coal seam/rubble/clinker interval by hanging the thermocouple wire in the open test hole and then grouting from the bottom of the test hole to just below the surface. Bentonite, cement, or bentonite-cement slurry grout was used for the bottom-up grouting. Thermocouple placement depths are provided in [Table 2](#) and are graphically shown in the borehole logs ([Appendix C](#)).

[Table 4](#) provides a summary of borehole temperature readings from thermocouples associated with the upper coal seam. Upper coal seam temperatures collected on May 23 and 24, 2023 were used to develop a downhole temperature contour map of the site as illustrated on [Figure 14](#). Across most of the Site borehole temperatures are relatively cool (less than 85°F). Higher temperatures (greater than 85°F), that indicate heat is being generated from coal beds, were encountered in the upper coal seam at only two locations at the Site ([Figure 14](#)): in the upper coal seam in borehole MM-22 immediately north of the Trailhead parking lot (21 ft bgs, max. 241°F) and towards the southern end of the AOI in MM-02 (15 ft bgs, max. 171°F). At a third area approximately 300 feet northeast of the Trailhead parking lot, upper coal seam temperatures at 12 ft bgs in two boreholes (MM-31 and MM-57) are slightly elevated relative to surrounding coal seam temperatures (81°F and 80°F, respectively) ([Figure 14](#)).

Temperature data is recorded continuously at 15 locations to evaluate long-term subsurface temperature conditions throughout the site. Data is recorded hourly using Lascar Electronics EL-USB-TC-LCD Thermocouple USB Data Loggers. Continuous temperature data from March 9, 2022, through May 24, 2023 is provided graphically in [Appendix D](#). Data logging began on March 9, 2022 at eight locations in the Southern AOI and began at the five other locations throughout the Site as data loggers were installed.

2.3.3 Borehole Emissions

During drilling, venting was observed and/or gas emissions detected from four open boreholes in the southern portion of the Site (MM-01, MM-02, MM-17, and MM-18) and three boreholes just north of the Marshall Mesa Trailhead Parking Lot (MM-21, MM-72, and MM-74, [Figure 8](#)). Emissions and venting from boreholes in or near areas of elevated borehole temperatures (see Section 2.2.3). No other venting was observed, nor emissions detected, throughout the remainder of the Site. Borehole emissions were measured using a 4-gas monitor and temperature measured with infrared gun; observations and data recorded is provided in [Table 5](#).

2.3.4 Test pits

Seven test pits were excavated at the site on April 12, 2023, and their locations are shown on **Figure 8**. Following inspection, each test pit was backfilled, and the area restored to original grade.

Test Pit #1

Located between test holes MM-02 and MM-11 and completed to a depth of 13.5 ft bgs (**Appendix A, Photo 25**).

- 0.0 to 1.0 ft – topsoil
- 1.0 to 12.5 - Sandstone, tan, dry, hard (R2)
- Traces of heat alteration at 10 ft bgs in the southern part of the test pit.
- 12.5 to 13.0 - Shale, dark brown, organic, dry, hard
- No elevated temperatures or coal combustion odors observed.

Test Pit #2

Located east of MM-18 and completed to a depth of 11.0 ft bgs

- 0.0 to 0.5 ft – topsoil
- 0.5 to 11.0- Fractured Sandstone, tan, dry, traces of shale at 11 ft.
- Refusal at 11.0 ft bgs.
- No elevated temperatures or coal combustion odors observed.

Test Pit #3

Located at the southern end of the previous excavation area, east of MM-01. Total depth 11.5 ft bgs. (**Appendix A, Photo 26**).

- 0.0 to 6.0 ft – Fill, with traces of trash, brown, dry, easy digging.
- 6.0 to 10.0 – Fractured Sandstone, tan, dry, same as Test Pit 2.
- 10.0 to 11.5 – Fractured Sandstone, hints of red, heat altered rock, traces of clinker and ash.
- Temperature 100 F at bottom of test pit. This test pit is immediately northeast of MM-02 which has a temperature of 171 F during the test pit excavation. The heat observed in Test Pit # is likely associated with the smoldering coal area just to the west.

Test Pit #4

Located between test holes MM-37 and MM-61 and completed to a depth of 11.0 ft bgs (**Appendix A, Photo 27**).

- 0.0 to 1.0 ft – topsoil
- 1.0 to 1.5 ft – coal waste
- 1.5 to 11.0 – Clinker, bright red heat altered sandstone, fractured, more intense heat alteration to the east.
- Refusal at 11.0. No heat or odors observed.

Test Pit #5

Located at the northeast corner of the “gravel piles” from previous OSM mitigation work, south of MM-39 (**Appendix A, Photo 28**).

- 0.0 to 0.5 ft – Gravel, loose, dry
- 0.5 to 8.5 – Fill, silty sand with chunks of sandstone, easy digging.
- 8.5 to 9.0 – Coal waste with chunks of clinker over organic shale, dark brown, wet, mine floor?
- 9.0 – Total depth.

Test Pit #6

Located west of Test Pit 5, between MM-40 and MM-35 (**Appendix A, Photo 29**).

- 0.0 to 0.5 ft – topsoil
- 0.5 to 1.5 – Coal waste.
- 1.5 to 2.0 - Shale, dark brown, organic, dry, hard
- 2.0 – Total depth.

Test Pit #7

Located between test holes MM-35 and MM-58 and completed to a depth of 13.5 ft bgs (**Appendix A, Photo 30**).

- 0.0 to 0.5 ft – topsoil/clinker, waste rock
- 0.5 to 1.5 – Coal waste, boney coal transition to organic shale.
- 1.5 to 5.0 - Shale, dark brown, organic, dry, hard
- 5.0 – Shale, grey, dry, hard. Total depth.

The findings from the test pits were consistent with the conditions encountered during the drilling. In the southern portion of the investigation area, Test Pits 1, 2, and 3 further constrained the boundary between the burned-out areas, actively burning areas, and unburned coal. In the northern portion of the site Test Pit 4 encountered extensively heat altered and fractured conditions with no remaining coal. Test Pits 5, 6, and 7 encountered the bottom of the coal seam (possibly mine floor) and underlying shale.

2.3.5 Groundwater

Monitoring wells were installed at the Site to evaluate groundwater flow direction as well as to estimate hydraulic conductivity (K) for the aquifer at the Site. Monitoring wells were installed during drilling at boreholes MM-11MW, MM-39MW, MM-50MW, MM-60MW, and MM-62MW (**Figure 8**). Monitoring well completion data is provided in **Table 3** and graphically in the borehole logs (**Appendix C**).

Well development was completed on April 24 and 25, 2023 at five of the wells, MM-11MW, MM-39MW, MM-50MW, MM-60MW, and MM-62MW. The well development was performed using a combination of bailing and purging to clear the screens and remove excess sediments from base of the wells. Development removed greater than three times the static water volume in each well and water chemistry was monitored to document changes in turbidity, temperature, pH, and conductivity as water from the surrounding aquifer began moving freely through the piezometer screens.

Aquifer testing followed the development by greater than 24 hours to determine the effective permeability of the surrounding rock. Slug tests were administered on April 26, 2023, on monitoring wells MM-11MW, MM-39MW, MM-50MW, MM-60MW, and MM-62MW. Slug tests were also administered on April 26, 2023, at three piezometers at the Lewis Mine Fire Site located directly north of the Site across Marshall Road (**Figure 1**). Slug test observations were evaluated using the Bouwer-Rice straight line method to obtain an estimated Hydraulic Conductivity (K) for the aquifer at the Marshall and Lewis Mine Fire Sites. Mean conductivity estimated from combined slug test data from both mine fire sites was 0.73, which is representative of weathered sandstone and siltstone. Groundwater flow potentially occurs through open bedrock fractures at the site, which would likely result in hydraulic conductivities values orders of magnitude higher than those observed during the slug tests. The extent to which the aquifer test results reflects the contribution of any fractured flow is unknown.

Static water levels were obtained from Site wells on April 24 and 25, 2023. Water level data is provided in **Table 3**. Groundwater flow is generally northeast across the Site, as shown in the potentiometric contours in **Figure 15**.

3. Summary of Findings

Subsurface investigation findings indicate heat (>85°F) is being generated from the upper coal bed interval at two areas at the Site: one north of and under to the Trailhead Parking Lot and near the southern end of the southern AOI (Figure 13), with maximum borehole temperatures of each area of 241°F and 171°F, respectively. These areas of elevated temperatures correlate with the spatial extent of observed snowmelt, delineating the extent of anomalous heat, and minor dispersed surface venting and borehole gas emissions that are commonly associated with coal oxidation and/or low intensity combustion. A third area of upper coal bed temperatures that are slightly elevated relative to surrounding coal seam temperatures occurs approximately 300 feet northeast of the Trailhead Parking Lot at boreholes MM-33 and MM-57 (81°F and 82°F, respectively) (Figure 14).

The primary feature of the residual gravity field is a discontinuous set of NNE-trending negative residual (low) gravity anomalies (Figure 7). The most prominent of these low anomalies occur in the area with surface and subsurface coal burning within the southern AOI and extends through burned-out/clinker through to the area with surface and subsurface coal burning in the Trailhead parking lot area (Figure 13). Although some of this signal may arise from the sand and gravel fill used to level the lot, the anomaly extends beyond the parking lot, especially to the NNE and southeast, coinciding with the upper coal seam burning/smoldering/ash zone. Towards the northeast half of the northern AOI, low residual gravity anomalies appear to be mostly associated with burned/rubble zone of the upper coal interval; several roughly circular low-gravity anomalies occur within this area, these appear to coincide largely with surface subsidence features.

Throughout the Site, hard sandstone and and/or interbedded shale/sandstone is found from surface to between about 5 and 30 ft bgs and is underlain by the Upper Coal Interval (i.e. No. 3 coal Seam) which is typically about 3 to 20 feet thick underlain by 5-to-10 feet of shale. Underlying this shale are two thinner (~2 feet thick) coal seams (2nd and 3rd Coal Intervals) separated by 5 to 10 feet of shale, with the stratigraphic units slightly dipping the east-southeast.

Evidence of underground mining is suspected from the rubble zones of three boreholes (MM-46, MM-54, and MM-55, Figure 13) located in the eastern to southeastern portions of the investigation areas; more commonly in boreholes throughout the Site the upper coal interval is characterized as burned-out with clinker/baked zones, rubble, and/or voids (Burned/Rubblized, Figure 13). Many of surface depressions found at the Site, especially in the northern AOI, are associated with these subsurface burned-out zones. Northwest of the burned-out zone the upper coal seam lies largely intact coal with no evidence of mining and/or mine fire. (Intact Coal, Figure 13).

Evidence of the actively burning or smoldering coal within the upper coal interval is mainly limited to two areas on the Site: one in the southern AOI and in the Trailhead parking lot area (Burning/Smoldering/Ash Zone, Figure 13). In the southern AOI, maximum upper coal seam temperatures were measured at 171°F (Figure 14). In the Trailhead parking lot area, elevated upper coal seam temperatures up to 241°F (MM-22) occur in the northeast parking area that is closed to the public. (Figure 14). Venting was observed and/or gas emissions detected in several boreholes with the in areas of elevated subsurface temperatures including MW-01, MW-02, MW-17, and MW-18 (Figure 8) in the southern AOI and in MW-21, MW-72, and MW-74 (Figure 8) in the parking lot area (Table 5). These areas with evidence of active, subsurface coal burning or smoldering also generally coincide with surface expressions of coal burning, including typical snowmelt areas (Figure 4). Evidence of snowmelt also occurs 300 feet northeast of the Trailhead parking lot (Figure 4), upper coal seam temperatures in this area are slightly elevated (up to 80°F) relative to that in surrounding boreholes (Figure 14) and may also indicate some smoldering coal activity.

The findings from the test pits were consistent with the conditions encountered during the drilling. In the southern portion of the investigation area, Test Pits 1, 2, and 3 further constrained the boundary between the burned-out areas, actively burning areas, and unburned coal. In the northern portion of the site Test Pit 4 encountered extensively heat altered and fractured conditions with no remaining coal. Test Pits 5, 6, and 7 encountered the bottom of the coal seam (possibly mine floor) and underlying shale.

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TABLES

Table 1. Preliminary Surficial Gas and Temperature Readings

Feature	Temperature °F	GEM 500 Readings-January 14, 2022				
		CH ₄	CO ₂	O ₂	H ₂ S	CO
		%	%	%	PPM	PPM
Ambient/Cal	33	0	0.1	20.9	0	0
MV1	33	0	0.1	20.9	0	0
MV2	35	0	0.5	20.7	0	0
MV3	36	0	0.8	20.4	0	0
MV4	36	0	0.1	20.9	0	0
MV5	35	0	0.3	21.0	0	0
MV6	32	0	0.1	21.3	0	0
MV7	32	0	0.1	21.4	0	0
MV8	30	0	0.1	21.4	0	0
MV9	28	0	0.1	21.0	0	0
MV10	40	0.1	12.9	8.5	0	218

NOTES:

CH₄ =Methane, CO₂ = Carbon Dioxide, O₂ = Oxygen, H₂S = hydrogen sulfide, CO carbon monoxide

Table 2. Borehole Data, Coal and Void Depths, and Thermocouple Placement Summary

Borehole ID	Date Drilled	Latitude	Longitude	Surface Elevation	Upper Coal/Void/ Rubble/ Clinker Interval		Total Depth	Water Level	Thermo-couple	Comments
					Top	Bottom				
					ft bgs					
MM-01	2/24/2022	39.952100	-105.232100	5573.458	13.5	23.5	33.5	--	17	warm venting, emissions
MM-02	2/21/2022	39.951710	-105.232460	5579.232	17	24	24	--	15	warm venting, emissions
MM-03	2/21/2022	39.951440	-105.232710	5580.938	12.5	26.5	32	--	21.5	
MM-04	2/22/2022	39.951170	-105.232910	5587.139	20	31	35	--	23	MW installed
MM-05	2/23/2022	39.950940	-105.233030	5594.915	29	39	50	--	--	MW installed
MM-06	2/24/2022	39.951860	-105.232500	5576.411	11	22	25	--	12	
MM-07	2/24/2022	39.952060	-105.232260	5573.983	11	21.5	25	--	12	
MM-08	2/24/2022	39.952070	-105.231970	5570.505	22	28	49	--	24	MW installed
MM-09	2/24/2022	39.952247	-105.232140	5571.752	10	20	54	--	12, 29	
MM-10	4/3/2023	39.951519	-105.232817	5579.724	5	17	39	--	12	
MM-11MW	4/3/2023	39.951728	-105.232668	5579.068	7	17.5	44	--	7	MW installed
MM-12	4/3/2023	39.951970	-105.232506	5574.409	6	13	50	--	7, 27	
MM-13	4/3/2023	39.952233	-105.232317	5570.013	5	7.5	30	--	6	
MM-14	3/30/2023	39.952437	-105.232184	5568.832	4	7	40	--	17	
MM-15	3/30/2023	39.952516	-105.231955	5570.046	5	13	40	--	14, 22	
MM-16	3/30/2023	39.952262	-105.232019	5572.474	11	22	45	--	11	

NOTES:
 Ft AMSL = Feet above mean sea level
 Ft bgs = feet below ground surface
 N/A = no thermocouple installed
 MW = Monitoring well
 -- indicates no data recorded

Table 2. Borehole Data, Coal and Void Depths, and Thermocouple Placement Summary (Continued)

Borehole ID	Date Drilled	Latitude	Longitude	Surface Elevation ft AMSL	Upper Coal/Void/ Rubble/Clinker Interval		Total Depth	Water Level Depth(s) ft bgs	Thermo- couple	Comments
					Top	Bottom				
					ft bgs					
MM-17	4/5/2023	39.951711	-105.232276	5577.92	7	25.5	35	--	15	warm venting, emissions
MM-18	4/5/2023	39.951574	-105.232509	5579.167	4	25	35	--	12	warm venting, emissions
MM-19	4/5/2023	39.952190	-105.231651	5567.848	11	28	35	--	15	
MM-20	3/21/2023	39.952413	-105.231483	5567.454	14.5	27	35	--	10	
MM-21	3/8/2023	39.953023	-105.230961	5569.948	17	20	40	--	25	warm venting, emissions
MM-22	3/7/2023	39.953052	-105.231040	5569.357	17	28	40	--	21	
MM-23	3/7/2023	39.953090	-105.230922	5568.996	21	27	40	--	22	
MM-24	3/6/2023	39.953126	-105.230792	5568.635	21	27	50	--	22	
MM-25	3/7/2023	39.953149	-105.230996	5568.406	13	27	50	--	17	
MM-26	3/6/2023	39.953185	-105.230856	5568.143	18	23	45	--	20	
MM-27	3/6/2023	39.953196	-105.230812	5568.012	21	31	60	--	22	
MM-28	3/7/2023	39.953253	-105.230858	5567.454	4	28	50	--	20	
MM-29	3/9/2023	39.953644	-105.230413	5560.63	7	17	39	--	17	
MM-30	3/8/2023	39.953752	-105.230546	5553.117	9	11	44	40.8	11	
MM-31	3/9/2023	39.953751	-105.230452	5555.217	12	15	39	38.4	13	
MM-32	3/29/2023	39.953960	-105.230184	5551.476	7	10	40	--	11	

NOTES:
 Ft AMSL = Feet above mean sea level
 Ft bgs = feet below ground surface
 N/A = no thermocouple installed
 MW = Monitoring well
 -- indicates no data recorded

Table 2. Borehole Data, Coal and Void Depths, and Thermocouple Placement Summary (Continued)

Borehole ID	Date Drilled	Latitude		Longitude		Surface Elevation ftAMSL	Upper Coal/Void/ Rubble/Clinker Interval		Total Depth	Water Level	Thermo- couple	Comments	
		NAD 1983					ft bgs	ft bgs					Depth(s)
MM-33	3/9/2023	39.953816	-105.230452			5555.479	5	12.5	40	39.4	13		
MM-34	3/13/2023	39.953802	-105.229818			5553.543	8	28	35	--	15		
MM-35	3/29/2023	39.954449	-105.229900			5541.175	10.5	12	30	--	17		
MM-36	3/13/2023	39.954182	-105.229078			5540.584	14.5	28	35	--	20		
MM-37	3/15/2023	39.954642	-105.229030			5547.671	6	28	34	--	17		
MM-38	3/13/2023	39.954310	-105.228513			5533.268	7	9	45	--	30		
MM-39MW	3/15/2023	39.954960	-105.229291			5547.539	11	14	79	--	12	MW installed	
MM-40	3/29/2023	39.955275	-105.229510			5528.314	N/A	N/A	50	--	20		
MM-41	3/29/2023	39.955515	-105.229240			5525.394	N/A	N/A	50	--	20		
MM-42	3/15/2023	39.955295	-105.228450			5542.651	12	26	34	--	16		
MM-43	3/15/2023	39.955071	-105.228070			5537.5	14.5	19.5	40	--	25		
MM-44	3/13/2023	39.954648	-105.227913			5527.592	N/A	N/A	40	--	30		
MM-45	4/5/2023	39.952744	-105.231467			5569.357	7	25	30	--	10		
MM-46	3/27/2023	39.953251	-105.229208			5538.189	35	47	50	--	33		
MM-47	3/22/2023	39.953394	-105.229853			5555.118	19.5	37	55	--	38		
MM-48	3/22/2023	39.953011	-105.230279			5563.025	11	15	55	--	40		

NOTES:

FtAMSL = Feet above mean sea level
 Ft bgs = feet below ground surface
 N/A = no thermocouple installed

MW = Monitoring well

-- indicates no data recorded

Table 2. Borehole Data, Coal and Void Depths, and Thermocouple Placement Summary (Continued)

Borehole ID	Date Drilled	Latitude	Longitude	Surface Elevation	Upper Coal/Void/ Rubble/Clinker Interval		Total Depth	Water Level	Thermo-couple	Comments
					Top	Bottom				
					ft bgs					
MM-49	3/24/2023	39.952585	-105.230029	5546.982	29.5	47	50	--	40	
MM-50MW	3/21/2023	39.951828	-105.230854	5554.528	19.5	47	80	--	N/A	MW installed
MM-51	3/17/2023	39.952634	-105.230966	5573.064	22	23.5	65	--	26, 42	
MM-52	3/20/2023	39.952168	-105.231196	5565.223	38.5	42	60	--	38	
MM-53	3/20/2023	39.952010	-105.231021	5563.386	24.5	41	45	--	26	
MM-54	3/20/2023	39.951695	-105.231721	5577.1	12	14.5	55	--	35	
MM-55	4/5/2023	39.951464	-105.232056	5582.644	13.5	14.5	55	--	25	
MM-56	3/7/2023	39.953037	-105.231142	5568.996	15	26	40	--	16	
MM-57	3/8/2023	39.953813	-105.230327	5556.135	17	18	50	48.2	12, 23, 29	
MM-58	3/9/2023	39.953886	-105.230294	5553.871	8	13	40	--	10	
MM-59	3/8/2023	39.953709	-105.230381	5557.579	20	21	44	43.5	20	
MM-60MW	3/13/2023	39.954506	-105.227576	5525.00	37.5	49.5	65	--	N/A	MW installed
MM-61	3/15/2023	39.954747	-105.229148	5548.294	7	24	29	--	12	
MM-62MW	3/30/2023	39.953148	-105.231167	5567.848	10.5	21.5	44.5	--	11	MW installed
MM-63	3/27/2023	39.952825	-105.230916	5569.488	16	22	44.5	--	26	
MM-64	3/22/2023	39.952882	-105.231517	5569.423	7	19	19.5	--	10	

NOTES:
 Ft AMSL = Feet above mean sea level
 Ft bgs = feet below ground surface
 N/A = no thermocouple installed
 MW = Monitoring well
 -- indicates no data recorded

Table 2. Borehole Data, Coal and Void Depths, and Thermocouple Placement Summary (Continued)

Borehole ID	Date Drilled	Latitude	Longitude	Surface Elevation	Upper Coal/Void/Rubble/ Clinker Interval		Total Depth	Water Level	Thermo-couple	Comments
					Top	Bottom				
					ft bgs					
MM-65	3/17/2023	39.952721	-105.231202	5569.783	10	33	44.5	--	14	
MM-66	3/28/2023	39.952664	-105.231683	5568.865	4	17	19.5	--	8	
MM-67	3/22/2023	39.952854	-105.231759	5570.112	4.5	7.5	34.5	--	22	
MM-68	3/23/2023	39.952626	-105.231873	5570.571	5	13.5	14.5	--	5	
MM-69	3/24/2023	39.952522	-105.231506	5564.895	12	24.5	29.5	--	14	
MM-70	3/23/2023	39.952979	-105.231452	5569.915	9	18	19.5	--	9	
MM-71	3/23/2023	39.952897	-105.231160	5569.652	9.5	30.5	34.5	--	20	
MM-72	3/23/2023	39.952954	-105.231030	5570.112	15	35	39.5	--	22	warm venting, emissions
MM-73	3/23/2023	39.953034	-105.231276	5569.357	10	22.5	24.5	--	10	
MM-74	3/23/2023	39.952993	-105.230754	5568.996	17	20	40	--	25	warm venting, emissions
MM-75	3/23/2023	39.953152	-105.230661	5568.57	21	27	50	--	22	
MM-76	3/23/2023	39.953345	-105.230774	5567.356	27	28	50	--	20	

NOTES:

Ft AMSL = Feet above mean sea level

Ft bgs = feet below ground surface

N/A= no thermocouple installed

MW = Monitoring well

-- indicates no data recorded

Table 3. Monitoring Well Completion Summary

Borehole ID	Total Depth (ft bgs)	Borehole Diameter (in)	Well Diameter (in)	Screen Interval (ft bgs)	Filter Pack Interval (ft bgs)	Depth to Water (ft TOC)	Groundwater Elevation (ft amsl)	Water Level Measurement Date
MM-11MW	44	5.5	2	13-43	13-43	33.30	5545.8	4/25/2023
MM-39MW	79	5.5	2	48-78	46-78	53.87	5493.7	4/24/2023
MM-50MW	79.5	5.5	2	49-79	47-79	46.12	5508.4	4/25/2023
MM-60MW	64.5	5.5	2	34-64	32-64	47.17	5477.8	4/25/2023
MM-62MW	44.5	5.5	2	14-44	12-44	37.16	5530.7	4/24/2023

NOTES:

Ft bgs = feet below ground surface

In. = inches

Ft TOC = feet below top of casing

Ft amsl = feet above mean sea level

Table 4. Upper Coal Seam Borehole Temperature Readings

Borehole	Thermocouple Depth (ft bgs)	Temperature Readings (° F)						
		3/23/2023	5/4/2023	5/5/2023	5/17/2023	5/23/2023	5/24/2023	5/26/2023
MM-01	7	104	--	--	--	--	--	--
MM-02	15	174	--	--	--	171	--	--
MM-03	21.5	60	--	--	--	60	--	--
MM-04	23	59	--	--	--	--	64	--
MM-05	27	56	--	--	--	--	58	--
MM-06	12	--	--	--	--	86	--	--
MM-07	12	59	--	--	--	63	--	--
MM-08	24	67	--	--	--	--	--	68
MM-09	12	59	--	--	--	75	--	67
MM-10	12	--	--	65	--	55	--	--
MM-12	7	--	--	52	56	55	--	--
MM-13	6	--	--	57	59	60	--	--
MM-14	17	--	--	61	65	60	--	--
MM-15	14	--	--	60	66	63	--	--
MM-16	11	--	--	--	--	81	--	--
MM-17	15	--	79	87	90	86	--	--
MM-18	12	--	90	90	91	91	--	--
MM-19	15	--	--	--	--	56	--	--
MM-20	10	--	--	--	--	53	--	--
MM-21	25	110	--	112	110	110	--	--
MM-22	21	216	--	--	--	241	--	--
MM-23	22	107	--	--	112	112	--	--
MM-24	22	82	--	--	82	88	--	--
MM-25	17	81	--	--	87	88	--	--
MM-26	20	97	--	--	--	78	--	--
MM-27	22	66	--	--	--	77	--	--
MM-28	20	65	--	--	--	67	--	--
MM-29	17	66	62	--	--	--	--	--
MM-30	11	68	66	--	64	--	61	--
MM-31	13	67	66	--	68	--	64	--
MM-32	11	NA	66	--	68	--	65	--
MM-33	13	91	88	--	73	--	81	--
MM-34	15	49	53	--	58	--	59	--
MM-35	17	--	53	--	65	--	59	--

Note: -- indicates no data recorded

Table 4. Upper Coal Seam Borehole Temperature Readings (Continued)

Borehole	Thermocouple Depth (ft bgs)	Temperature Readings (° F)						
		3/23/2023	5/4/2023	5/5/2023	5/17/2023	5/23/2023	5/24/2023	5/26/2023
MM-36	20	53	58	--	68	--	66	--
MM-37	17	54	53	--	63	--	54	--
MM-38	30	57	58	--	72	--	67	--
MM-39	12	50	--	--	60	--	55	--
MM-40	20	--	--	--	--	--	54	--
MM-41	20	--	--	--	--	--	55	--
MM-42	16	53	53	--	--	--	61	--
MM-43	25	54	58	--	--	--	64	--
MM-44	30	56	61	--	--	--	68	--
MM-45	10	--	--	51	57	--	--	--
MM-46	33	--	60	--	--	--	71	--
MM-47	38	--	61	--	--	--	--	--
MM-48	40	--	61	--	--	--	69	--
MM-49	40	--	57	--	--	--	65	--
MM-51	26	54	--	--	--	55	84	--
MM-52	38	--	--	--	N/A	65	--	--
MM-53	26	--	--	--	N/A	67	--	--
MM-54	35	--	--	51	75	51	--	--
MM-55	25	--	--	--	N/A	59	--	--
MM-56	16	97	--	--	106	101	--	--
MM-57	12	84	86	--	78	76	80	--
MM-58	10	80	74	--	72	70	--	--
MM-59	20	71	71	--	69	65	67	--
MM-61	12	54	56	--	--	--	54	--
MM-62	11	44	--	--	--	--	--	--
MM-63	26	62	--	--	82	81	--	83
MM-64	10	73	--	55	58	56	--	--
MM-65	14	49	--	68	--	65	--	65
MM-66	8	59	--	51	56	60	--	--
MM-67	22	52	--	57	--	59	--	--
MM-68	5	--	--	53	58	60	--	--
MM-69	14	--	56	--	61	55	--	--
MM-70	9	--	--	50	56	50	--	--

Note: -- indicates no data recorded

Table 4. Upper Coal Seam Borehole Temperature Readings (Continued)

Borehole	Thermocouple Depth (ft bgs)	Temperature Readings (° F)						
		3/23/2023	5/4/2023	5/5/2023	5/17/2023	5/23/2023	5/24/2023	5/26/2023
MM-71	20	--	--	72	77	75	--	--
MM-72	22	--	--	81	--	71	--	--
MM-73	10	--	--	60	66	64		--
MM-74	25	--	65	--	58	64	63	--
MM-75	22	--	60	--	63		59	--
MM-76	20	--	57	--	65	66	57	--

NOTES: -- indicates no data recorded

Table 5. Borehole Emissions Data

Feature	Date	LEL	O ₂	H ₂ S	CO	Comments
		%	%	PPM	PPM	
MM-01	2/24/2022	--	--	--	1700	warm venting
MM-02	2/21/2022	--	18.8	--	53	89°F venting
MM-17	4/5/2023	--	--	--	--	warm venting
MM-18	4/5/2023	--	--	2.2	450	warm venting
MM-21	3/8/2023	--	--	5.3	300	103°F venting
MM-72	3/3/2023	--	--	--	--	Light venting, musty odor, low O ₂ , trace H ₂ S
MM-74	3/23/23	--	--	5.3	300	103°F venting

Notes:

-- indicates no data recorded

LEL= Lower Explosive Limit, O₂ = Oxygen, H₂S = hydrogen sulfide, CO carbon monoxide

FIGURES

\\t:\local\gis\USVolume4\Legacy\Yr134\11ECA\GEO\SUPVOL\1\PROJECTS\DATA\CO_DRMS_Mine_Fires\100-Sites\118--Marshall3-GIS\ROI_1-Marshall_Mesa_Site_Location_v2.mxd July 2023: christina.coulter



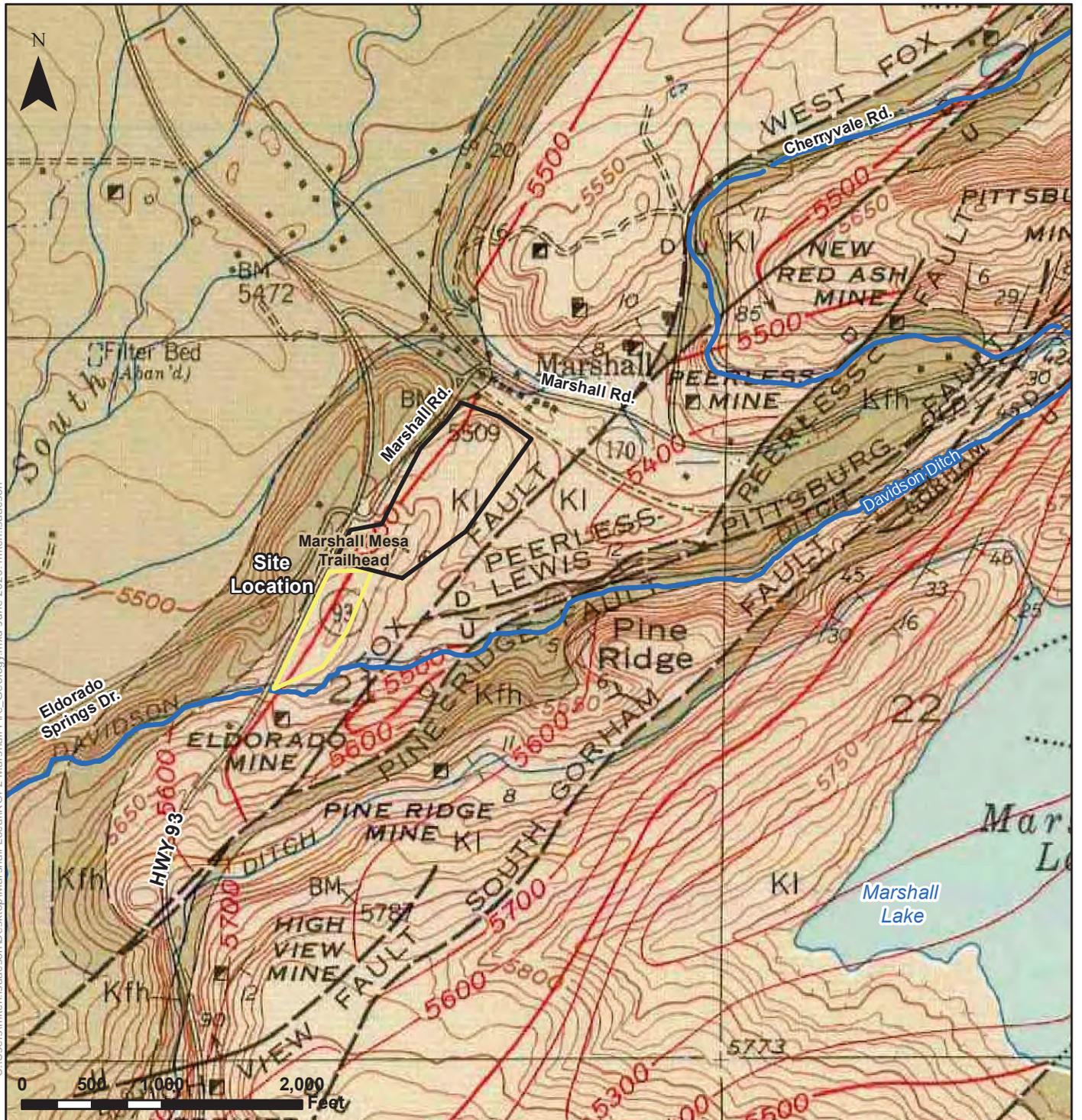
Legend

- Northern AOI
- Southern AOI
- Marshall Wildfire Impacted Area
- 2017 Mitigation Area



Notes:
 - Coordinate System: NAD 1983 UTM Zone 13N
 - Projection: Transverse Mercator North American 1983
 - World Imagery Basemap from ESRI, June 15, 2021

TITLE: Underground Coal Fire Investigation Site Location Map			
LOCATION: Marshall Mesa, Boulder County, Colorado			
	APPROVED	JN	FIGURE 1
	DRAFTED	MRI, CEC	
	PROJECT#	114-910499	
	DATE	03/16/2022	

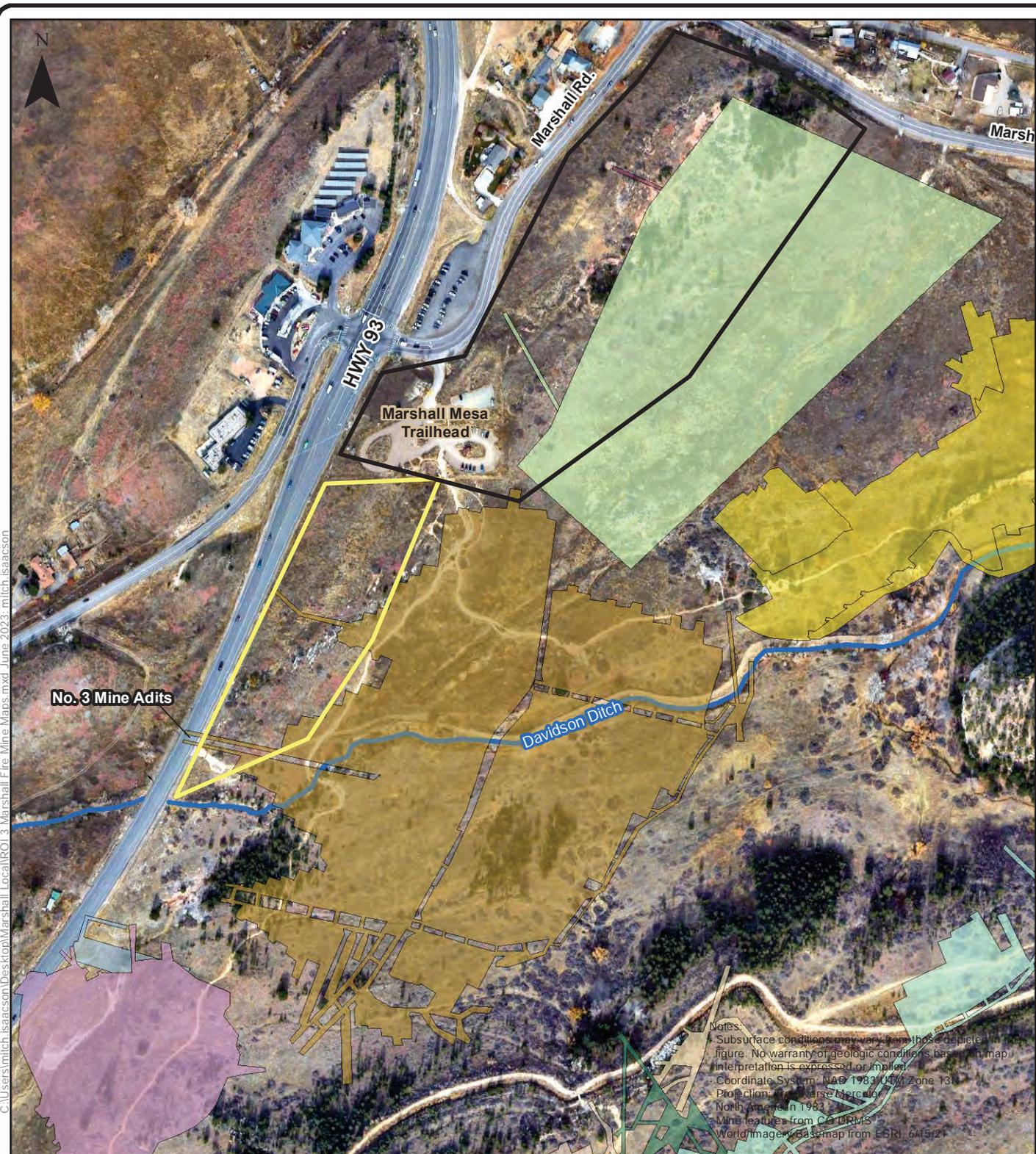


Legend

- Northern AOI
- Southern AOI
- KI Laramie formation
- Kfh Fox Hills Sandstone
- Kp Pierre shale
- $\angle 60$ Strike and dip of beds
- $\angle 64$ Strike and dip of overturned beds
- Mine Shaft
- Sand, gravel, or clay pit
- Structure contour (top of the Fox Hills Sandstone) Contour Interval 100 ft
- Contact (dashed where approx., dotted where concealed)
- High-angle fault, showing dip (dashed where approx, dotted where concealed. U, upthrown side; D, downthrown side)
- Doubtful or probable fault

Note:
 Geologic Map from: Spencer, F. D., 1961, Bedrock geology of the Louisville quadrangle, Colorado, USGS Publications Warehouse, 10.3133/gq151, <https://pubs.er.usgs.gov/publication/gq151>

Underground Coal Fire Investigation Geologic Map		
LOCATION: Marshall Mesa, Boulder County, Colorado		
 	APPROVED: JN DRAFTED: CEC MRI PROJECT#: 117-8295005 DATE: 06/28/2023	FIGURE 2



Notes:
 Subsurface conditions may vary from those depicted in figure. No warranty of geologic conditions has been made. Interpretation is expressed or implied.
 Coordinate System: NAD 1983 UTM Zone 13N
 Projection: Transverse Mercator
 North American 1983
 Mine features from CO DRMS
 World Imagery Basemap from ESRI, 6/15/21

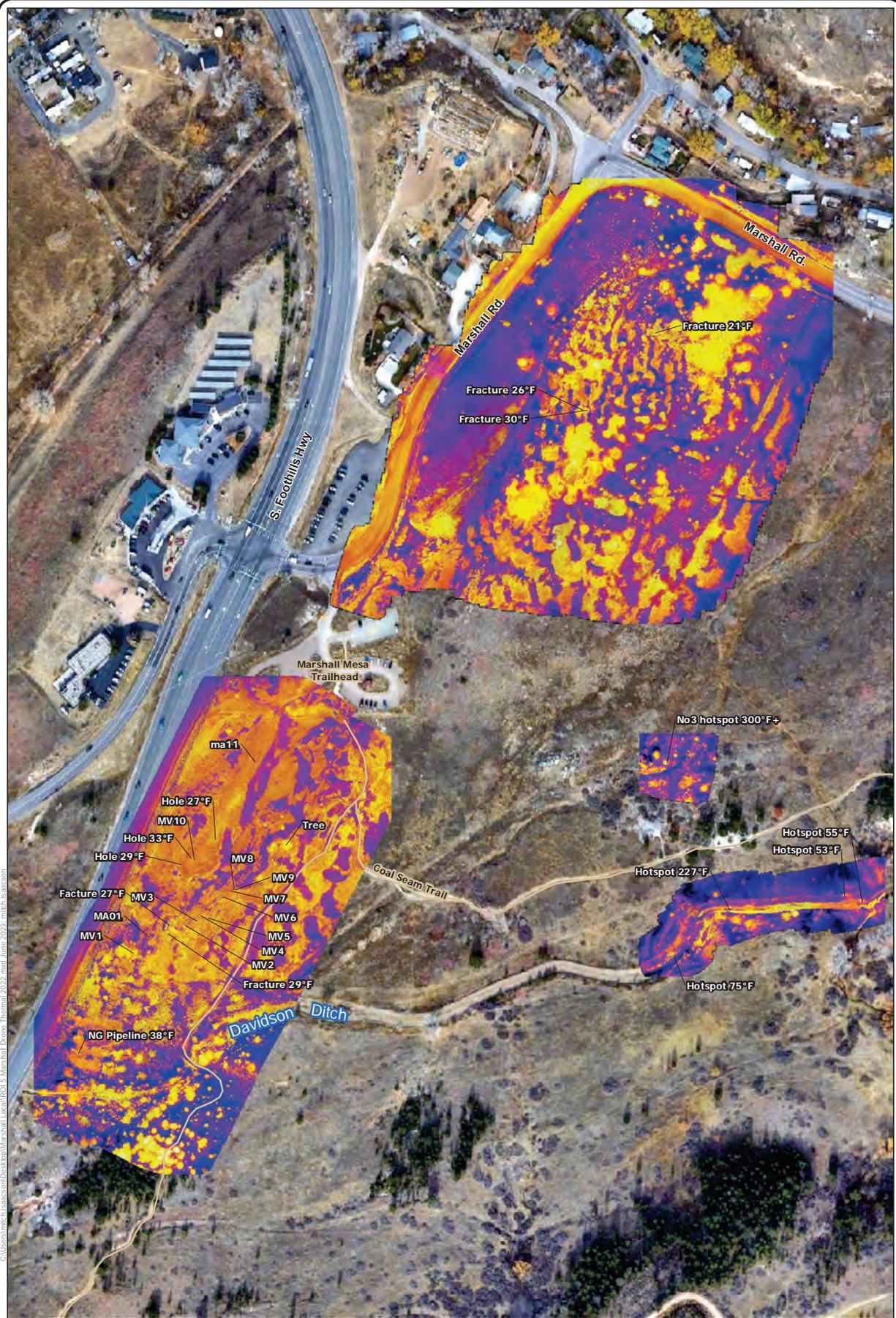
Legend

- Northern AOI
- Southern AOI
- Marshall Mine Workings (CO DRMS)**
- Big Tom Mine
- Lewis No 1 and No 2
- Marshall No 7
- Black Diamond
- Marshall No 1
- Pine Cliff 1940
- Eldorado 1939
- Marshall No 3
- Kitchen Slope
- Marshall No 5



TITLE: Underground Coal Mine Fire Investigation Historic Mine Workings		
LOCATION: Marshall Mesa, Boulder County, Colorado		
APPROVED	JN	FIGURE 3
DRAFTED	CEC, MRI	
PROJECT#	117-8295005	
DATE	06/29/2023	

C:\Users\mitch.isaacson\Desktop\Marshall Fire Mine Maps.mxd June 2023 - mitch.isaacson



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0 50 100 200 Feet

Notes:
 - Aerial Imagery: July 2022 T1 UAV Imagery
 - Coordinate System: NAD 1983 2011 UTM Zone 13N
 - Projection: Transverse Mercator NAD 1983 2011
 - Source: 30m resolution site features from CO DRMS

TITLE: Underground Coal Mine Fire Investigation January 2022 UAV Thermal Imagery		FIGURE
LOCATION: Marshall Mesa, Boulder County, Colorado		5
	APPROVED: JN	
	DRAFTED: MRI	
	PROJECT#: 117-8295005	
	DATE: 6/29/2023	



F:\CO DRMS Mine Fresh\100-Sites\118 - Marshall\3 - Snowmelt Image.mxd March 2022: christina.coulter

Notes:

- View to the northwest
- Photo taken by Tetra Tech on 3/10/2022

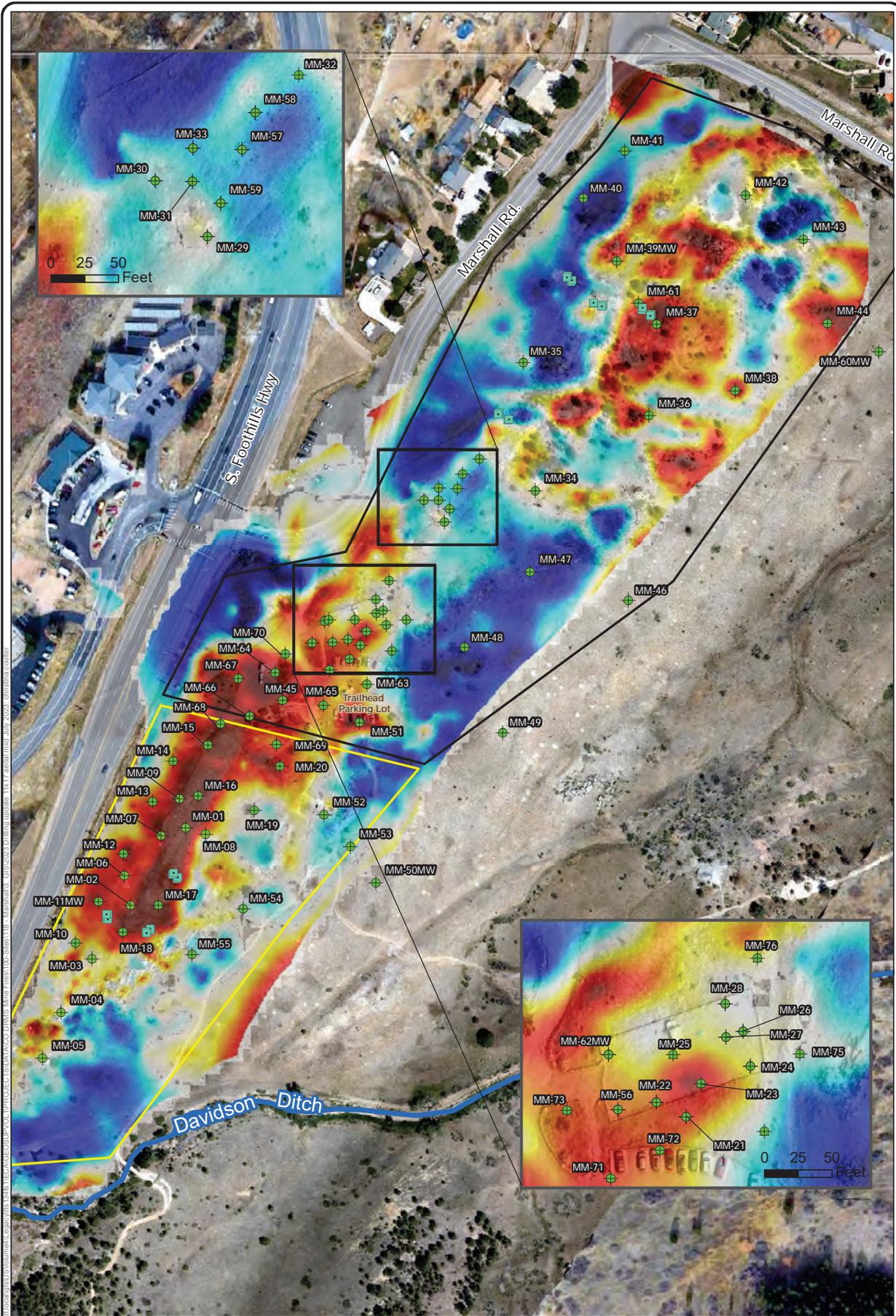
TITLE: **Underground Coal Mine Fire Investigation
Aerial Imagery of Snowmelt from
March 10, 2022**

LOCATION: Marshall Mesa, Boulder County, Colorado

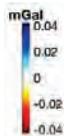


APPROVED	JIN
DRAFTED	CEC MRI
PROJECT#	117-8296005
DATE	06/27/2023

FIGURE
6

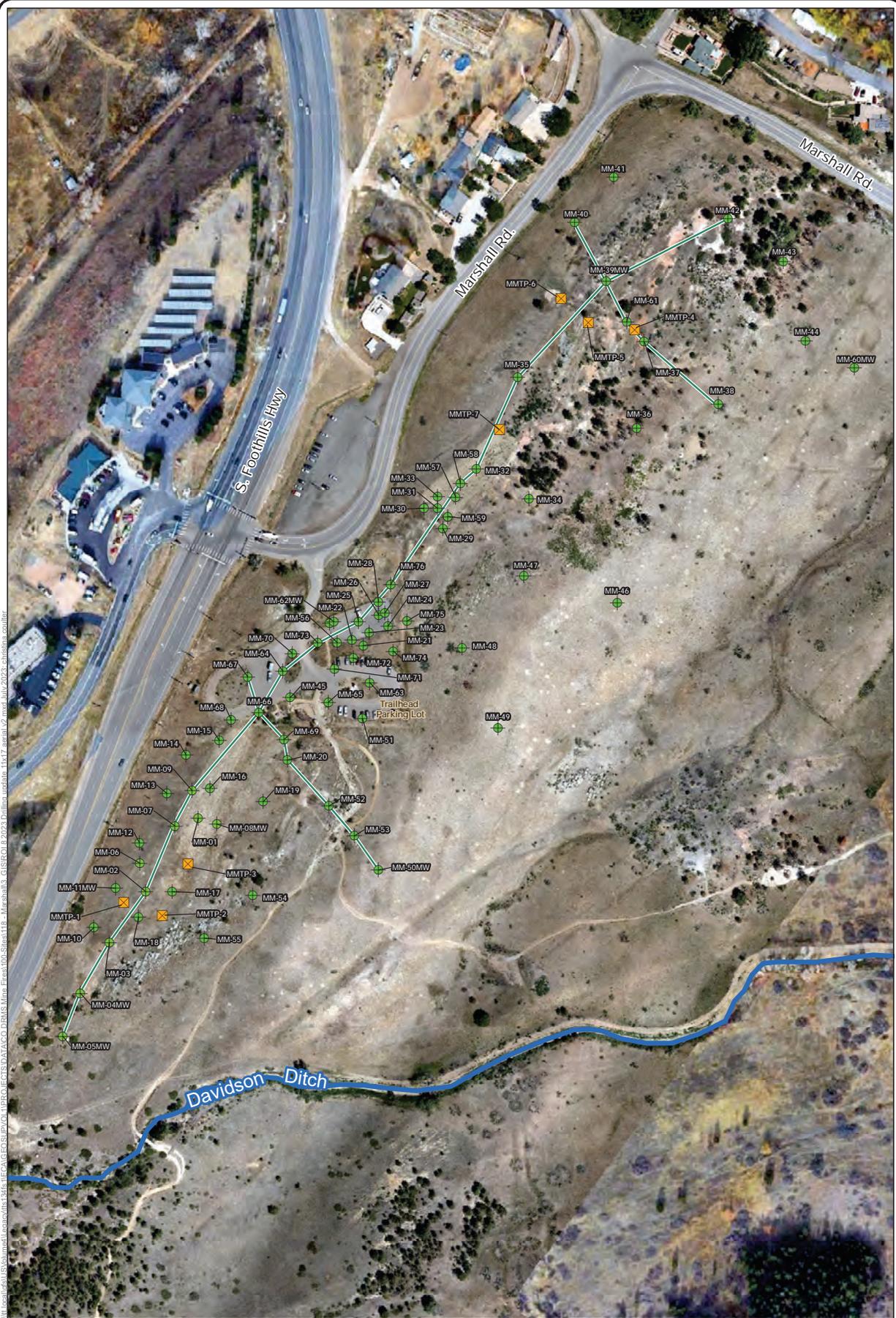


- Legend
- Asbuilt Boring Location
 - Asbuilt Test Pit Location
 - Northern AOI
 - Southern AOI
 - Davidson Ditch

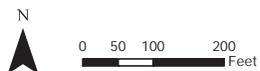


Notes:
 - Aerial Imagery: July 2022 T1 UAV Imagery
 - Coordinate System: NAD 1983 UTM Zone 13N
 - Projection: Transverse Mercator/North American 1983
 - All boring and test pit site features from CO DRMS

TITLE: Underground Coal Mine Fire Investigation 2022 Residual Gravity Survey Results		FIGURE
LOCATION: Marshall Mesa, Boulder County, Colorado		7
	APPROVED: JN	
	DRAFTED: MRI	
	PROJECT#: 117-8295005	
	DATE: 07/19/2023	

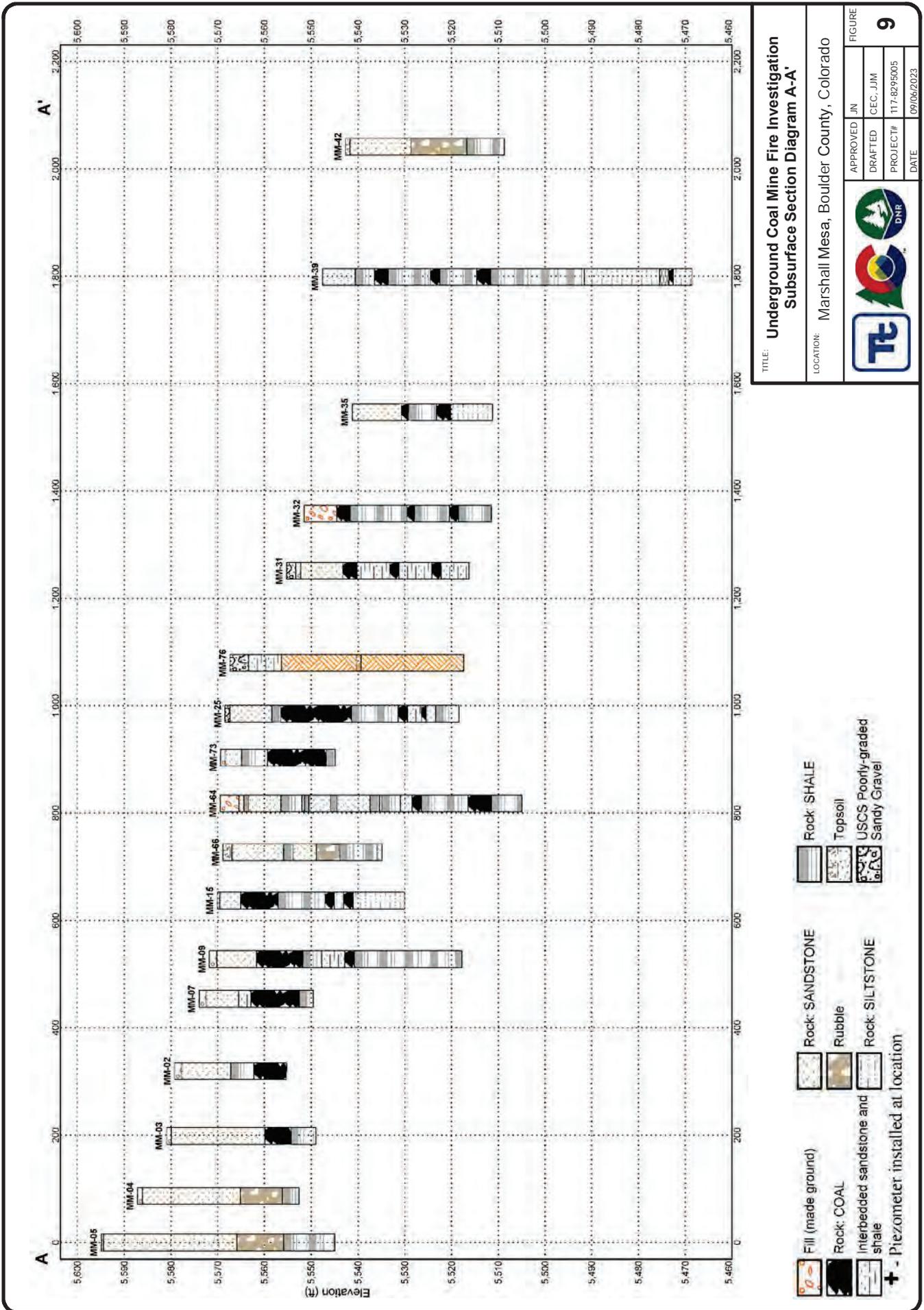


- Legend**
- Asbuilt Boring Location
 - Asbuilt Test Pit Location
 - Davidson Ditch
 - Cross Section Lines



Notes:
 - Aerial Imagery: July 2022 T1 UAV Imagery
 - Coordinate System: NAD 1983 2011 UTM Zone 13N
 - Projection: Transverse Mercator NAD 1983 2011
 - Data Source: 2023 site features from CO DRMS

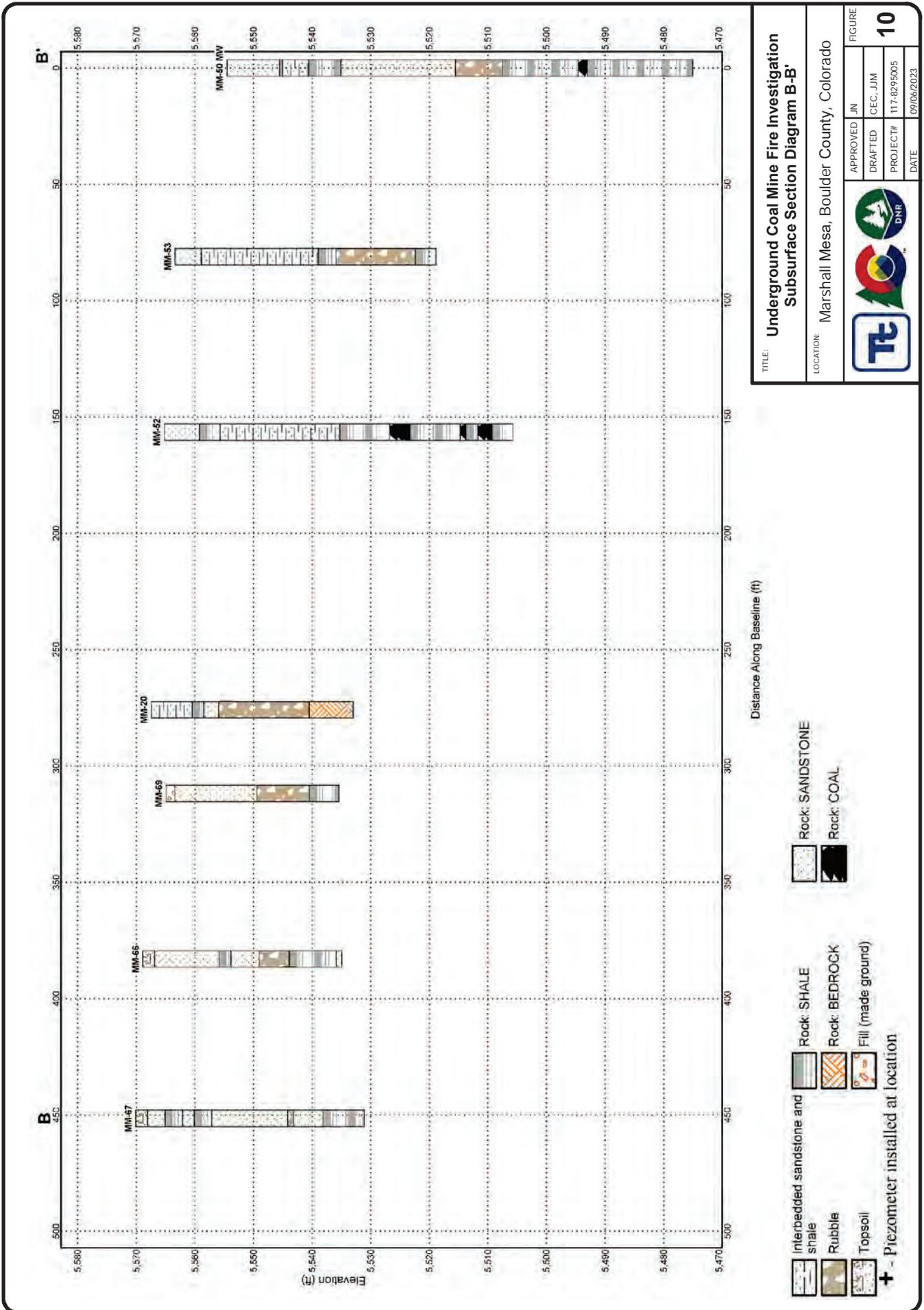
TITLE: Underground Coal Mine Fire Investigation As-built Borehole and Test Pit Location	
LOCATION: Marshall Mesa, Boulder County, Colorado	
APPROVED: JN	FIGURE: 8
DRAFTED: MRC, CEC	
PROJECT#: 117-8295005	
DATE: 07/27/2023	



TITLE: **Underground Coal Mine Fire Investigation
Subsurface Section Diagram A-A'**

LOCATION: Marshall Mesa, Boulder County, Colorado

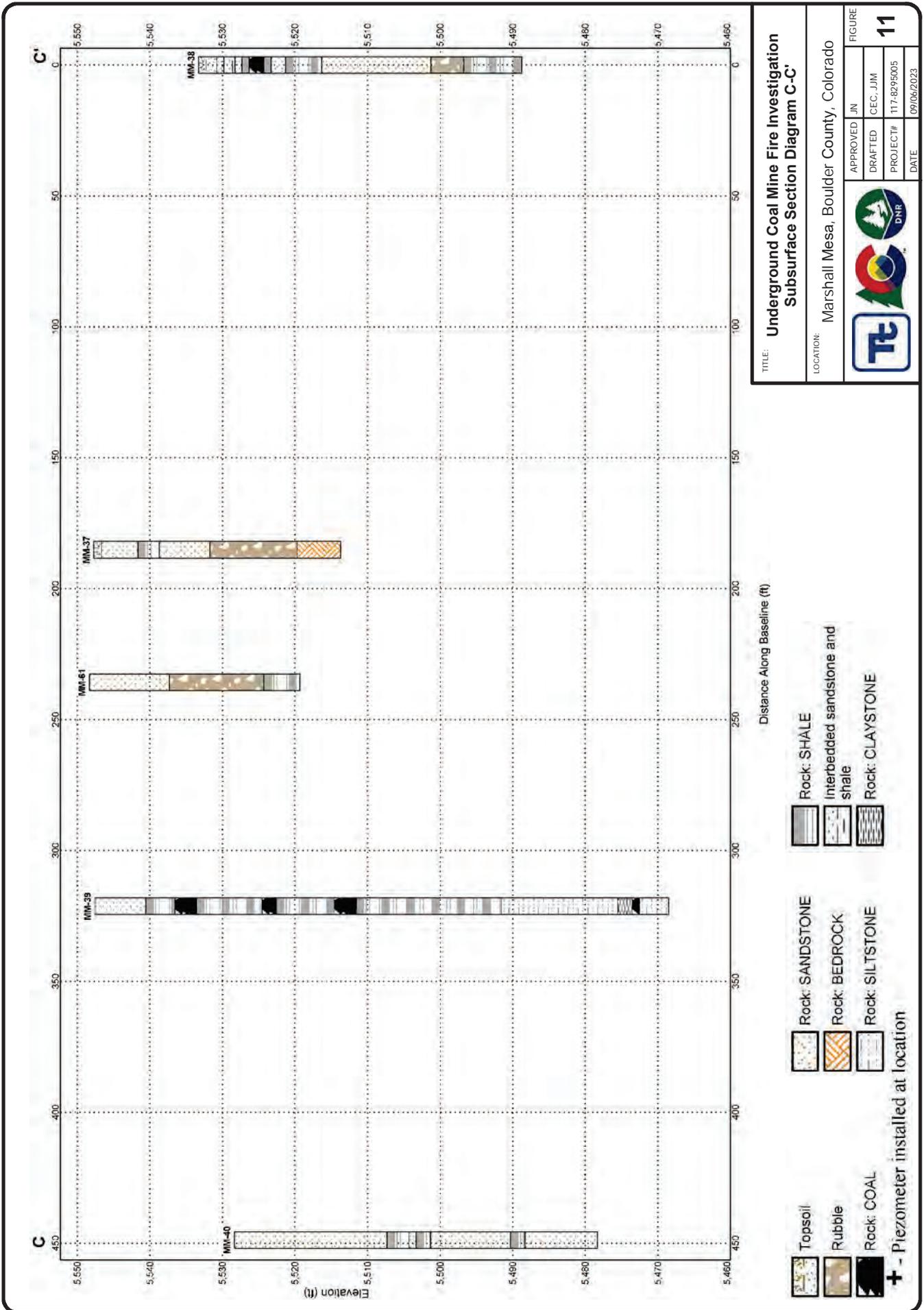
 	APPROVED	JIN	FIGURE 9
	DRAFTED	CEC, JJM	
PROJECT#		117-8295005	DATE
DATE		09/06/2023	



TITLE: **Underground Coal Mine Fire Investigation
Subsurface Section Diagram B-B'**

LOCATION: Marshall Mesa, Boulder County, Colorado

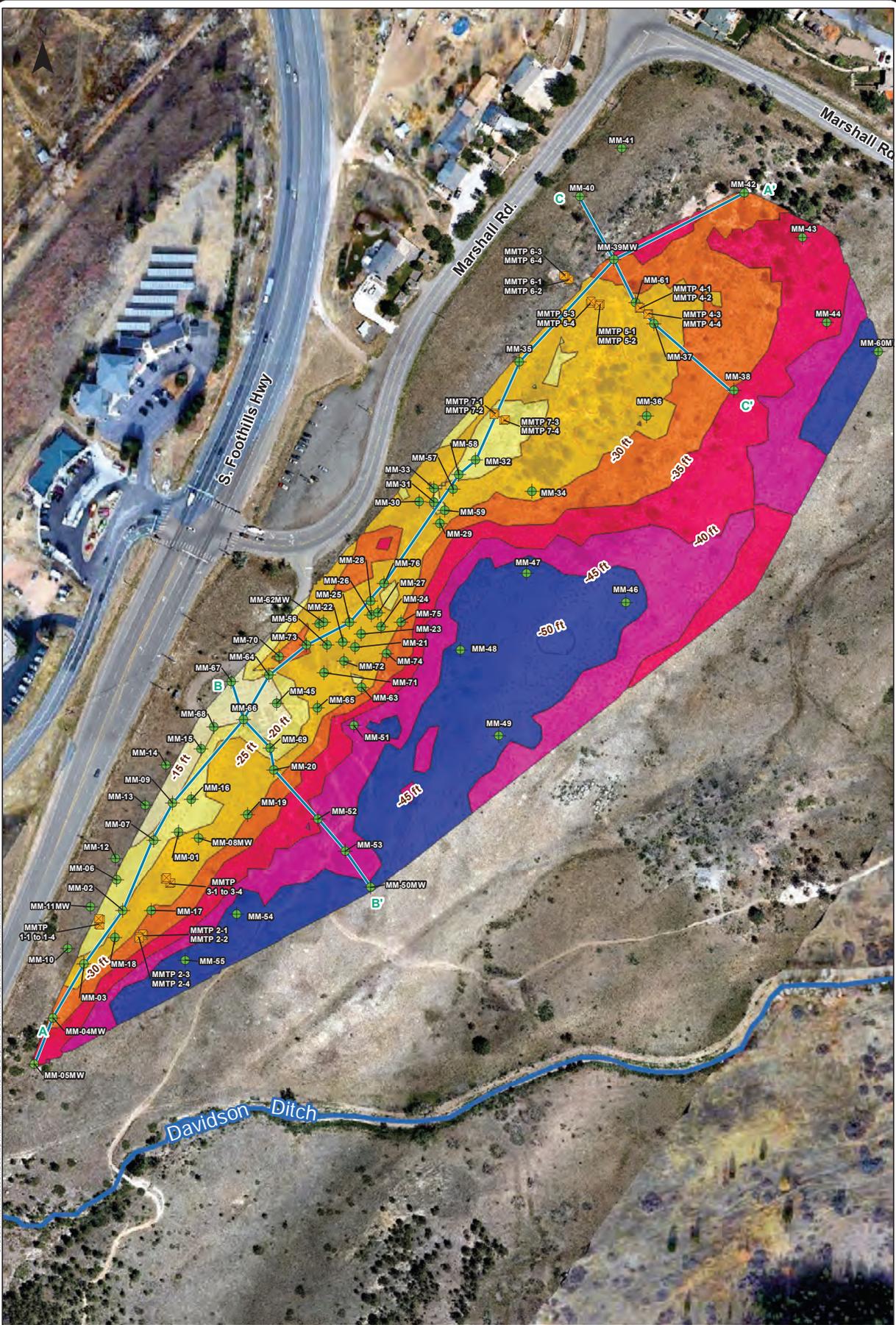
 	APPROVED	JIN	FIGURE 10
	DRAFTED	CEC, JJM	
	PROJECT#	117-8295005	
	DATE	09/06/2023	



TITLE: **Underground Coal Mine Fire Investigation
Subsurface Section Diagram C-C'**

LOCATION: Marshall Mesa, Boulder County, Colorado

	APPROVED	JIN	FIGURE 11
	DRAFTED	CEC, JJM	
	PROJECT#	117-8295005	
	DATE	09/06/2023	



- Legend**
- ◆ Asbuilt Boring Location
 - Asbuilt Test Pit Location
 - Davidson Ditch
 - Cross Section Lines

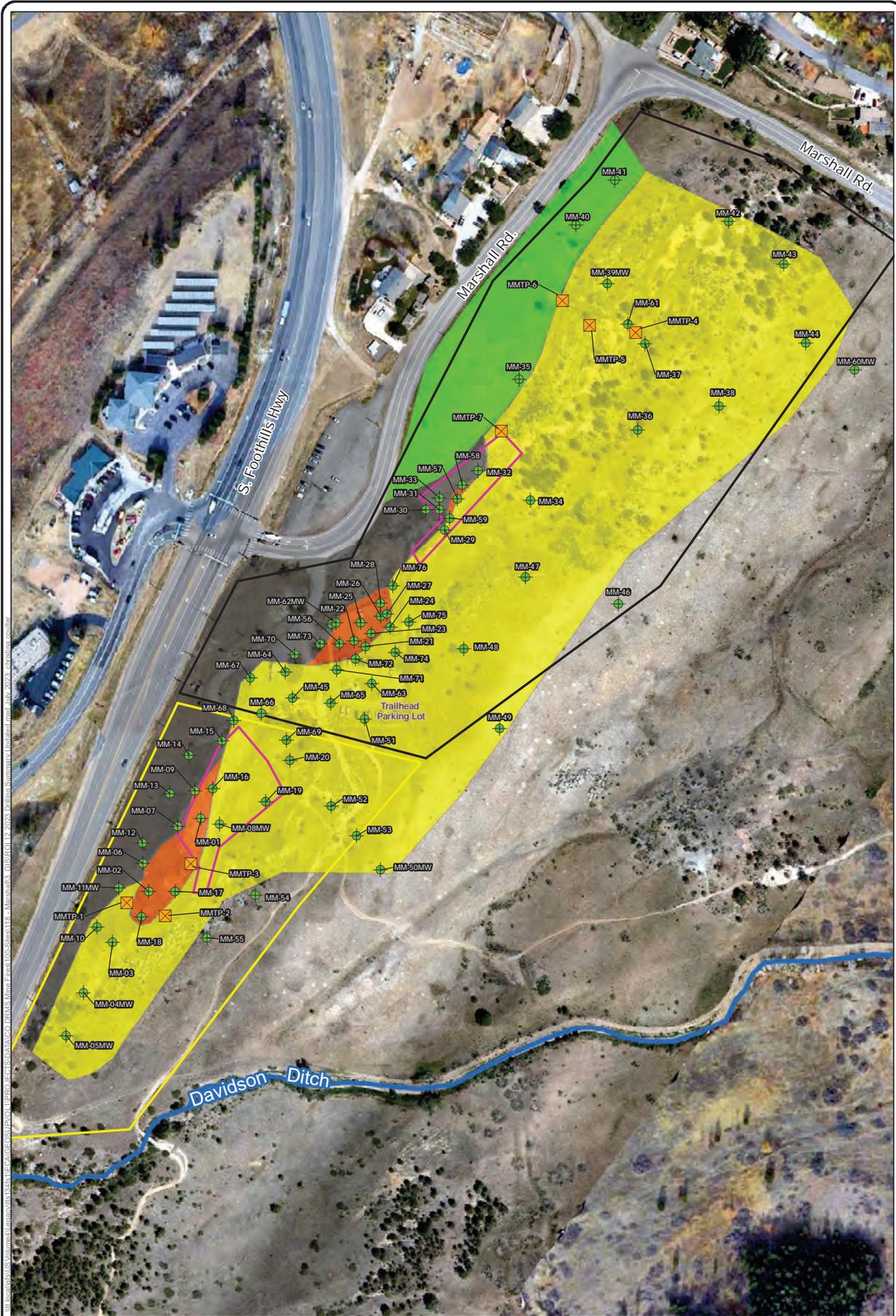
Depth to Bottom of Coal/Rubble (ft bgs)

10 - 20	35 - 40
20 - 25	40 - 45
25 - 30	45 - 65
30 - 35	



Notes:
 - Aerial Imagery: July 2022 T1 UAV Imagery
 - Coordinate System: NAD 1983 2011 UTM Zone 13N
 - Projection: Transverse Mercator NAD 1983 2011
 - Source: Geospatial data from CO DRMS

TITLE: Marshall Mesa Drilling Investigation Depth to Bottom of Coal or Rubble Interval			
LOCATION: Marshall Mesa, Boulder County, Colorado			
			APPROVED: JN
			DRAFTED: MRI
			PROJECT#: 114-910499
			DATE: 03/09/2022
			FIGURE: 12



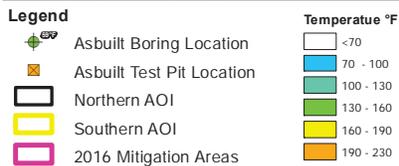
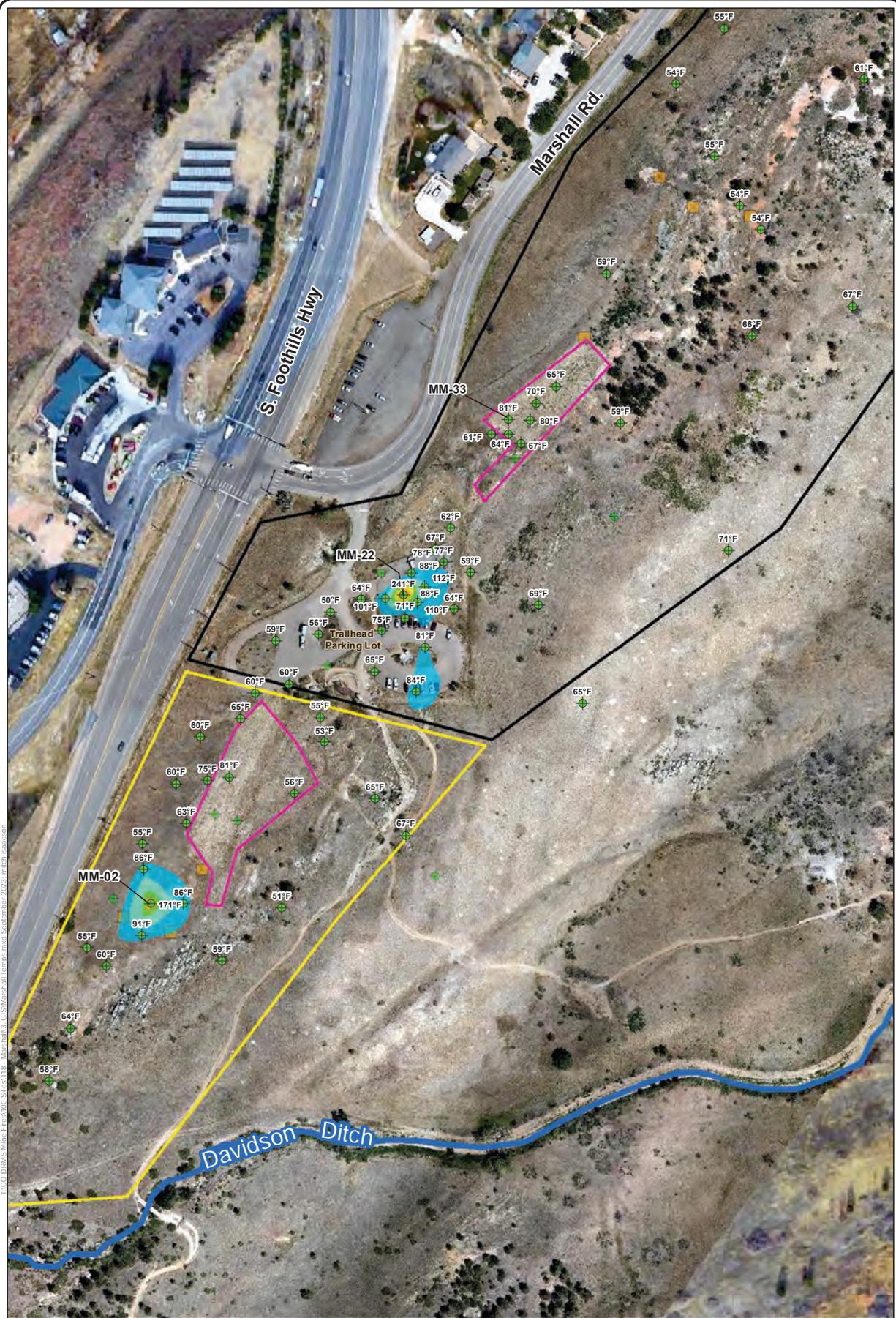
- Legend**
- Asbuilt Boring Location
 - Asbuilt Test Pit Location
 - Northern AOI
 - Southern AOI
 - 2017 Mitigation Areas

- Upper Coal Seam Interval Condition**
- Below Coal Seam
 - Burned/Rubblized
 - Burning/Smoldering/Ash Zone
 - Intact Coal



Notes:
 - Aerial Imagery: July 2022 T1 UAV Imagery
 - Coordinate System: NAD 1983 2011 UTM Zone 13N
 - Projection: Transverse Mercator NAD 1983 2011
 - Site features from CO DRMS

TITLE: Underground Coal Mine Fire Investigation Upper Coal Seam Interval Generalized Conditions	
LOCATION: Marshall Mesa, Boulder County, Colorado	
APPROVED: JN	FIGURE: 13
DRAFTED: MRI, CEC	
PROJECT#: 117-8295005	
DATE: 07/27/2023	



Notes:
 - Aerial Imagery: July 2022 T1 UAV Imagery
 - Coordinate System: NAD 1983 2011 UTM Zone 13N
 - Projection: Transverse Mercator NAD 1983 2011
 - Data Source: 2016 Mitigation Areas from CO DRMS

TITLE: Underground Coal Mine Fire Investigation Upper Coal Seam Temperatures, May 23-26, 2023			
LOCATION: Marshall Mesa, Boulder County, Colorado			
	APPROVED: JN	FIGURE: 14	
	DRAFTED: MRI, CEC		
	PROJECT#: 117-8295005 DATE: 09/18/2023		

\\f:\local\gis\USVolume4\Legacy\134\1s\1ECA\GEO\SUPVOL\1\PROJECT\SDATA\ICO DRMS Mine Fires\100-Sites\118 - Marshall\3 - GIS\ROI 14 Potentiometric Map.mxd July 2023: christina.coullier



Notes:
 - Aerial Imagery: July 2, 2023
 - Coordinate System: NAD 1983 2011 UTM Zone 13N
 - Projection: Transverse Mercator NAD 1983 2011
 - Faults, geologic, and site features from CO DRMS

Legend

- Asbuilt Boring Location
- Asbuilt Well Location and Water Level (ft AMSL)
- Potentiometric Surface Contour (10 ft)
- Northern AOI
- Southern AOI
- Davidson Ditch

0 100 200 400 Feet

TITLE: **Underground Coal Mine Fire Investigation**
 Potentiometric Surface April 24-25, 2023

LOCATION: Marshall Mesa, Boulder County, Colorado

	APPROVED	JN	15
	DRAFTED	MRI, CEC	
	PROJECT#	117-8295005	
	DATE	07/20/2023	

APPENDIX A: Marshall Mesa Underground Coal Fire Investigation Report of Preliminary Investigations



COLORADO
Division of Reclamation,
Mining and Safety
Department of Natural Resources



Marshall Mesa Underground Coal Fire Investigation

Report of Preliminary Investigations



March 16, 2022

#114-910599

Report of Preliminary Investigations Marshall Underground Coal Fire

#114-910599
March 16, 2022

PRESENTED TO

**Colorado Department of Natural Resources
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Disclaimer

The contents of this report do not necessarily represent the views or policies of the State of Colorado Department of Natural Resources, Division of Reclamation, Mining, and Safety, or United States Department of the Interior, Office of Surface Mining Reclamation and Enforcement. Subsurface conditions may vary from those depicted in this report. No warranty of geologic conditions is expressed or implied.

The site conditions and resulting recommendations presented in this document are based on conditions encountered at the specific underground coal mine location at the time of inspection. Due to the dynamic nature of underground coal mine fires, the complexity and variability of natural earth and rock formations and materials, significant variations may occur between and around these locations or with time. Because these data represent a very small statistical sampling of overall site conditions, it is possible that conditions may be encountered that are substantially different from those indicated. In these instances, modification and adjustment to the recommendations presented may be warranted.

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APPENDICES

- Appendix A: Photo Log
- Appendix B: Boring Logs

ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
agl	Above ground level
AML	Abandoned Mine Lands
amsl	Above mean sea level
AOI	Area of Interest
bgs	Below Ground Surface
CO ₂	Carbon Dioxide
CO	Carbon Monoxide
DRMS	Division of Reclamation, Mining and Safety
ft	Feet
°F	Degrees Fahrenheit
Hwy	highway
H ₂ S	Hydrogen sulfide
OSM	Office of Surface Mining
O ₂	oxygen
No.	Number
UAV	Unmanned Aerial Vehicle or System

1. INTRODUCTION

Following the Marshall Wildfire on December 30, 2021, Colorado Division of Reclamation, Mining, and Safety (DRMS) requested Tetra Tech complete a preliminary evaluation of the conditions across the southern half of the Marshall Underground Coal fire site which is located near the southwest corner of the Marshall Wildfire impacted area.

The preliminary evaluations included surface-feature temperature and combustion gas observations, unmanned aerial vehicle (UAV) based infrared thermal/visual scans, drilling investigation, and subsurface temperature monitoring. Initial site evaluation work was initiated in January and the drilling and thermocouple installations were completed by the end of February. Long-term coal seam temperature monitoring was initiated March 3, 2022. This report summarizes the findings of the initial evaluations, follow up inspections, drilling investigation, and initial subsurface temperature monitoring.

2. SITE DESCRIPTION

Location and Setting

The Marshall underground coal mine fire site is located on the City of Boulder, Colorado (Marshall Mesa Trailhead Open Space) property located south of Boulder, immediately southeast of the intersection of State Highway 93 (Hwy 93) and Eldorado Springs Road. The southern half of the Marshall Mesa Site or Area of Interest (AOI) for the investigations is undeveloped, open space land, owned and managed by the City of Boulder bounded by the Marshall Mesa trailhead parking area to the north, Coal Seam trail to the east, Davidson Ditch to the south, and Hwy 93 to the west (**Figure 1**).

The site sits at an elevation of approximately 5,500 feet above mean sea level (ft amsl) and is generally flat with some hummocky areas due to suspected subsidence features related to historic coal mines. A sandstone outcrop cuts across the southern half of the AOI (at SW to NE trend).

Vegetation is mostly grass with some shrubs and trees although much of the site burned during the Marshall Wildfire. **Figure 1** shows the perimeter of the Marshall Wildfire and impacted areas of the AOI.



Image 1: Marshall Mesa Trailhead and AOI (November 2018)

Recent Site History

There is an extensive history of underground fires at Marshall Mesa documented through historical photographs, reports, and mine maps describing underground fires more than 100 years ago. As described in the 2018 Mine Fire Inventory report (Tetra Tech, 2019), the recent, 20-year, history highlights the dynamic, ever changing conditions at mine fire sites. During a site visit in October 2003, it was reported that the fire was moderately active with ground temperatures ranging from 118°F to 130°F. The smell of coal combustion was noted near the venting fractures

(Renner, 2005). These features were located in the northern portion of the Marshall Mesa site in a recently active subsidence feature.

In February 2005, a recently constructed building was inspected for damage caused by subsidence believed to be related to the Marshall Coal Mine. Vents and subsidence features were identified under and around the building (Amundson, 2005). The building was ultimately demolished after the property was acquired by the City of Boulder for construction of the Marshall Mesa Trailhead.

On December 20, 2005, a brush fire was started by a hot vent from the Marshall Mesa Coal Fire. The fire was quickly contained and extinguished. The origin of the fire was traced back to a 373°F vent in the northern portion of the Marshall Mesa site. In January 2006, fire abatement was undertaken by the Office of Surface Mining to fill in vents with small rock material to reduce the potential of starting another surface fire. 275 tons of unwashed aggregate was placed over the vent area to a total depth of 18 inches (Blackburn, 2006).

In 2016-2017, two areas of trough subsidence were excavated, compacted, and backfilled to natural grade. Both areas, shown on **Figure 1**, were in areas where surface expression of the mine fire had been observed. During the subsidence mitigation work, a few small vents were uncovered in both locations. In all cases, the exhaust was warm, moist air with temperature less than 90°F. No new evidence of subsidence or other indicators of the coal mine fire were observed during the completion of the remedial activities. Gas monitoring during construction did not detect gases associated with coal combustion over the background levels.

The site was visited in the morning following a small, overnight, snowstorm in October 2018. No signs of venting, heat, odors, or snowmelt were observed (Tetra Tech, 2019).

Regional Geology

The site lies in the late Cretaceous Laramie formation, west (on the footwall) of the east-dipping Fox Fault, which is the first major Laramide back thrust east of the Rocky Mountain Front Range (**Figure 2**). Units within the AOI dip six to twelve degrees to the southeast (e.g., Trudgill, 2015). Between the Fox Fault and the Gorham Fault some 500 meters southeast, multiple anastomosing fault strands create an elliptical anticlinorium elongated to the northeast.

Surface and bedrock units in the vicinity consist of late Cretaceous sedimentary rocks. The most prominent and youngest unit in the area is the Laramie Formation, a set of brackish to freshwater deposits up to 800 feet thick. The upper Laramie contains mainly clay and sandy shale, is highly variable laterally, and is easily eroded. Most surface rocks across Lake Marshall and Davidson Mesas are from the comparatively erosion-resistant shaly sandstones of lower 80–125 feet of the Laramie. A ubiquitous horizon of varnished, very durable ripple marks up to 1 inch deep at the top of the “C sandstone” member of the lower Laramie outcrops northeast of the site near Marshall Road, providing a stratigraphic marker.

In addition to the main, mapped faults (i.e., Fox, Pine Ridge, Peerless, Pittsburgh, South Gorham, and West Fox), there are a series of smaller faults present further complicating the site. The lower Laramie formation also contains nearly all of the coal seams mined in the area, with most activity concentrated in the three to eight-foot thick No. 3 Seam within the lower 40 feet of the formation, some 20 to 40 feet below the C sandstone. The underlying Fox Hills Sandstone varies from 80 to 250 feet across the Mesa because of depositional variations, inter-tonguing with the underlying shales, and duplication by faults **Figure 2**.

The Pierre Shale is an extensive clay to mudstone, though limestone and sandstone members are present at various locations and intervals within the unit’s ~8,000-foot total thickness. In places, the Pierre is effectively water-soluble, spontaneously decomposing into suspended sediment and secondary settling silt and sand grains. The flat bottom of the South Boulder Creek plain in the vicinity of Marshall is entirely underlain by Pierre Shale.

Stratigraphy

The lower Laramie Formation below the C sandstone comprises alternating sandstone and shale with notable coal seams. Several coal seams have been mined in the lower Laramie in the area. At three to eight feet thick, the No. 3 coal seam is the thickest and most prominent. Near the site, this seam lies approximately ten feet below the top of the lower Laramie, underlying 17 feet of friable shaly and loose sandy material. This erodible unit is capped by up to ten feet of the “C” sandstone (Emmons, 1896) member, with its diagnostic oxide-varnished ripple-marked top and locally abundant oxidized concretions. Few members in this interval resist erosion, creating muddy flats with few outcrops. Erodible shales, sandstones, and some coal streaks in the lowest portion of the Laramie manifest as low-relief areas between the C sandstone and the massive grey sandstone at the top of the Fox Hills, in the swath from the C sandstone ridge southeast of the site.

Mine Maps

Coal mining started in the area as early as 1859 and continued through the 1950s. **Figure 3** shows the approximate extents of various coal mines in the immediate vicinity around the Marshall Mesa Trailhead. Historical maps identifying underground workings are only available for some of these mines, including the Marshall No. 3, Black Diamond, and Eldorado Mines. Others, including the Marshall No. 1 and No. 2, are known to exist to the north of the project areas, but mine maps are not currently available for these mines. The No. 3 Mine map shows workings to the south and east of the Marshall Mesa Trailhead, stopping just to the east of the project area. Two adits or airways are shown to extend west across the southern portion of the site to the slope west of Hwy 93.

It should be noted that the accuracy of available mine maps have not been confirmed and may not reflect the final extents and configuration of a given mine. Mine working extents and locations should therefore be considered approximate.

3. INVESTIGATION

As directed by DRMS, the preliminary investigation of the southern portion of the Marshall Mesa underground coal fire, was conducted in a phased approach utilizing a multi-disciplinary methodology for gathering background data, evaluating site conditions, and performing a targeted drilling investigation. The goal of the investigation was to quantify the extents of subsurface heat and extents of potential subsurface coal fire activity relative to the suspected ignition area of the Marshall Wildfire. The preliminary activities of the evaluation are summarized below.

Preliminary Site Inspection

Site Reconnaissance

The first part of data collection at the site included a reconnaissance of the project site as well as the surrounding areas. The No. 3 Mine map shows two adits potentially extending under Hwy 93 and daylighting out the slope to the west (**Figure 3**). This area was inspected January 7, 2022 and no signs of mine openings, recent subsidence, vents, or intakes were observed.

Surficial Fracture Gas and Temperature Observations

Two rounds of gas and temperature readings were completed January 7, 2022 and January 14, 2022 at ten discrete locations within the AOI shown on **Figure 4**. These locations were selected by DRMS to screen for potential connectivity between the surface and underground mine workings suspected to be present in the area. Tetra Tech performed temperature measurements and obtained gas readings at each location to screen for subsurface temperatures and combustion gases typically associated with oxidizing and/or burning coal. A FLIR Infrared (IR)

thermometer, Trimble R2 GPS unit, and a Landtec GEM 5000 gas analyzer with the capability to measure Methane %, Carbon Dioxide % (CO₂), Oxygen % (O₂), hydrogen sulfide (H₂S), and carbon monoxide (CO) were used for the observations.

The Trimble R2 GPS survey antenna was used to survey the ten observation locations (MV1-MV10) identified during the January 7th, 2022 site activities. The IR thermometer was aimed at the deepest part of the fracture to take a reading representative of venting atmosphere/gas temperature. In most cases movement of air or gases in or out of the fractures was not apparent. The gas analyzer's silicone inlet tube was inserted as far in the hole as possible in the direction of suspected air movement and the analyzer was turned on. The analyzer was run long enough (typically 1 to 2 minutes) to purge the suction line, for the gas reading to stabilize and to understand if there were short term fluctuations in gas concentrations. **Table 1** presents the gas concentration and temperature readings of each feature.



Table 1. Preliminary Gas and Temperature Readings

Feature	GEM 5000 Readings – January 14, 2022					
	Temp °F	CH ₄ %	CO ₂ %	O ₂ %	H ₂ S PPM	CO PPM
Ambient	33	0	0.1	20.9	0	0
MV01	33	0	0.1	20.9	0	0
MV02	35	0	0.5	20.7	0	0
MV03	36	0	0.8	20.4	0	0
MV04	36	0	0.1	20.9	0	0
MV05	35	0	0.3	21	0	0
MV06	32	0	0.1	21.3	0	0
MV07	32	0	0.1	21.4	0	0
MV08	30	0	0.1	21.4	0	0
MV09	28	0	0.1	21	0	0
MV10	40	0.1	12.9	8.5	0	218

Tetra Tech noted slightly elevated temperatures and combustion gases at location MV-10 (**Figure 4**). The presence of CO without heat and CO₂ is typically associated with incomplete combustion or oxidation of subsurface coal. No other indications of mine fire activity were observed including odors, heat, venting gases, or intakes. Fracture temperatures at feature MV01 to MV09 were close to ambient (33°F) and no discernable airflow (intake or vent) was observed.

Site Imaging

Thermal Imaging

On January 8, 2022, Tetra Tech performed a UAV-based thermal inspection and mapping of the AOI within Marshall Mesa Open Space. A flight was performed to develop a thermal overlay of the AOI to map potential thermal anomalies, or features with sharp contrast, hot or cold, with the surrounding area (**Figure 5**). The color scale on the

figure ranges from approximately 10-30°F with the darker blues and purples representing the cooler temps (~20°F) and the brighter colors representing the relatively warmer temps (25-30°F).

The warm circles (~28°F), primarily on the southern portion of the figure, are conifer trees that trap and hold warmer air. The area snowmelt area displayed a slightly elevated temperature (~1-2°F) above the surrounding area that was consistent with on the ground temperature observations. Low altitude video inspections were also performed to provide more detail of the fractures in question and actively search for thermal anomalies that may not be observed from higher altitude thermal mapping. No additional features were identified during the detailed imaging.

Site Mapping

On February 9, 2022, Tetra Tech completed a UAV-based visual photogrammetry flight of the property to develop baseline aerial imagery for the drilling program. The imagery was captured using a 45-megapixel survey-grade camera flown at approximately 200 feet above ground level (ft agl). The map was georeferenced using eight ground control points, surveyed using a Trimble R2 GPS antenna with precision RTX, and is used as the base imagery for **Figure 4** and **Figure 7**.

Snowmelt Imagery

With multiple snowfall events occurring in Boulder during January, February, and March 2022, Tetra Tech was able to visit the site several times to observe snowmelt patterns. During these visits an area was observed that consistently had snowmelt before the surrounding areas despite similarities in aspect and surface material or other factors that could influence differential melting patterns other than subsurface heat. **Image 3** and **Figure 6** show ground and perspective shots of the consistent snowmelt area during a recent storm and an outline of the consistent snowmelt area is shown on **Figure 4**. On the ground temperature observations with the handheld IR thermometer showed ground temperatures in the snow free areas were just above freezing at 34°F and only 1°F to 3°F warmer than background surface temperatures. No other areas of snowmelt were identified in the AOI.



North of the AOI, two suspected snowmelt areas were identified during the snowmelt imaging. These areas were not evaluated further since they are out of the scope of this investigation. Their locations were documented and recommendations for further evaluation are included in Section 4.2. **Appendix A** provides additional photographs of snowmelt areas at the site.

Microgravity Calibration Readings

A preliminary microgravity survey was completed across the AOI to evaluate the suitability of the method for the site, given the shallow coal mining, large extents of undermined areas, and extensive faulting. Results from the preliminary survey will identify areas. These data will be calibrated with the preliminary drilling data and used to guide additional investigations.

Drilling Investigation

DRMS and Tetra Tech developed a borehole drilling program to quantify the extents of subsurface heat and/or fire in the AOI. Borehole locations were positioned to examine the main snow melt area and area to the south beneath the possible origin point of the Marshall wildfire. Drilling work was completed between February 21, 2022 and February 25, 2022 by Authentic Drilling based in Kiowa, Colorado. A track mounted CME-55 utilizing an ODEX casing advance system advanced the boreholes through the overburden and into competent rock. The boreholes were then

completed to depth with an air-rotary tricone bit. Foam and water were pre-mixed and on standby in-case hot or burning conditions were encountered. A downhole camera was used to examine select boreholes and confirm the lithology and nature of the fractured/void zones. **Table 2** summarizes the borehole data and the boring logs are included as **Appendix B**. Borehole locations are shown on **Figure 4**.

Descriptions of the subsurface conditions observed, and select monitoring data, in each of the boreholes are summarized below:

1. **MM-01** - The location of borehole MM-01 in the middle of the primary snowmelt feature, was selected based on the snowmelt imaging and observed slightly elevated surface temperatures **Figure 6**. The borehole encountered 8.5 feet of backfill from the 2016 mitigation work, comprised of a brown, sandy, silty mixture with gravel and cobbles. Competent rock was encountered at 8.5 feet below ground surface (ft bgs), however circulation was lost shortly after. Drilling advancement was easy to 15 ft bgs and the ODEX casing was set at 13.5 ft bgs. The borehole began venting low temp (<90°F) gases with a strong, sulfurous coal combustion odor, typical of underground coal fires. Carbon monoxide concentrations fluctuated but were observed up to 1743 parts per million (ppm), H₂S was detected at 4.2 ppm, CO at 10 %, no methane was detected, and low oxygen conditions were present. A tri-cone bit was used to advance the borehole from 15 ft bgs through soft conditions and no circulation to 24 ft bgs, where solid rock was again encountered. From there the borehole was advanced through 9.5 ft of solid rock to a total depth of 33.5 ft bgs.
2. **MM-02** - Borehole MM-02 was located approximately 160 feet to the south of MM-01, at the southern end of surface heat documented with the snowmelt imagery. This borehole encountered a light-colored sandstone just below the surface which extended to a depth of approximately 15 feet where there was a transition to a dark brown shale with coal encountered from 17 to 24 ft bgs. No gases, heat or odors were observed. The borehole was covered, allowed to sit overnight, and was checked the following morning. CO was the only gas detected at a concentration of 199 ppm and the IR thermometer recorded a temperature of 89°F at the bottom of the borehole. A thermocouple was installed to 15 ft bgs and grouted in place.
3. **MM-03** - Sandstone, brown to reddish brown, with interbedded shale was encountered just below the surface at this location. From 12 to 17 ft bgs the color became redder and there was some bit chatter, likely indicating a fractured or disturbed zone (**Image 3**). Coal was encountered from 21 to 26.5 ft bgs, with a grey shale underlying the coal from 26.5 ft bgs to the total depth of 32.0 ft bgs. The borehole remained open overnight and the following morning venting, gases, odors, or heat were not observed. A thermocouple was grouted in the borehole to a depth of 21.5 ft bgs.



4. **MM-04** – Similar to MM-03, sandstone with some shale intervals were encountered from the surface to 20 ft bgs where the color became reddish and then circulation was lost at 22 ft bgs. From 22 to 31 ft bgs there was rig chatter and the bit was bouncing, indicating fractured conditions, possible faulting, rubble, or ash. The borehole drilled solid and smooth from 31 to 34.5 ft bgs, the total depth. Three-inch steel casing was installed to 34 ft bgs with a slotted interval from 24 to 34 ft bgs. The borehole was sealed from 20 ft bgs to 16 ft bgs with bentonite and then grouted to the surface. No odors, gases, or heat were observed during drilling or the casing installation. A thermocouple was hung in the steel casing to 23 ft bgs.
5. **MM-05** – MM-05 drilled solidly through interbedded, brown, sandstone and shales from the surface to a depth of 29.0 ft bgs where circulation was lost. There was soft drilling, with intermittent rig chatter from 29.0 to 39.0 ft bgs indicative of a fractured, fault, rubble, or ash zone. There was smooth, steady drilling from 39.0 to 50.0 ft bgs, the total depth of the borehole. The borehole was examined with a downhole camera and no obvious voids or coal were observed. Three-inch steel casing was installed to 50 ft bgs with a slotted interval from 30 to 40 ft bgs. The borehole was sealed with bentonite from 23 to 27 ft bgs and then grouted to the surface. A thermocouple was hung in the steel casing at a depth of 30 ft bgs. Venting, gases, odors, or heat were not observed following drilling or casing installation.
6. **MM-06** – This borehole was advanced through brown to grey, sandstones and shales from the surface to 11.0 ft bgs where coal was encountered. The coal seam extended from 11.0 to 22.0 ft bgs and was underlain by a competent grey shale. The total depth of the borehole was 24.5 ft and it was allowed to sit open overnight and the following morning venting, gases, odors, or heat were not observed, and a thermocouple was grouted in to 12 ft bgs.
7. **MM-07** – Borehole MM-07, located 50 feet west of MM-01, was advanced through interbedded sandstone and shale with intact coal encountered from 11 to 21.5 ft bgs. Grey shale was encountered from 21.5 to 24.5 ft bgs, the borehole's total depth. It sat open overnight and the following morning venting, gases, odors, or heat were not observed, and a thermocouple was grouted in to 12 ft bgs.
8. **MM-08** – This borehole encountered 3.5 feet of fill underlain by a brown sandstone with interbedded shale to a depth of 11.0 ft bgs. From 11 to 24 ft bgs there was interbedded, red to light tan, sandstones and shales. Coal was encountered from 24 to 28 ft bgs with a grey sandy shale extending from 28 to 35 ft bgs. Another coal interval was encountered from 35 to 41 ft bgs with grey shale from 41 to 49 ft bgs. Following completion of drilling and sitting of overnight, no venting, gases, odors, or heat were observed, however, approximately four feet of water was measured in the bottom of the open borehole. Three-inch steel casing was installed to 49 ft bgs with a slotted interval from 41 to 49 ft bgs to monitor the water level in the borehole. A thermocouple was grouted in the annulus between the steel casing and borehole wall at a depth of 24 ft bgs.
9. **MM-09** - MM-09 drilled very similarly to MM-06 and MM-07 with coal encountered from 10 to 20 ft bgs. The borehole was advanced through interbedded shales, sandstones, and a thin coal seam from 29 to 31 ft bgs. A grey, sandy shale was encountered from 31 to 54 ft bgs where the borehole was terminated. It was left open overnight. The following morning venting, gases, odors, or heat were not observed, and two thermocouples were grouted in borehole MM-09, one at 12 ft bgs and one at 29 ft bgs.

Table 2: Borehole Summary

Borehole ID	Date Drilled	Total Depth (ft bgs)	Top of Coal (ft bgs)	Bottom of Coal (ft bgs)	Venting	Casing	Screened Interval (ft bgs)	Thermocouple Depth (ft bgs)	Comments
MM-01	2/21/2022	33.5	-	-	yes	no	-	7	Warm venting borehole. 1743ppm CO. Casing installation failed due to collapsing borehole. Losing grout at 14 ft bgs. Needed 1yd of cement to backfill. Suspected coal interval 13.5-23.5 ft bgs.
MM-02	2/21/2022	24.0	17.0	24.0	slightly	no	-	15	Venting 199 ppm CO the day after drilling. No other gases detected. 89F in borehole.
MM-03	2/23/2022	32.0	21.0	26.5	no	no	-	21.5	Reddish overburden and partial coal seam. No current fire activity.
MM-04	2/22/2022	34.5	-	-	no	yes	24-34	23	Reddish coloring above and circulation lost in anticipated coal interval. No signs of ongoing fire activity.
MM-05	2/23/2022	50.0	-	-	no	yes	30-40	30	Circulation lost in suspected coal interval. Rubble or ash from 22-31 ft bgs. No current fire activity.
MM-06	2/24/2022	24.5	11.0	22.0	no	no	-	12	Solid borehole, no signs of coal mine fire.
MM-07	2/24/2022	24.5	11.0	21.5	no	no	-	12	Solid borehole, no signs of coal mine fire.
MM-08	2/24/2022	49.0	24.0	28.0	no	yes	41-49	24	~4 ft of water in the borehole 2/25/21 0830. Second coal interval from 35-41 ft bgs. No signs of coal mine fire.
MM-09	2/24/2022	54.0	10.0	20.0	no	no	-	12, 29	Thin coal seam encountered from 29-31 ft bgs. No signs of coal mine fire.

Each of the boreholes was completed with a 12-inch, flush mount monitoring well cover that was cemented in place. The well covers were installed a few inches above the natural ground surface to promote drainage and prevent ponding on the well covers.

3.1.1 Borehole Emissions Observations

Emissions readings were taken during the drilling from the open boreholes once the boreholes were advanced to their total depth. To obtain emissions readings, the drilling rods were removed, equipment was switched off, and the boreholes sat open for a minimum of ten minutes prior to taking initial readings. Follow up readings were obtained in the morning after the boreholes sat overnight. Boreholes MM-01 and MM-02 were the only boreholes where combustion gases were detected during the initial or follow up readings with the findings from the follow up measurements presented below in [Table 3](#).

Table 3: Borehole Gas Readings

Feature	GEM 5000 Readings – February 22, 2022					
	Temp °F	CH ₄ %	CO ₂ %	O ₂ %	H ₂ S PPM	CO PPM
Ambient	5	0	0.1	20.9	0	0
MM-01	109	0	9.8	10.1	4	1743
MM-02	89	0	5.1	13.5	1	199

3.1.2 Thermocouple Installation

Type K thermocouples were installed in all the boreholes at or near the top of the coal seam interval. In boreholes MM-01, MM-04, and MM-05 where coal was not encountered, the thermocouples were installed at the top of the suspected coal interval. Thermocouples were installed by hanging the thermocouple wire in the open borehole and then grouting in place or by hanging the thermocouple wire down the inside of the steel casing installed in the borehole.

On March 9, 2022 thermocouple dataloggers were installed in the well monuments to record hourly temperature readings. This baseline data will be harvested monthly to allow DRMS to track potential changes in mine fire activity and correlate subsurface changes to weather events and variations in ambient conditions. **Table 4** summarizes the baseline thermocouple data collected prior to the installation of the dataloggers. The thermocouple in MM-06 was potentially damaged during installation and is not reading properly. No thermocouple data is available for this location.

Table 4: Downhole Thermocouple Temperature Data

Date	MM-01 7 ft bgs	MM-02 15 ft bgs	MM-03 21.5 ft bgs	MM-04 23 ft bgs	MM-05 30 ft bgs	MM-06* 12 ft bgs	MM-07 12 ft bgs	MM-08 24 ft bgs	MM-09S 12 ft bgs	MM-09D 29 ft bgs
3/3/2022	120.3	165.5	84.9	-	-	-	67.3	89.0	65.1	83.1
3/4/2022	119.0	166.2	62.3	82.3	78.6	-	67.1	69.5	64.3	83.1
3/7/2022	116.0	165.5	62.2	58.8	58.1	-	65.8	70.3	62.5	84.9
3/8/2022	117.9	165.3	61.0	60.4	58.3	-	66.7	69.7	62.9	82.8
3/9/2022	118.3	164.3	59.9	58.1	57.5	-	61.9	67.9	61.1	82.1

Notes: Thermocouples grouted in borehole: MM-01, MM-02, MM-03, MM-06, MM-07, MM-08, MM-09S, MM-09D. Thermocouples in MM-04 and MM-05 are hanging in slotted steal casing. *Error message thermocouple likely damaged during installation.

Figure 7 presents an overview of the subsurface temperatures observed near the top of the upper coal seam as observed on March 9, 2022. Temperature observations from March 3 to March 9, 2022 remained relatively consistent.

4. SUMMARY OF FINDINGS

Findings

The findings of the investigation of the southern half of the Marshall Mesa Underground Coal Mine Fire AOI are summarized below:

- No surface heat, vents, intakes, or recent subsidence, indicative of changing subsurface conditions, were identified during site reconnaissance of the AOI and surrounding areas.
- One fracture (MV-10) was observed to have a slightly elevated temperature (40F vs 33F ambient) and low CO (199 ppm) readings.
- No heat anomalies were identified with UAV mounted thermal and visual cameras.
- A relatively small area of enhanced snowmelt, with surface temperatures a few degrees above background, was identified in the AOI. Two possible snowmelt areas were identified north of the project area but within the overall Marshall Mesa site.
- Two of nine boreholes (MM-01 and MM-02) encountered coal combustion gases and elevated temperatures (~90F).
 - Conditions encountered in boreholes MM-01 and MM-02 indicate that the underground conditions are hot in discrete locations that seem to correspond with observed snowmelt patterns but are below active burning levels and more indicative of a semi-dormant fire or intense oxidation of the fractured coal.
 - The discrete areas of oxidation and/or low-level combustion with heat are seemingly constrained by the flat lying geology, faulting, and relatively intact overburden in the areas currently exhibiting heat.
 - With no observed vents or intakes, there is currently little air flow to the warm areas of coal.

- Boreholes MM-03 through MM-09 showed no evidence of current fire activity. No heat, gases, or odors typically associated with mine fires were observed in these boreholes.
- No significant voids or mine workings were encountered by any of the boreholes. Circulation losses were attributed to fracturing, rubble, or ash zones based on bit chatter in these intervals when no resistance is typically encountered from open voids.
- Baseline thermocouple data show subsurface heat distribution consistent with borehole observations, snowmelt patterns, and site reconnaissance observations.

Recommendations

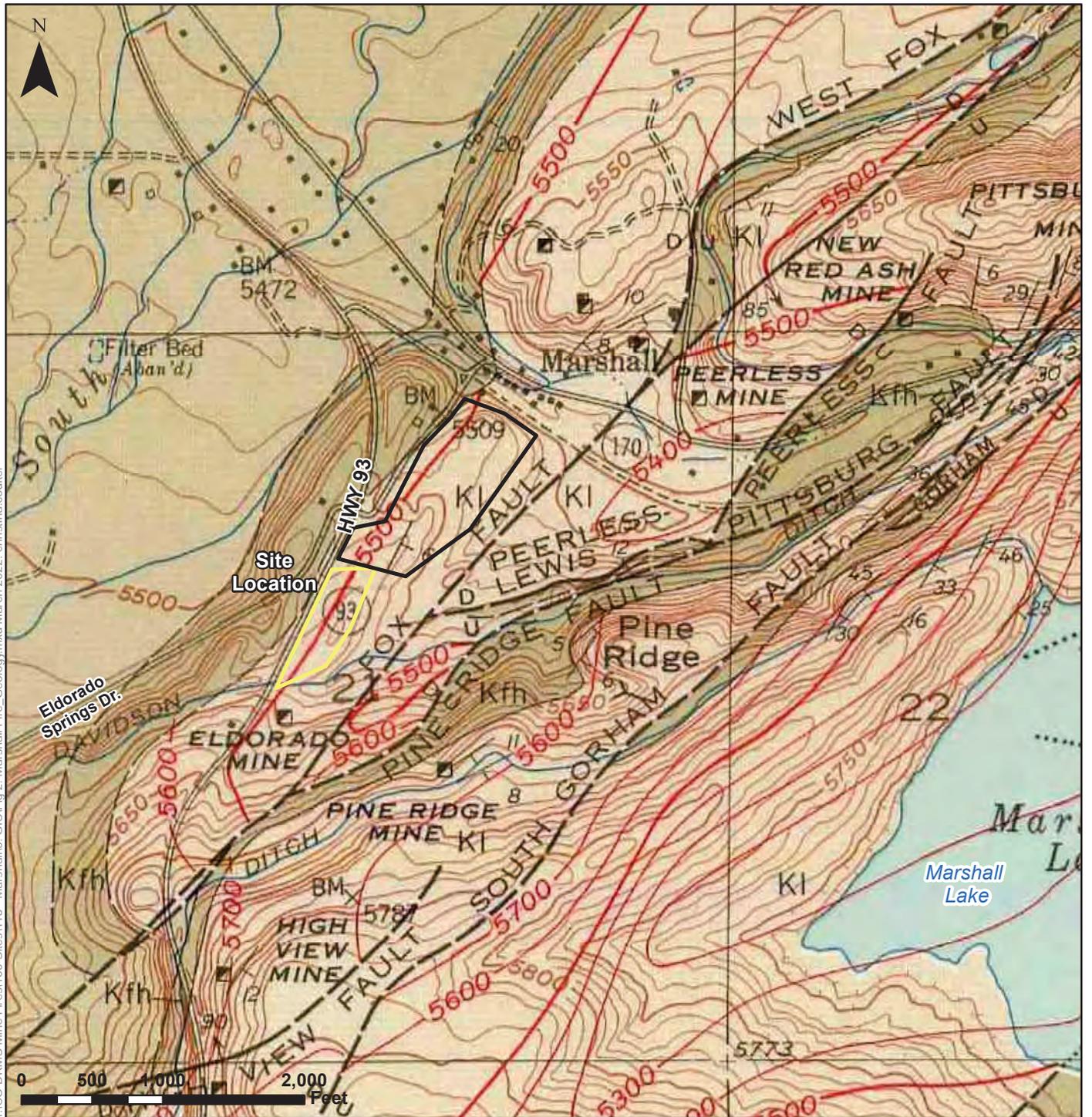
The southern portion of the Marshall Mesa underground coal mine fire that was the focus of this investigation is currently exhibiting the characteristics of a low activity, semi-dormant mine fire. No dangerous surface features or hazardous conditions related to the underground coal fire were observed. Given the extents of the historic behavior of the mine fire, observed site conditions, and remaining portion of the site to be investigated, Tetra Tech has the following recommendations.

1. Site Monitoring – The site should be visited on a regular basis to conduct snow melt observations (both north and south site areas), ground and UAV based thermal imaging, thermocouple readings, and record gas concentration measurements as appropriate. These data will be compared to weather data to establish if there is a relationship between atmospheric and subsurface conditions as well as document changes to fire activity.
2. Additional Investigations
 - a. Geophysical Investigation – Preliminary microgravity data was collected across the AOI to calibrate for future investigations. The results of the calibration modeling show the methodology will provide useful results at the Marshall Mesa site. A sitewide microgravity survey modelled on the preliminary microgravity data and calibrated by the existing borehole data, would allow extrapolation and understanding of subsurface conditions, including faulting and mine workings, across the site away from the discrete borehole locations. This data would expand the understanding subsurface conditions across the site while helping to guide geotechnical drilling.
 - b. Geotechnical Drilling - Additional drilling is recommended at the site to completely quantify the extents of the subsurface heat, confirm the orientation and offset of faults which could provide structural control on underground fire extents, and identify the extents of mine workings in proximity to current expressions of the underground coal fire at the Marshall Mesa site. Collection of core samples for detailed logging of stratigraphy should be considered as well as installation of additional thermocouples more comprehensive subsurface temperature monitoring.

5. REFERENCES

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- Tweto, Ogden, 1979, Geologic Map of Colorado, MIG-16, scale 1:500,000.

FIGURES



Legend

- Marshall Mesa North
- Marshall Mesa South
- KI Laramie formation
- Kfh Fox Hills Sandstone
- Kp Pierre shale
- $\angle 60$ Strike and dip of beds

- $\angle 64$ Strike and dip of overturned beds
- Mine Shaft
- Sand, gravel, or clay pit

——— Structure contour (top of the Fox Hills Sandstone) Contour Interval 100 ft

Contact (dashed where approx., dotted where concealed)

- $\frac{D}{U}$ High-angle fault, showing dip (dashed where approx, dotted where concealed. U, upthrown side; D, downthrown side)
- Doubtful or probable fault

Note: Geologic Map from: Spencer, F. D., 1961, Bedrock geology of the Louisville quadrangle, Colorado, USGS Publications Warehouse, 10.3133/gq151, <https://pubs.er.usgs.gov/publication/gq151>

Marshall Mesa Underground Coal Fire Investigation Geologic Map										
LOCATION: Marshall Area, Boulder, Colorado										
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APPROVED	JN	2								
DRAFTED	CEC									
PROJECT#	114-910499									
DATE	03/16/2022									



T:\CO DRMS Mine Fires\100-Sites\118 - Marshall\3 - Marshall Fire Mine Maps_v10.7.mxd March 2022: christina.coulter

Legend

Marshall Mesa North
 Marshall Mesa South

Marshall Mine Workings (CO DRMS)

 Big Tom Mine	 Lewis No 1 and No 2	 Marshall No 7
 Black Diamond	 Marshall No 1	 Pine Cliff 1940
 Eldorado 1939	 Marshall No 3	
 Kitchen Slope	 Marshall No 5	

Notes:

- Coordinate System: NAD 1983 UTM Zone 13N
- Projection: Transverse Mercator North American 1983
- Mine features from CO DRMS
- World Imagery Basemap from ESRI, 6/15/21

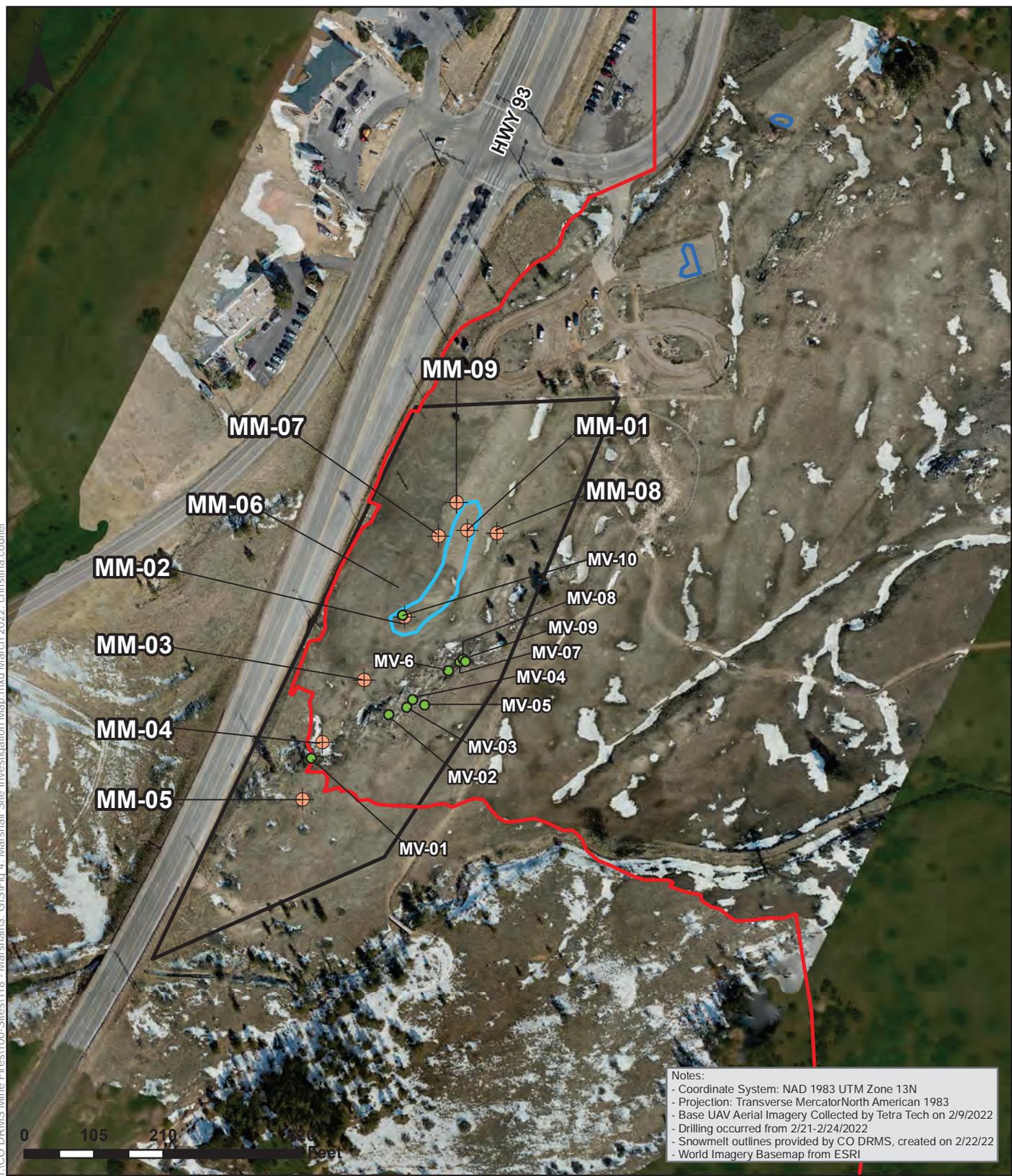
Note: Subsurface conditions may vary from those depicted in this figure. No warranty of geologic conditions based on map interpretation is expressed or implied.

TITLE: **Marshall Mesa Underground Coal Mine Fire Investigation Mine Maps**

LOCATION: Marshall Area, Boulder, Colorado

	APPROVED	JN	3
	DRAFTED	CEC, MRI	
	PROJECT#	114-910499	
	DATE	03/16/2022	

T:\CO DRMS Mine Fires\100-Sites\118 - Marshall\3. GIS\Fig 4. Marshall Site Investigation Map.mxd March 2022. christina.coulter



Legend

- Site Location
- Typical Snowmelt
- Additional Snowmelt Areas
- Marshall Wildfire Impacted Area
- ⊕ Borehole Locations
- Gas and Temperature Readings (01/14/2022)

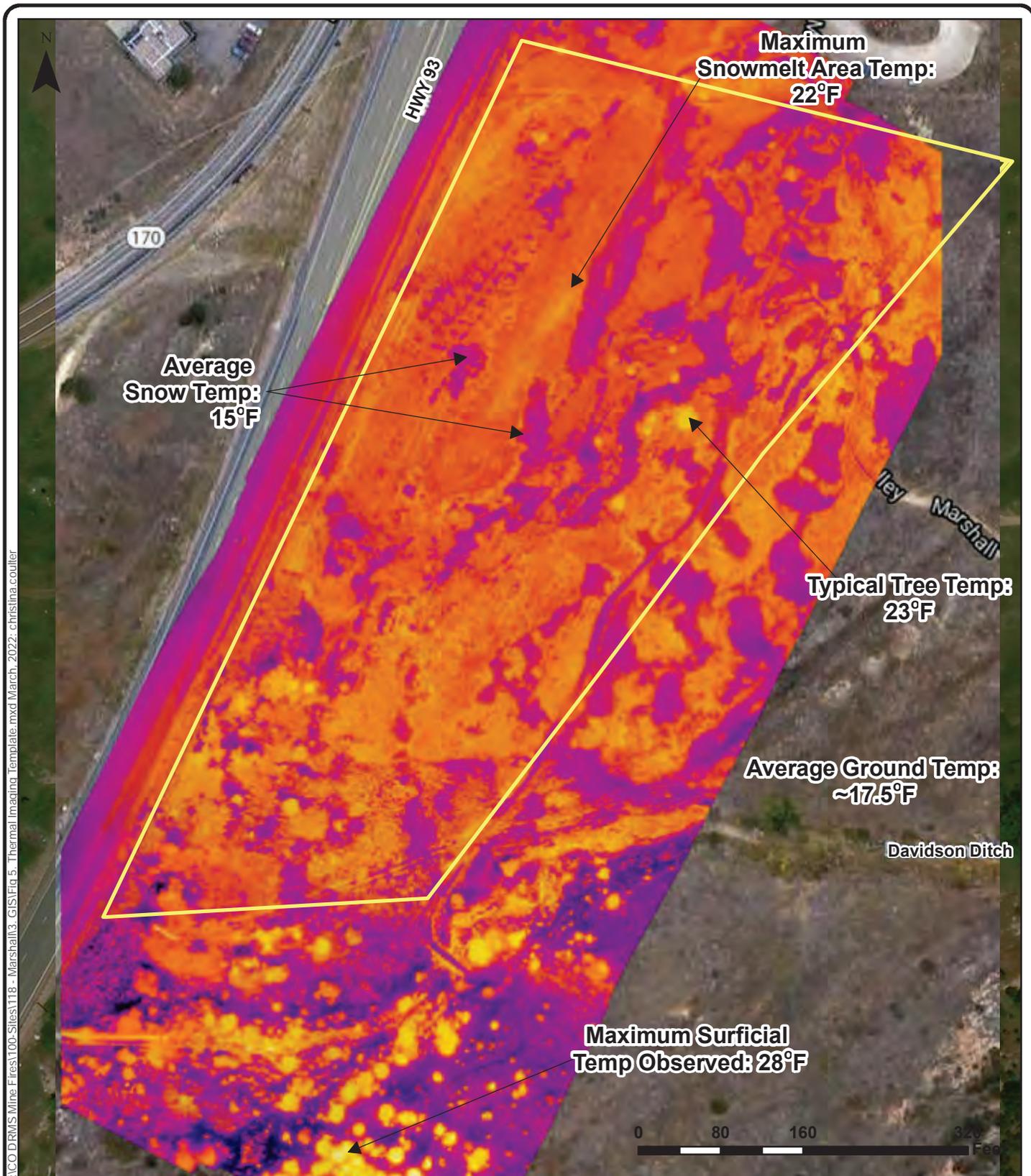
TITLE: **Marshall Mesa
Underground Coal Fire Investigation
Site Investigation Locations and Features**

LOCATION: Marshall Area, Boulder, Colorado



APPROVED	JN
DRAFTED	CEC
PROJECT#	114-910499
DATE	03/14/2022

FIGURE
4



C:\CO DRMS Mine Fires\100-Sites\118 - Marshall\3 - GIS\Fig 5 - Thermal Imaging_Template.mxd March, 2022 - christina.coulter

Legend

Marshall Mesa South

Notes:

- Thermal imaging performed by Tetra Tech on 01/08/2022.
- Ambient Temp. at 0600 was 34°F, light wind, cloudy.
- Max surficial Temp Observed was 28°F (a tree in the southern portion of the site).
- World Imagery Basemap from ESRI, June 15, 2021.

TITLE: Marshall Mesa Underground Coal Fire Investigation Thermal Imaging		5					
LOCATION: Marshall Area, Boulder, Colorado							
	APPROVED JUN						
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DRAFTED	CEC						
PROJECT#	114-910499						
DATE	03/16/2022						



F:\CO DRMS Mine Fires\100-Sites\118 - Marshall\3 - Snowmelt Image.mxd March 2022: christina.couler

- Notes:
- View to the northwest
 - Photo taken by Tetra Tech on 3/10/2022

Tetra Tech					
TITLE: Marshall Mesa Underground Coal Fire Investigation Snowmelt Image		LOCATION: Marshall Area, Boulder, Colorado		APPROVED JIN	FIGURE 6
		DRAFTED CEC			
		PROJECT# T14-910499			
		DATE 03/16/2022			

AVCO DRMS Mine Fires100-Sites118 - Marshall13 - GIS\Fig 7 Marshall Downhole Temperature Contours.mxd March 2022 christina.coutler



Notes:
 - Coordinate System: NAD 1983 UTM Zone 13N
 - Projection: Transverse Mercator/North American 1983
 - UAS Aerial Imagery Collected by Tetra Tech on 2/9/22
 - Temperature Readings Collected by Tetra Tech on 3/9/22
 - World Imagery Basemap from ESRI, 6/15/2021

Legend

- Borehole Locations
- Marshall Mesa North
- Marshall Mesa South
- Marshall Wildfire Impacted Area
- Southern Snowmelt Area
- Additional Snowmelt Areas
- Temperature Contours (°F)**
- 75°F
- 100°F
- 125°F
- 150°F

TITLE: **Marshall Mesa
Underground Coal Fire Investigation
Top of Coal Seam
Temperature Contour Map - March 9, 2022**

LOCATION: Marshall Area, Boulder, Colorado

	APPROVED	JN	7
	DRAFTED	CEC	
	PROJECT#	114-910499	
	DATE	03/16/2022	

APPENDIX A: PHOTO LOG

Appendix A
 Marshall Mesa Underground Coal Mine Fire Investigation Photolog
 Boulder, CO



PHOTOGRAPH 1 02-17-2022 View of the snowmelt area to the south.



PHOTOGRAPH 2 02-17-2022 View to north across AOI with snowmelt visible.



PHOTOGRAPH 3 Fracture sample location MV07 with animal tracks entering/exiting.



PHOTOGRAPH 4 02-21-2022 Drilling MM-01



PHOTOGRAPH 5 03-06-2022 UAV Snowmelt looking South.



PHOTOGRAPH 6 03-10-22 Snowmelt looking to the south.

Boulder, CO



PHOTOGRAPH 7 03-06-2022 UAV snowmelt looking Northwest.



PHOTOGRAPH 8 02-22-2022 MM-03 Drilling



PHOTOGRAPH 9 02-24-2022 MM-06 Drilling through coal.



PHOTOGRAPH 10 02-24-2022 MM-01 Grouting



PHOTOGRAPH 11 03-06-2022 Possible snowmelt areas north of the AOI.



PHOTOGRAPH 12 03-09-2022 Parking lot possible snowmelt.

APPENDIX B: BOREHOLE LOGS

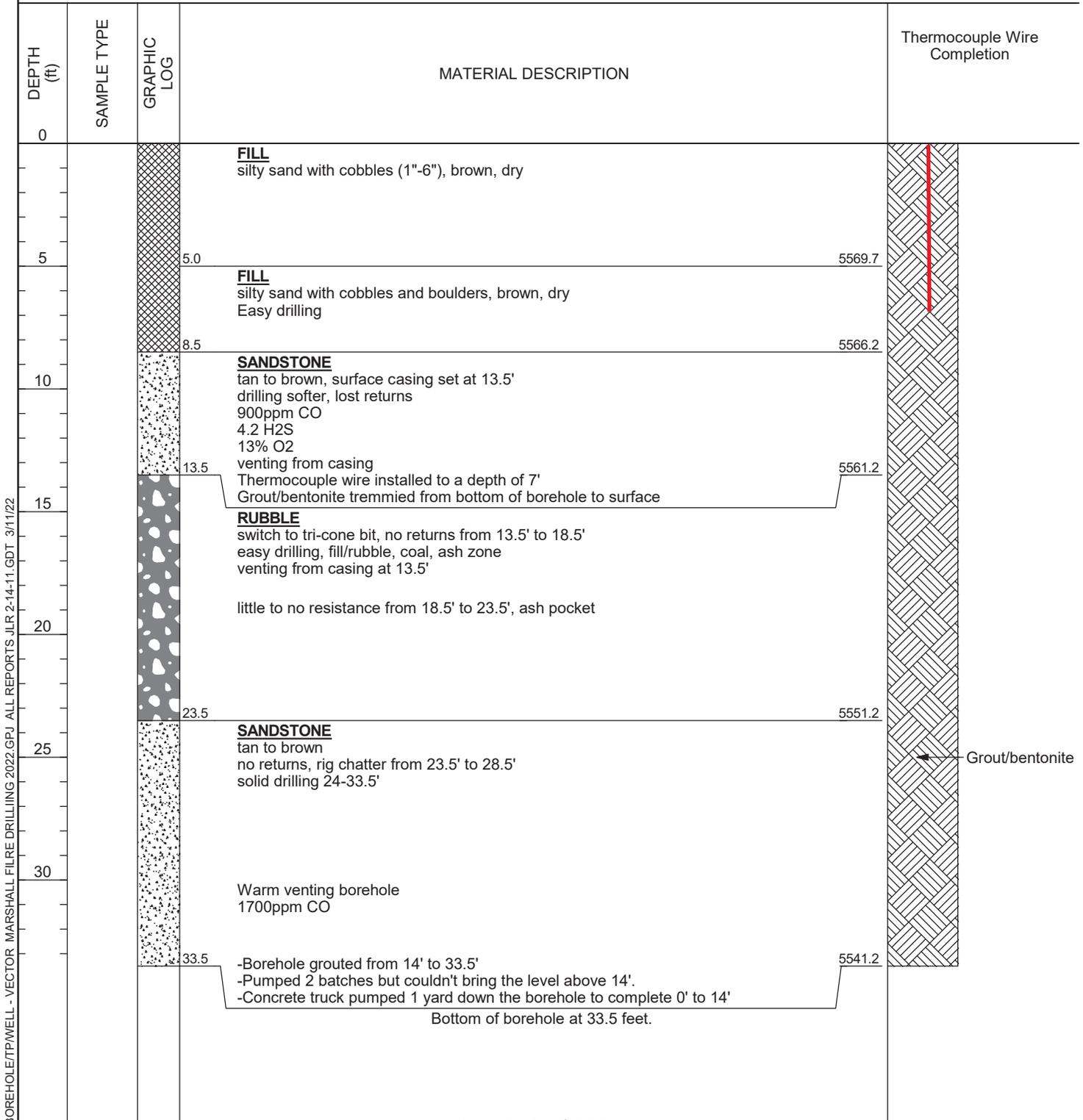


Tetra Tech Inc
 3801 Automation Way, Suite 100
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 Telephone: 970-223-9600
 Fax: 970-223-7171

BOREHOLE ID: MM-01
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 2022
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/21/2022** GROUND ELEVATION: **5575 ft** METHOD: **ODEX**
 CONSULTANT: **Tetra Tech** LATITUDE: **39.952038 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** LONGITUDE: **-105.232111 W** DRILLED BY: **Jake**
 EQUIPMENT: **CME 55** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



BOREHOLE/TP/WELL - VECTOR MARSHALL FILRE DRILLING 2022.GPJ ALL REPORTS JLR 2-14-11.GDT 3/11/22

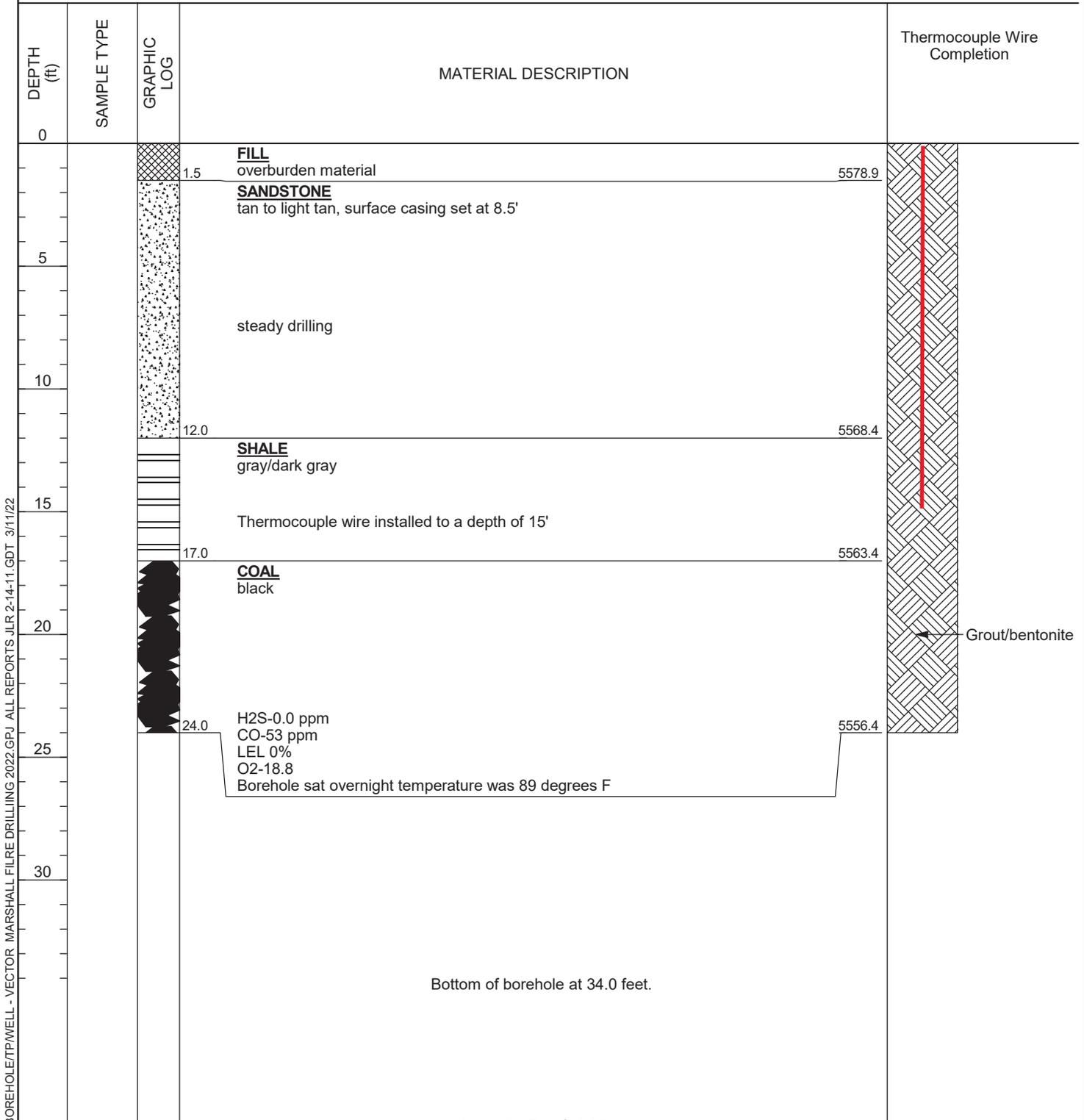


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BOREHOLE ID: MM-02
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 2022
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/21/2022** GROUND ELEVATION: **5580 ft** METHOD: **ODEX**
 CONSULTANT: **Tetra Tech** LATITUDE: **39.951678 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** LONGITUDE: **-105.232449 W** DRILLED BY: **Jake**
 EQUIPMENT: **CME 55** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



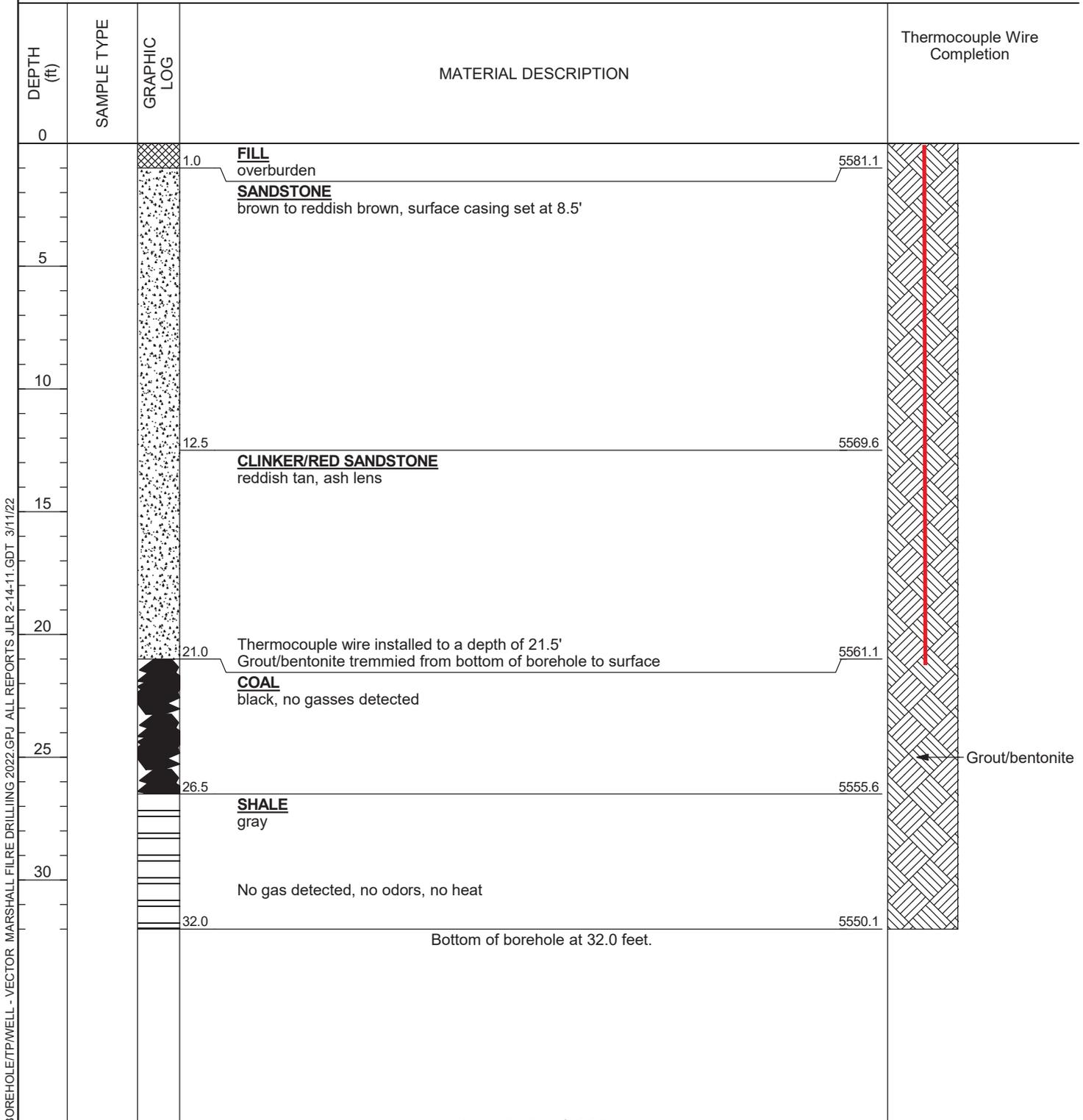


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BOREHOLE ID: MM-03
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 2022
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 02/23/2022 GROUND ELEVATION: 5582 ft METHOD: ODEX
 CONSULTANT: Tetra Tech LATITUDE: 39.951415 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling LONGITUDE: -105.232666 W DRILLED BY: Jake
 EQUIPMENT: CME 55 INCLINATION: Vertical LOCATION: Marshall Mesa



BOREHOLE/TP/WELL - VECTOR MARSHALL FILRE DRILLING 2022.GPJ ALL REPORTS JLR 2-14-11.GDT 3/11/22

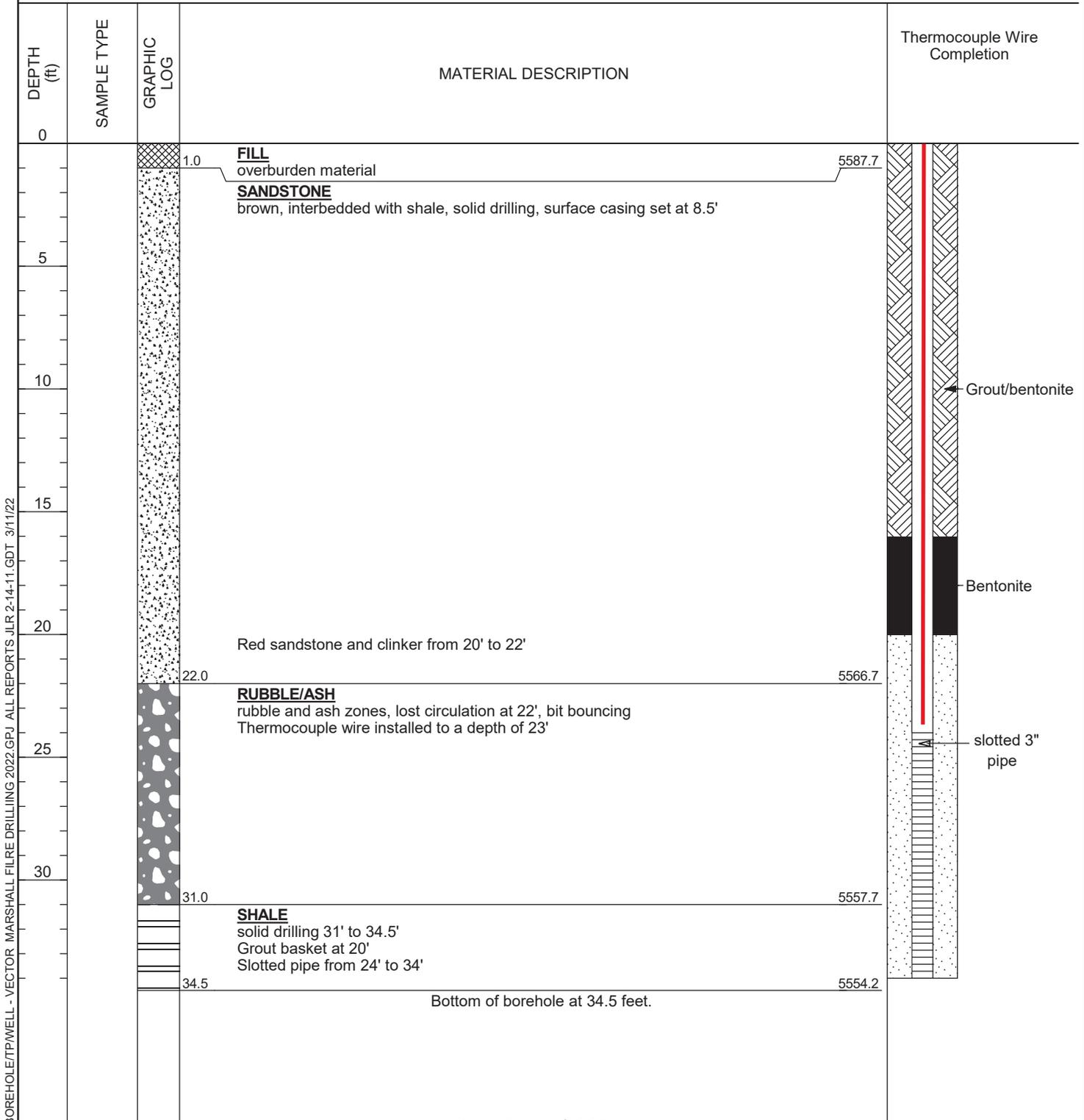


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BOREHOLE ID: MM-04
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 2022
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/22/2022** GROUND ELEVATION: **5589 ft** METHOD: **ODEX**
 CONSULTANT: **Tetra Tech** LATITUDE: **39.951154 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** LONGITUDE: **-105.232891 W** DRILLED BY: **Jake**
 EQUIPMENT: **CME 55** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



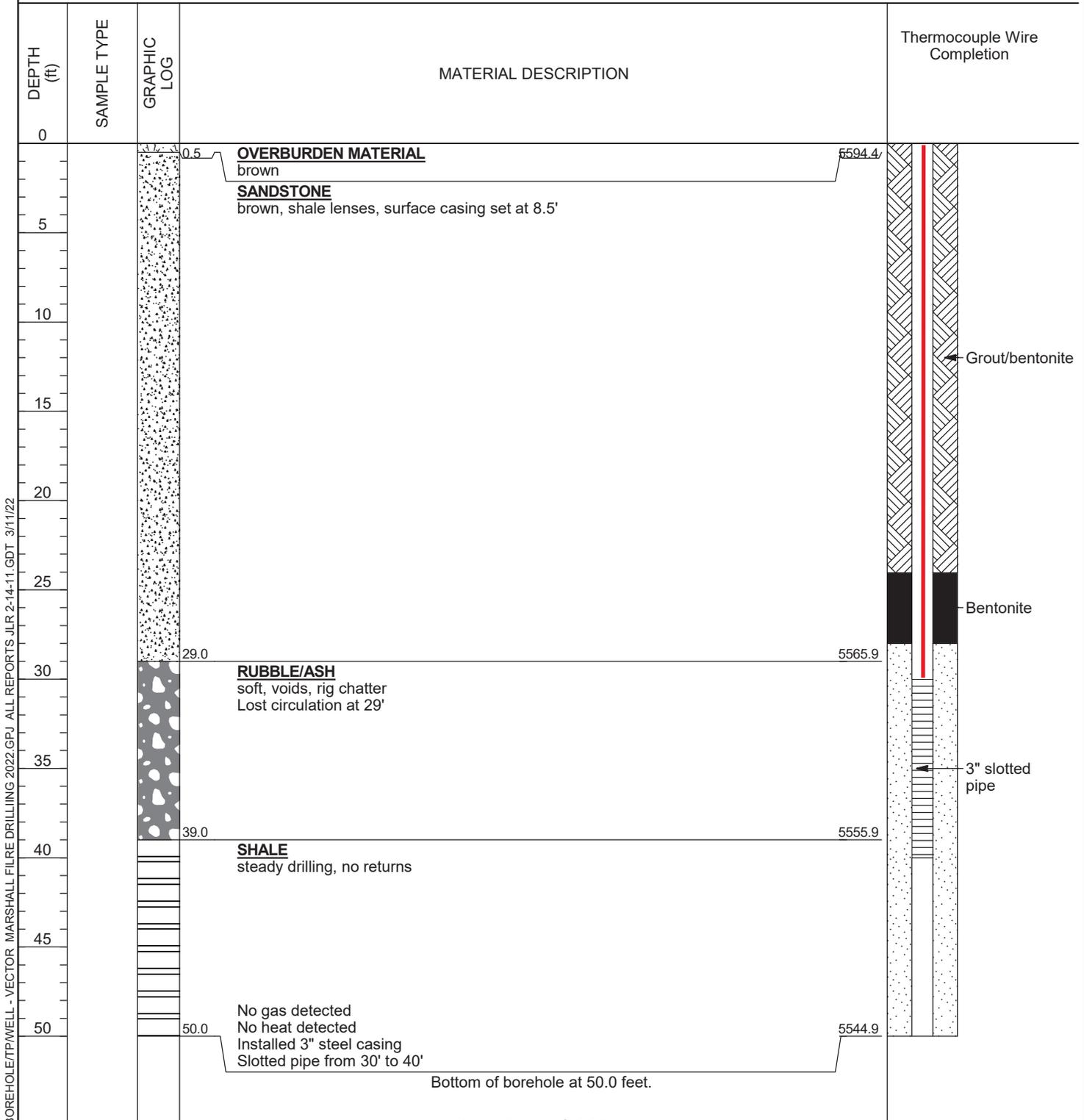


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BOREHOLE ID: MM-05
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 2022
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/23/2022** GROUND ELEVATION: **5595 ft** METHOD: **ODEX**
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 CONTRACTOR: **Authentic Drilling** LONGITUDE: **-105.232997 W** DRILLED BY: **Jake**
 EQUIPMENT: **CME 55** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



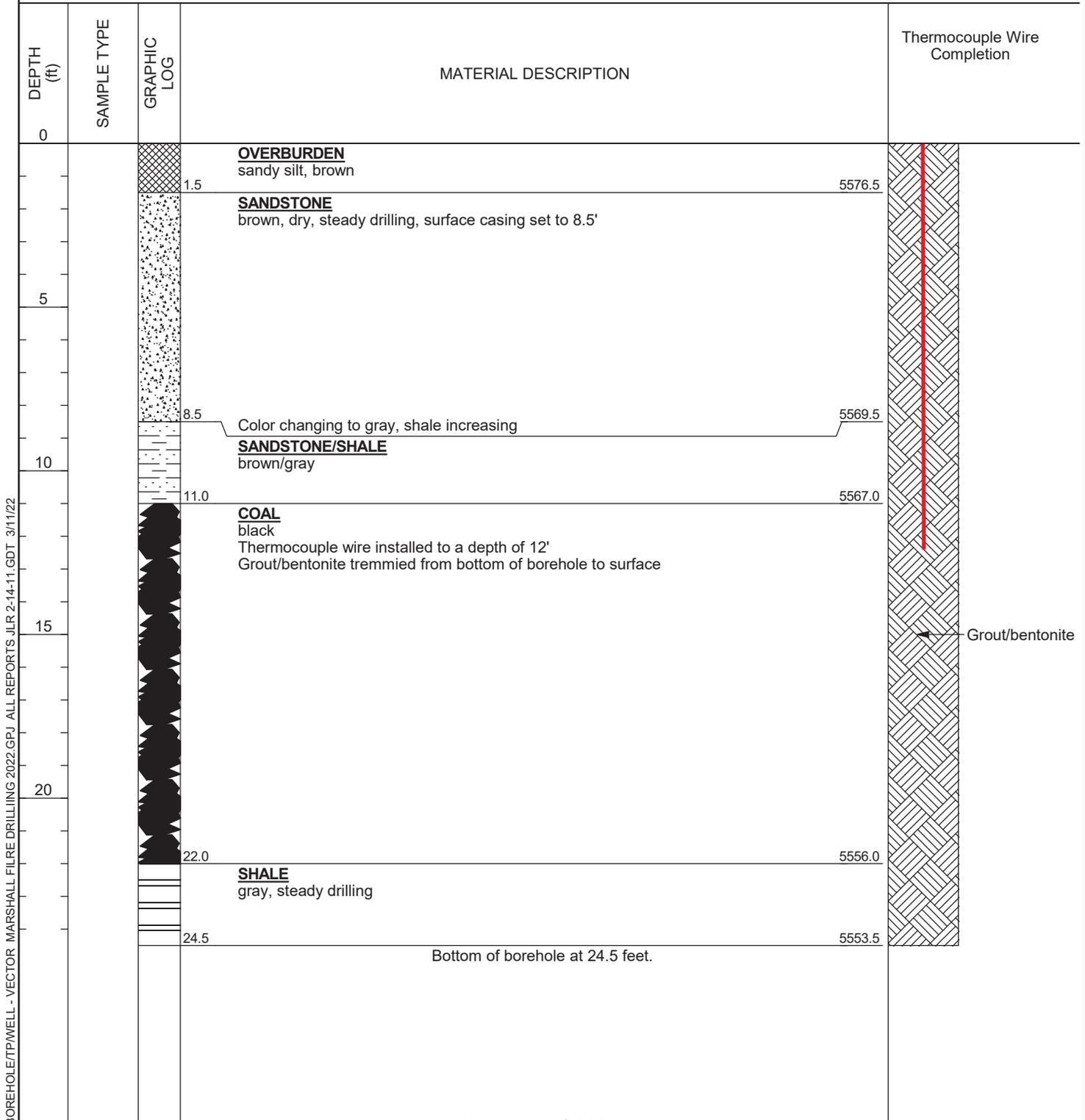


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BOREHOLE ID: MM-06
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 2022
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 02/24/2022 GROUND ELEVATION: 5578 ft METHOD: ODEX
 CONSULTANT: Tetra Tech LATITUDE: 39.951799 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling LONGITUDE: -105.232474 W DRILLED BY: Jake
 EQUIPMENT: CME 55 INCLINATION: Vertical LOCATION: Marshall Mesa



BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022.GPJ ALL REPORTS JLR 2-14-11.GDT 3/11/22

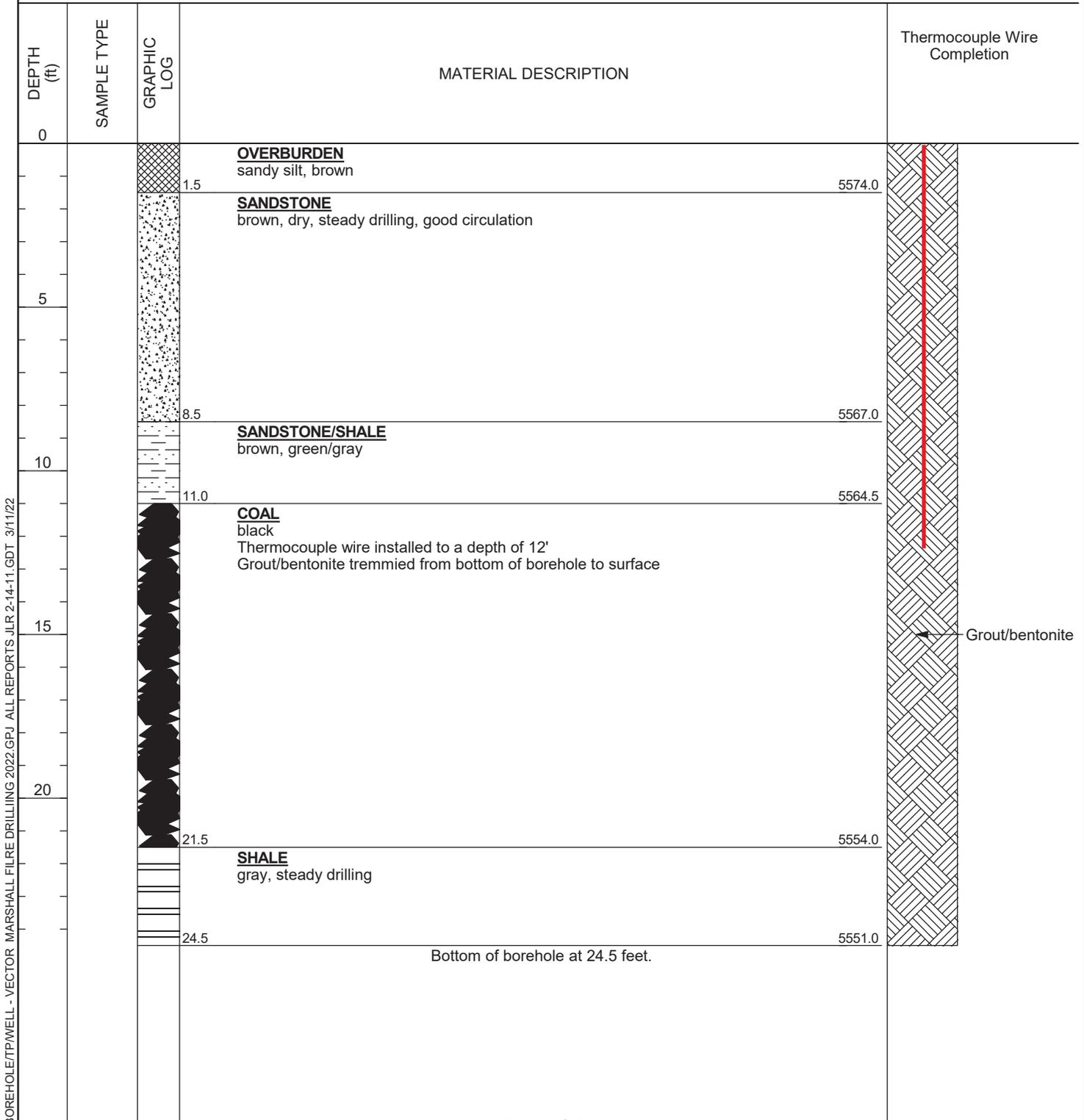


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BOREHOLE ID: MM-07
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 2022
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/24/2022** GROUND ELEVATION: **5576 ft** METHOD: **ODEX**
 CONSULTANT: **Tetra Tech** LATITUDE: **39.952014 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** LONGITUDE: **-105.232266 W** DRILLED BY: **Jake**
 EQUIPMENT: **CME 55** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



BOREHOLE/TP/WELL - VECTOR MARSHALL FILRE DRILLING 2022.GPJ ALL REPORTS JLR 2-14-11.GDT 3/11/22

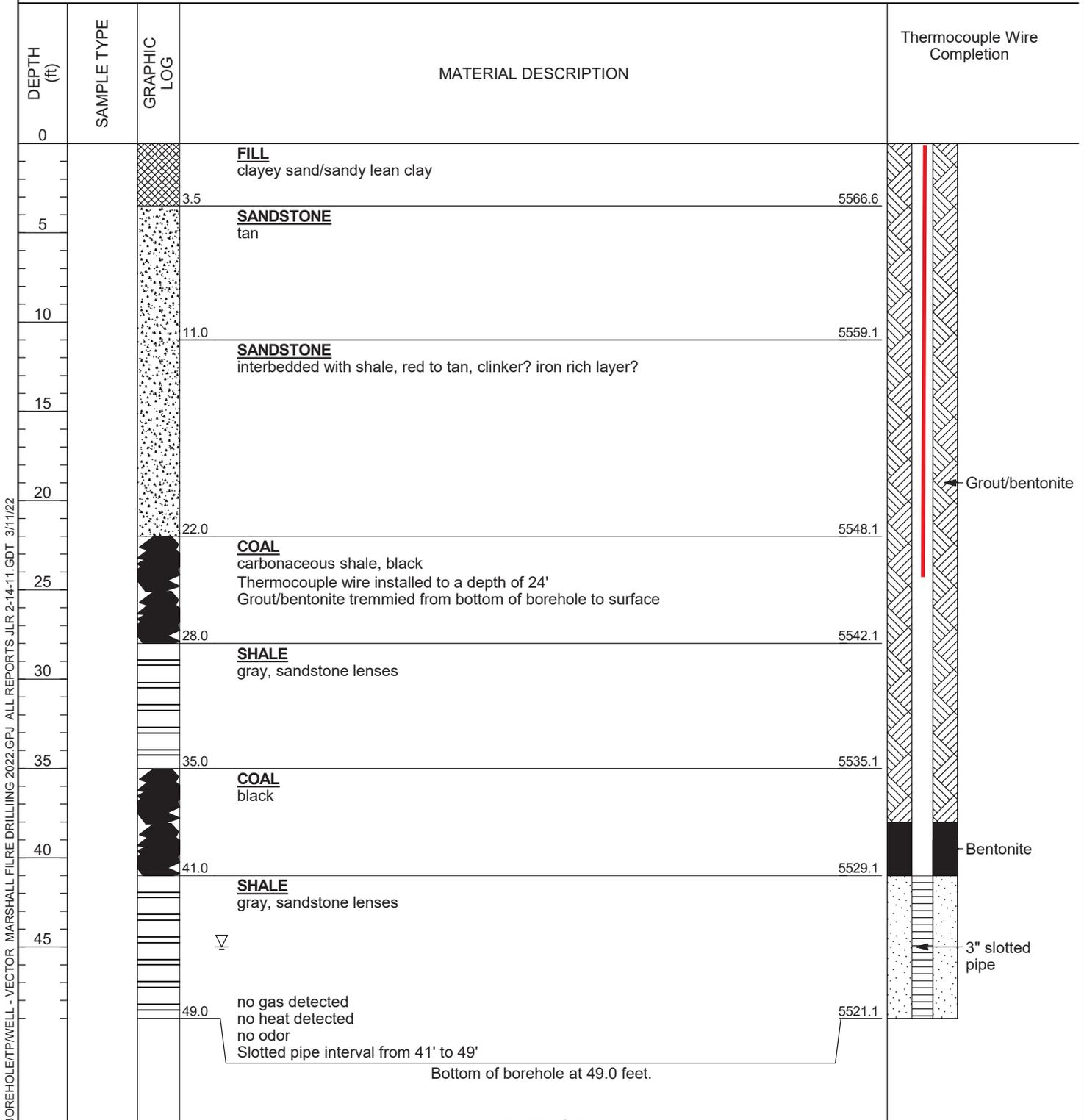


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BOREHOLE ID: MM-08
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 2022
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/24/2022** GROUND ELEVATION: **5570 ft** METHOD: **ODEX**
 CONSULTANT: **Tetra Tech** LATITUDE: **39.952027 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** LONGITUDE: **-105.231949 W** DRILLED BY: **Jake**
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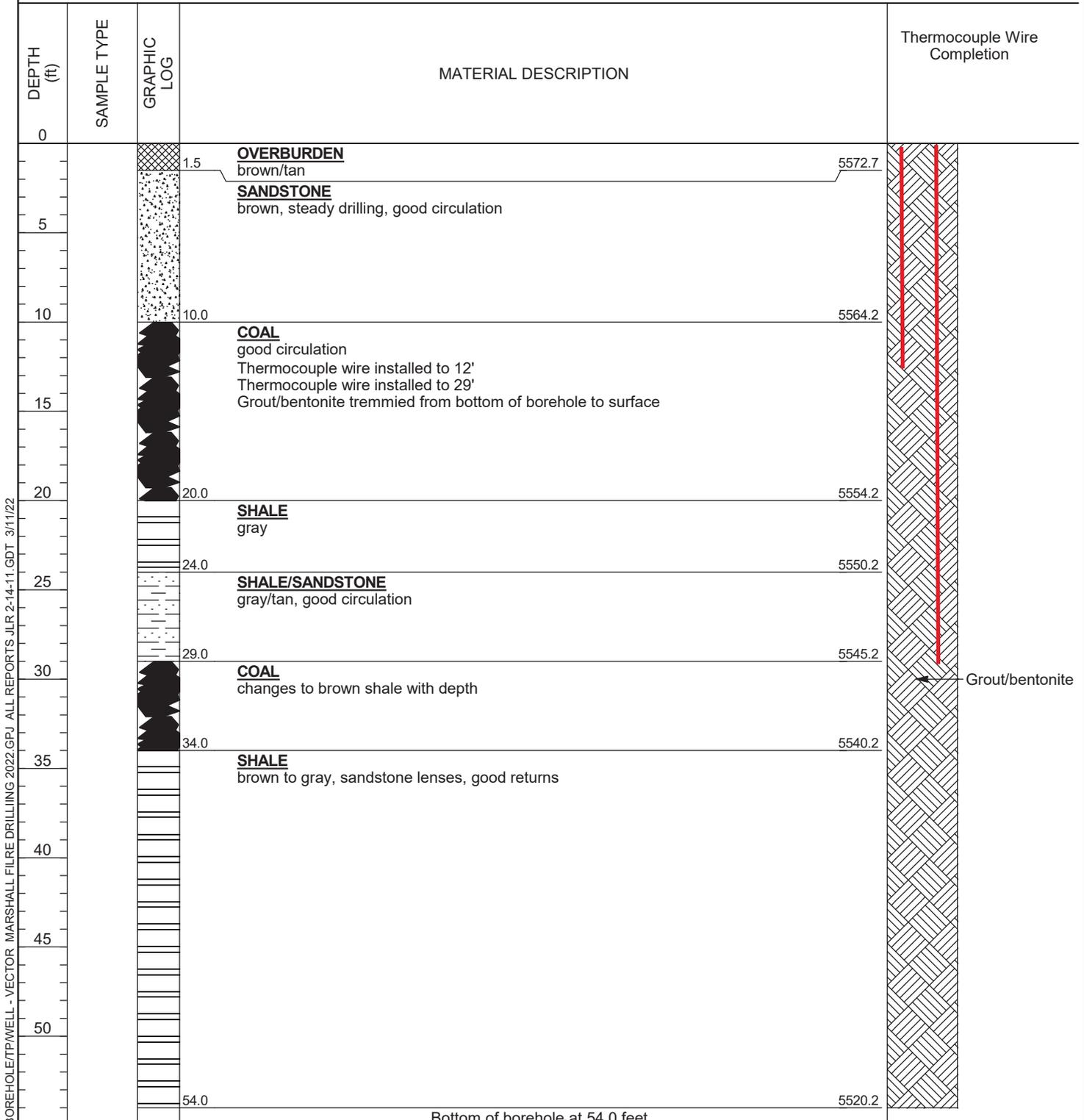


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BOREHOLE ID: MM-09
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 2022
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/24/2022** GROUND ELEVATION: **5574 ft** METHOD: **ODEX**
 CONSULTANT: **Tetra Tech** LATITUDE: **39.952156 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** LONGITUDE: **-105.232168 W** DRILLED BY: **Jake**
 EQUIPMENT: **CME 55** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



BOREHOLE/TP/WELL - VECTOR MARSHALL FILRE DRILLING 2022.GPJ ALL REPORTS JLR 2-14-11.GDT 3/11/22

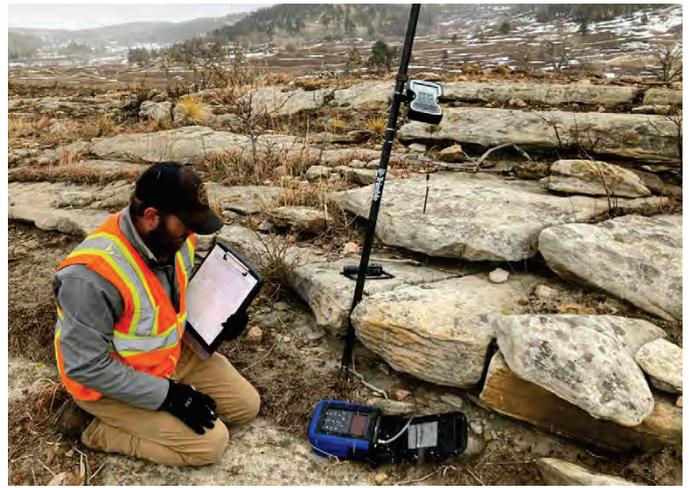
APPENDIX B: Photo Log

APPENDIX B – PHOTO LOG

Marshall Mesa Underground Mine Fire Report of Investigation Photo Log



PHOTOGRAPH 1 Marshall Mesa Trailhead looking southwest, November 2018



PHOTOGRAPH 2 1-14-2022 Gas and Temperature Observations



PHOTOGRAPH 3 2-17-2022 Snowmelt looking West



PHOTOGRAPH 4 2-17-2022 Snowmelt looking South



PHOTOGRAPH 5 2-17-2022 Snowmelt looking North



PHOTOGRAPH 6 03-06-2022 UAV snowmelt looking Northwest.

APPENDIX B – PHOTO LOG

Marshall Mesa Underground Mine Fire Report of Investigation Photo Log



PHOTOGRAPH 7 03-06-2022 UAV parking lot snowmelt



PHOTOGRAPH 8 03-06-2022 UAV Snowmelt looking South.



PHOTOGRAPH 9 03-09-2022 Parking lot snowmelt



PHOTOGRAPH 10 03-10-22 Snowmelt looking to the south.



PHOTOGRAPH 11 2-21-2022 Drilling MM-01



PHOTOGRAPH 12 02-24-2022 MM-01 Grouting

APPENDIX B – PHOTO LOG

Marshall Mesa Underground Mine Fire Report of Investigation Photo Log



PHOTOGRAPH 13 02-22-2022 MM-03 Drilling



PHOTOGRAPH 14 02-24-2022 MM-06 Drilling



PHOTOGRAPH 15 03-06-2023 Set up on MM-26



PHOTOGRAPH 16 02-24-2022 MM-26 Drilling through coal



PHOTOGRAPH 17 03-08-2023 Site overview looking south from parking lot



PHOTOGRAPH 18 03-08-2023 Site overview looking southeast from parking lot

APPENDIX B – PHOTO LOG

Marshall Mesa Underground Mine Fire Report of Investigation Photo Log



PHOTOGRAPH 19 03-08-2023 Site overview looking southwest from parking lot



PHOTOGRAPH 20 MM-21, in foreground



PHOTOGRAPH 21 03-08-2023 Snow melt area borehole location, looking southwest



PHOTOGRAPH 22 View to north. MM-29 in the foreground, Marshall Rd in background.



PHOTOGRAPH 23 Clinker cuttings from MM-47, looking north.



PHOTOGRAPH 24 Drilling MM-36, view to the west.

APPENDIX B – PHOTO LOG

Marshall Mesa Underground Mine Fire Report of Investigation Photo Log



PHOTOGRAPH 25 Setting up on Test Pit 1.



PHOTOGRAPH 26 Fractured sandstone and shale in Test Pit 3.



PHOTOGRAPH 27 Test Pit 4 clinker and coal waste.



PHOTOGRAPH 28 Test Pit 5 in the OSM reclamation area.



PHOTOGRAPH 29 Test Pit 6, coal waste underlain by sandstone.



PHOTOGRAPH 30 Test Pit 7 looking east.

APPENDIX C: Borehole Logs

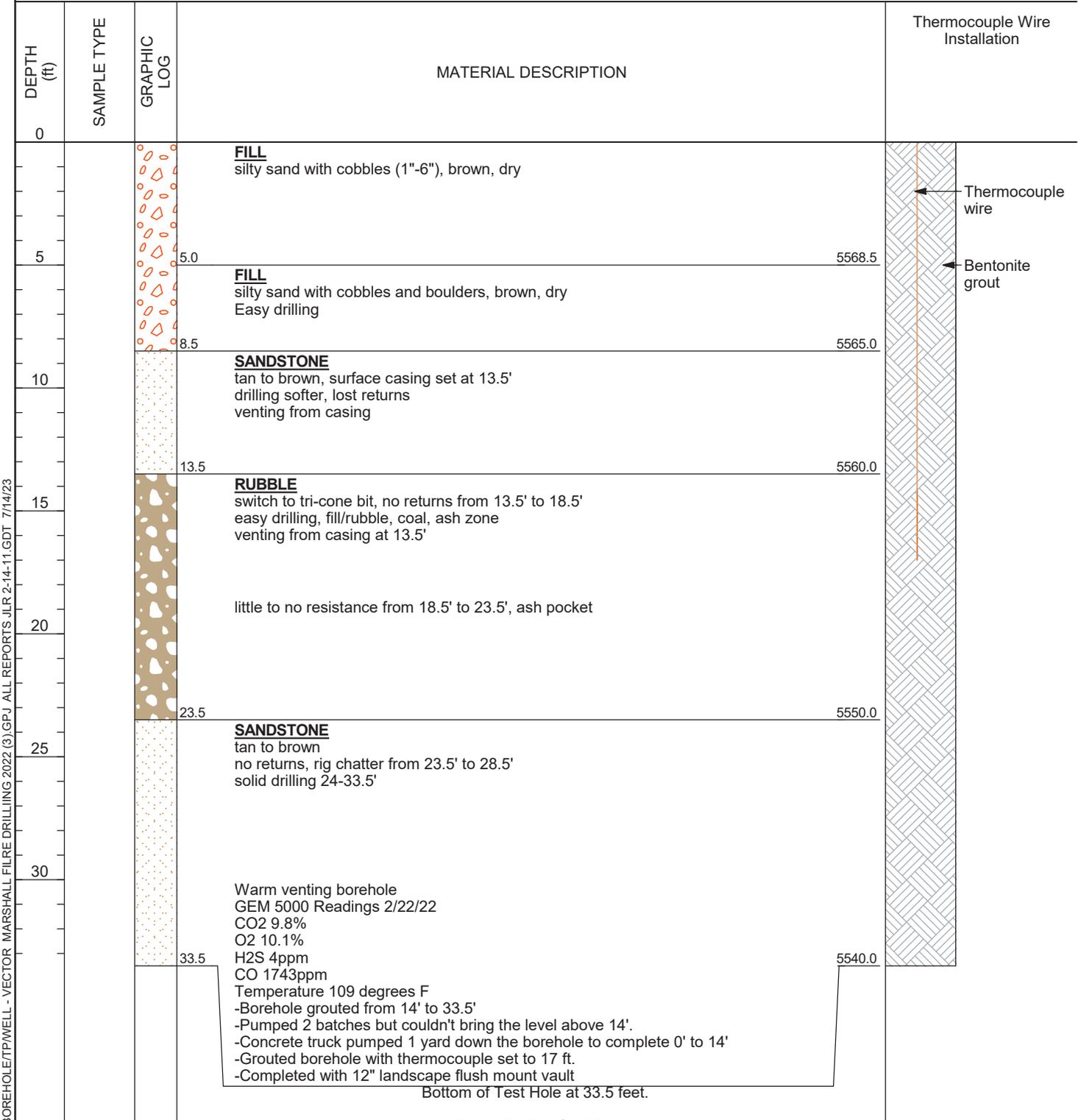


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BOREHOLE ID: MM-01
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/21/2022** GROUND ELEVATION: **5573 ft** METHOD: **ODEX**
 CONSULTANT: **Tetra Tech** NORTHING: **1771800.165000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075111.453000 E** DRILLED BY: **Jacob Bakken**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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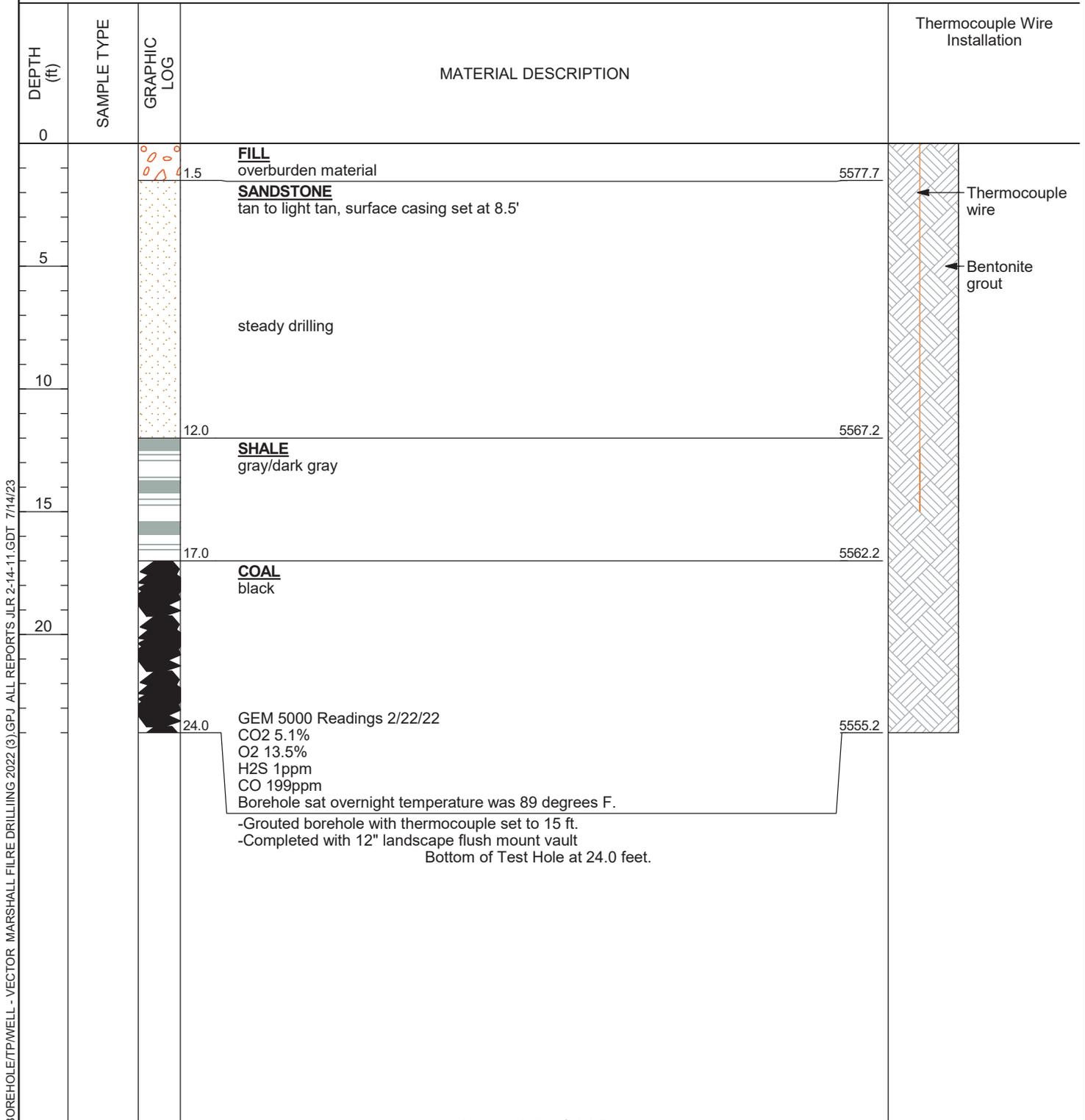


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BOREHOLE ID: MM-02
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/21/2022** GROUND ELEVATION: **5579 ft** METHOD: **ODEX**
 CONSULTANT: **Tetra Tech** NORTHING: **1771657.791000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075010.939000 E** DRILLED BY: **Jacob Bakken**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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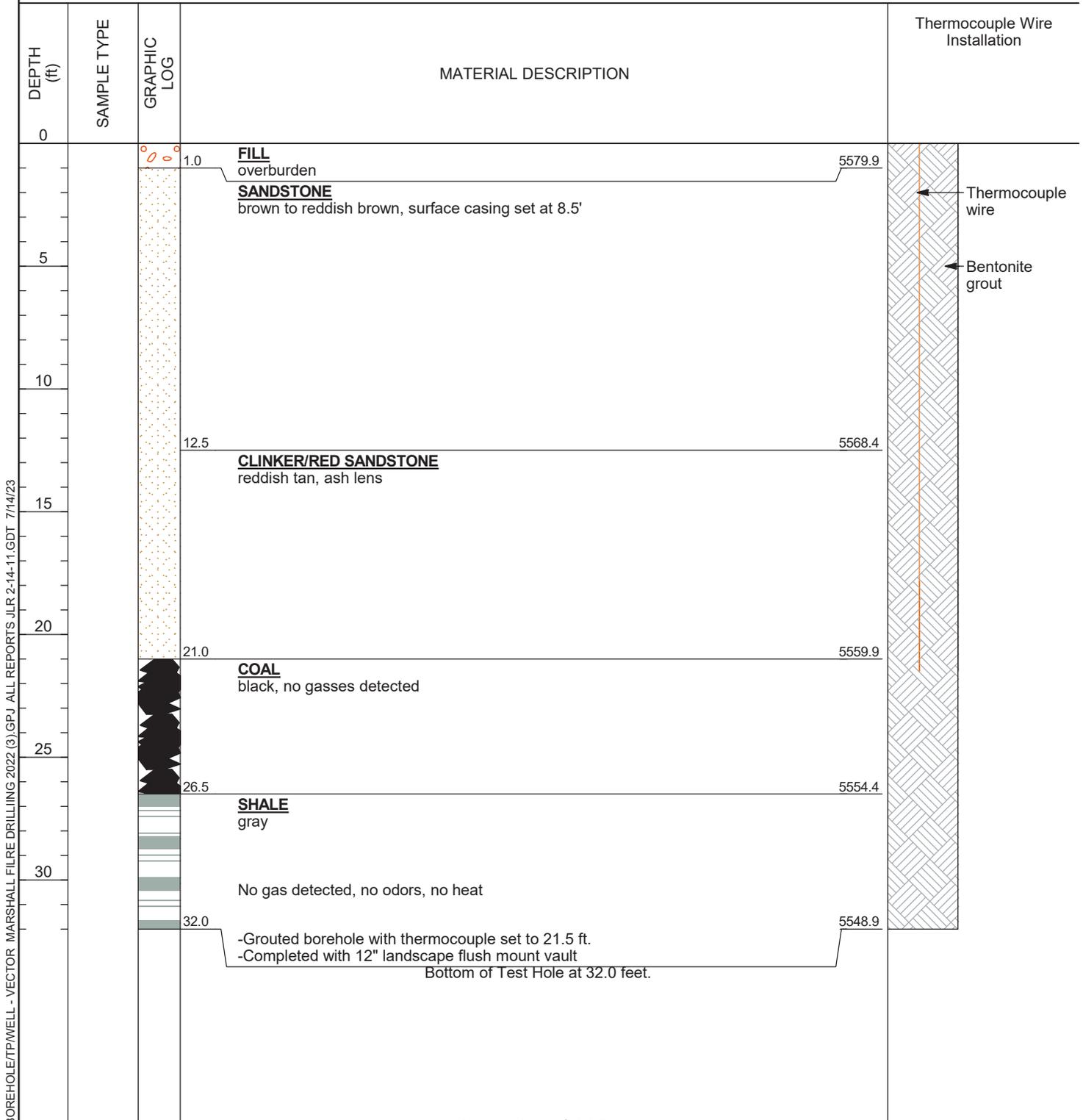


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 F a x : 970-22T-7171

BOREHOLE ID: MM-03
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 02/21/2022 GROUND ELEVATION: 5581 ft METHOD: ODEX
 CONSULTANT: Tetra Tech NORTHING: 1771559.224000 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling EASTING: 3074941.135000 E DRILLED BY: Jacob Bakken
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa



BOREHOLE/TP/WELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

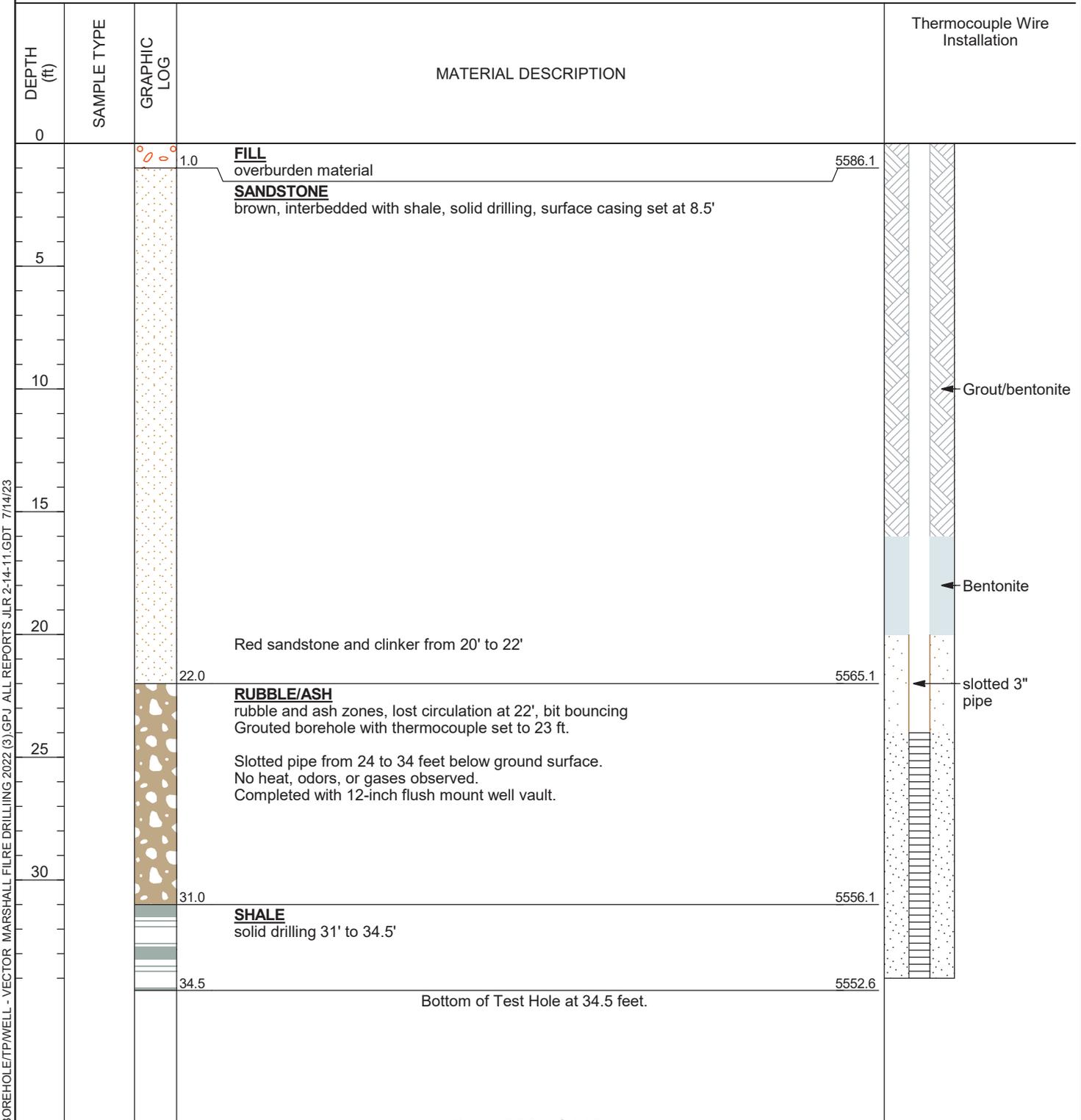


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BOREHOLE ID: MM-04
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/22/2022** GROUND ELEVATION: **5587 ft** METHOD: **ODEX**
 CONSULTANT: **Tetra Tech** NORTHING: **1771460.699000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3074885.349000 E** DRILLED BY: **Jacob Bakken**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



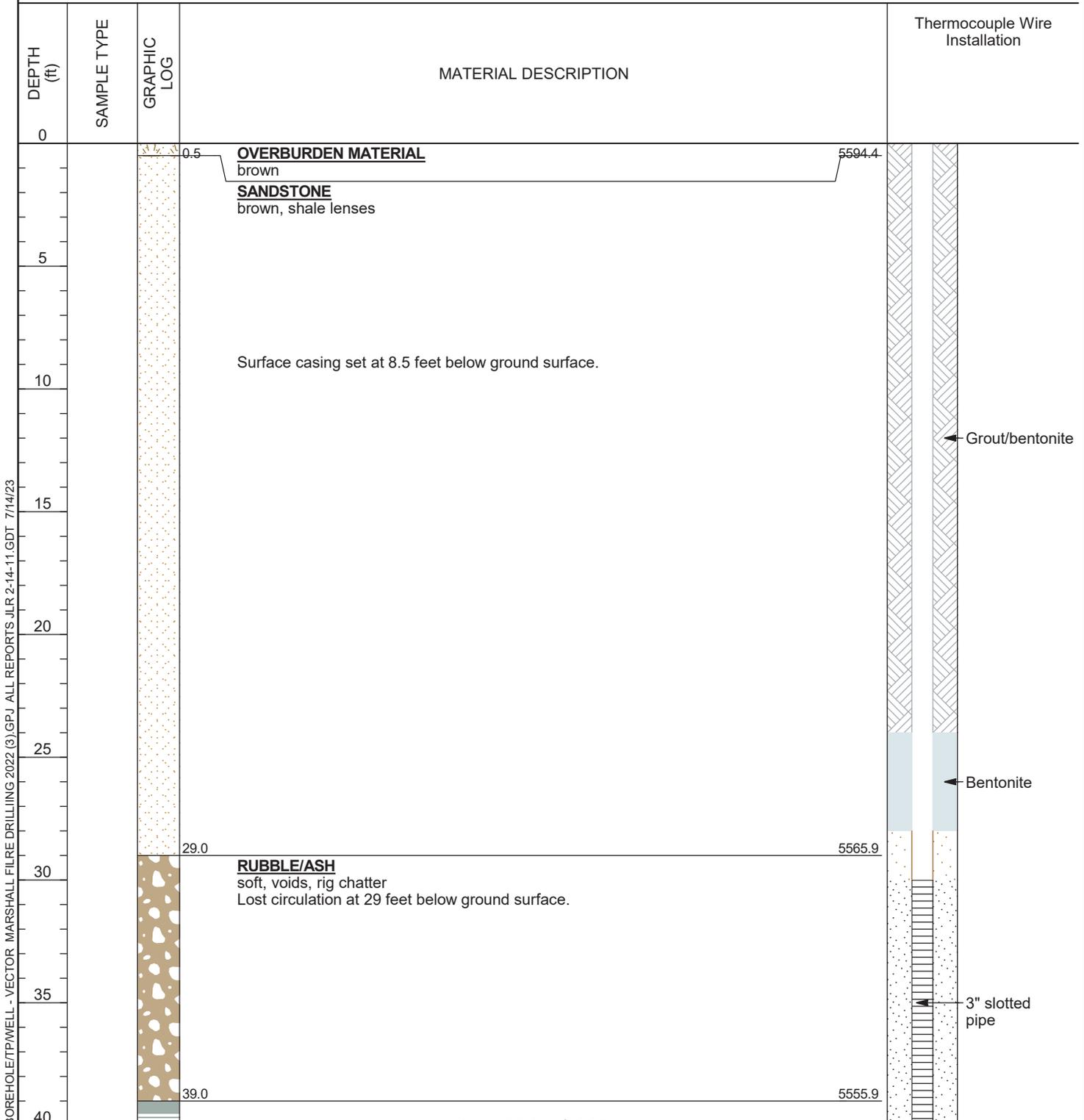


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BOREHOLE ID: MM-05
 PAGE 1 OF 2

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/23/2022** GROUND ELEVATION: **5595 ft** METHOD: **ODEX**
 CONSULTANT: **Tetra Tech** NORTHING: **1771376.811000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3074851.951000 E** DRILLED BY: **Jacob Bakken**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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BOREHOLE ID: MM-05
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			<p>SHALE steady drilling, no returns <i>(continued)</i></p>	
45			<p>No gas detected No heat detected Installed 3-inch steel casing. Slotted pipe from 30 to 40 feet below ground surface.</p>	
50		50.0	<p>Grout basket at 27 feet below ground surface. Grouted borehole with thermocouple set to 27 ft. Completed with 12" landscape flush mount vault Bottom of Test Hole at 50.0 feet.</p>	5544.9

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BOREHOLE ID: MM-06
 PAGE 1 OF 1

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 02/24/2022 GROUND ELEVATION: 5576 ft METHOD: ODEX
 CONSULTANT: Tetra Tech NORTHING: 1771712.403000 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling EASTING: 3074999.563000 E DRILLED BY: Jacob Bakken
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
1.5			OVERBURDEN sandy silt, brown	
5			SANDSTONE brown, dry, steady drilling, surface casing set to 8.5'	Thermocouple wire
8.5			Color changing to gray, shale increasing	Bentonite grout
11.0			SANDSTONE/SHALE brown/gray	
15			COAL black	
22.0			SHALE gray, steady drilling	
24.5			Grouted borehole with thermocouple set to 12 ft. Completed with 12" landscape flush mount vault Bottom of Test Hole at 24.5 feet.	

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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BOREHOLE ID: MM-07
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **02/24/2022** GROUND ELEVATION: **5574 ft** METHOD: **ODEX**
 CONSULTANT: **Tetra Tech** NORTHING: **1771785.461000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075066.637000 E** DRILLED BY: **Jacob Bakken**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
1.5			OVERBURDEN sandy silt, brown 5572.5	<p>Thermocouple wire</p> <p>Bentonite grout</p>
5			SANDSTONE brown, dry, steady drilling, good circulation 5565.5	
8.5			SANDSTONE/SHALE brown, green/gray 5563.0	
11.0			COAL black 5552.5	
21.5			SHALE gray, steady drilling 5549.5	
24.5			Grouted borehole with thermocouple set to 12 ft. Completed with 12" landscape flush mount vault Bottom of Test Hole at 24.5 feet.	

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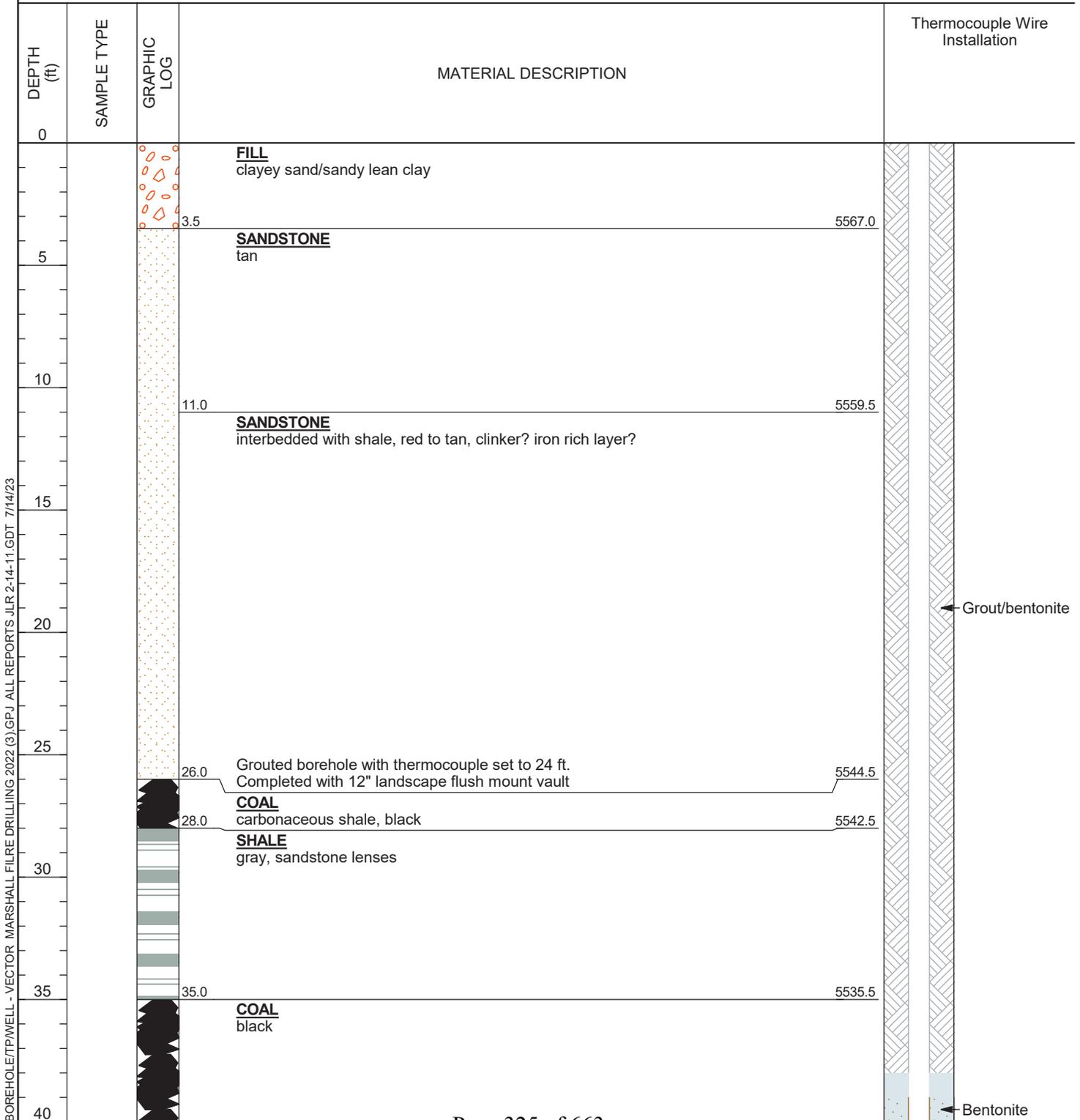


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BOREHOLE ID: MM-08
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 02/24/2022 GROUND ELEVATION: 5571 ft METHOD: ODEX
 CONSULTANT: Tetra Tech NORTHING: 1771789.344000 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling EASTING: 3075147.934000 E DRILLED BY: Jacob Bakken
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa



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BOREHOLE ID: MM-08

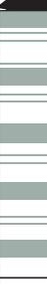
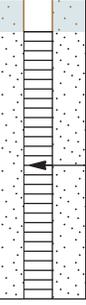
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CLIENT State of Colorado DRMS

PROJECT NAME Marshall Drilling 202T

PROJECT NUMBER 114-910599

PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
45			<p>41.0 SHALE gray, sandstone lenses</p> <p>5529.5</p> <p style="text-align: center;">▽</p> <p>no gas detected no heat detected no odor</p> <p>49.0</p> <p>5521.5</p> <p>Installed 49 feet of steel casing. Grout basket at 40 feet below ground surface and grouted to the surface. Slotted pipe interval from 41 to 49 feet below ground surface. Water level 45 feet below ground surface. Completed with 12-inch flush mount well vault. Bottom of Test Hole at 49.0 feet.</p>	 <p>3" slotted pipe</p>

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

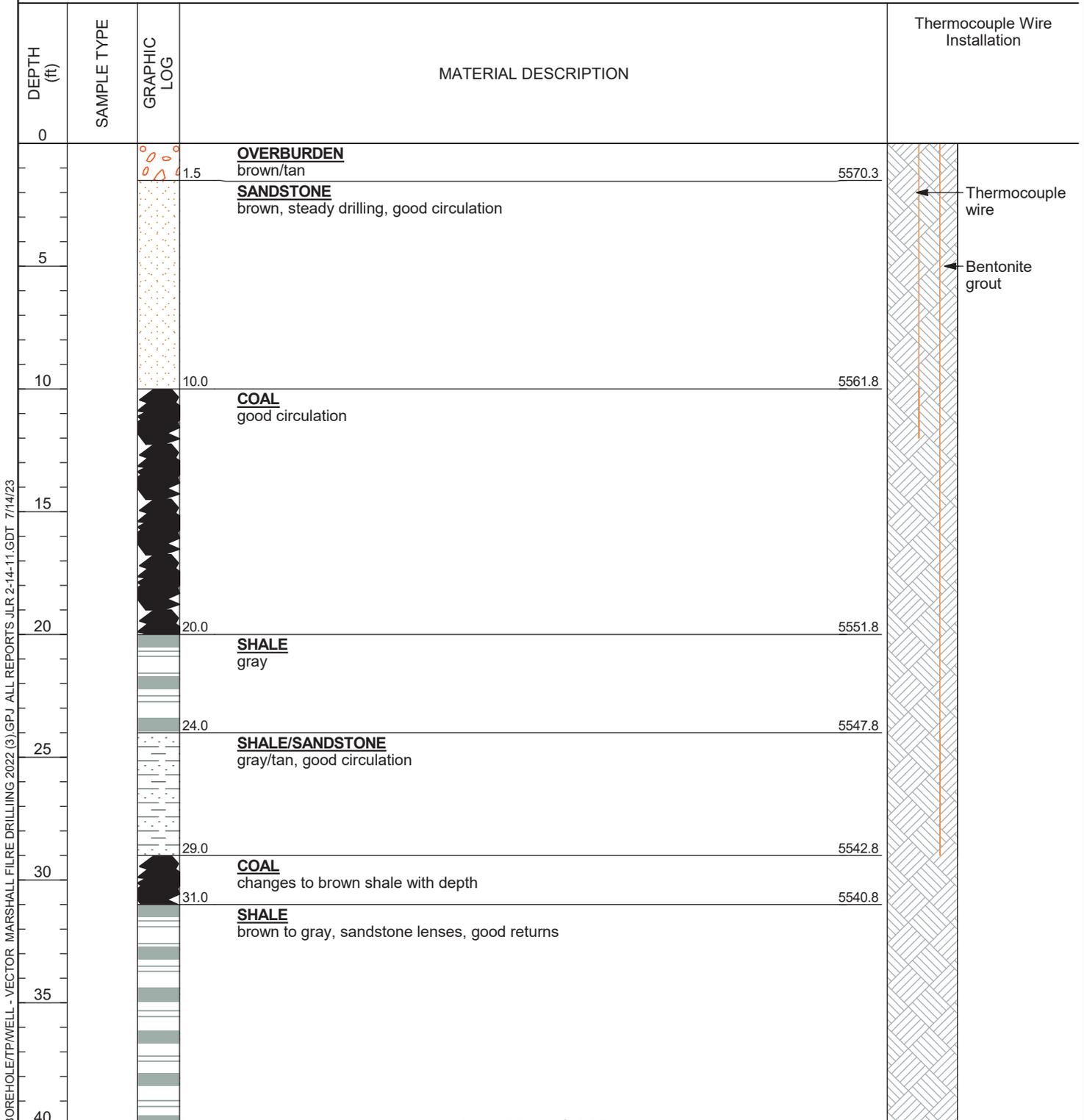


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BOREHOLE ID: MM-09
 PAGE 1 OF 2

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 02/24/2022 GROUND ELEVATION: 5572 ft METHOD: ODEX
 CONSULTANT: Tetra Tech NORTHING: 1771853.591000 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling EASTING: 3075099.954000 E DRILLED BY: Jacob Bakken
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa



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BOREHOLE ID: MM-09
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			SHALE brown to gray, sandstone lenses, good returns (<i>continued</i>)	
45				
50				
54.0				5517.8
			First thermocouple wire installed to 12 feet below ground surface. Second thermocouple wire installed to 29 feet below ground surface. Completed with 12-inch flush mount well vault. Bottom of Test Hole at 54.0 feet.	

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BOREHOLE ID: MM-10
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **04/03/2023** GROUND ELEVATION: **5580 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771587.947000 N** LOGGED BY: **Zach Spence**
 CONTRACTOR: **Authentic Drilling** EASTING: **3074910.982000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0.5			TOPSOIL Brown 5579.2	
5.0			SANDSTONE Tan, dry, hard, drill chatter to 2 feet Softer, color changed to tan to tannish brown 5574.7	Thermocouple wire
12.0			CLINKER SANDSTONE Red to reddish tan, some chatter at hard lenses 5567.7	Bentonite grout
17.0			RUBBLE Poor returns of red, fast drilling Loss of circulation 5562.7	
32.0			SHALE Firm, no returns, steady drilling Poor returns of dark gray shale to 20 feet Loss of returns Good returns of gray shale, drill chatter to 27 feet Steady drilling 5547.7	
36.0			COAL Black, soft 5543.7	
39.0			SHALE Dark brown to dark gray, steady drilling 5540.7	
Grouted borehole with thermocouple set to 12 ft.				

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BOREHOLE ID: MM-10

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CLIENT State of Colorado DRMS

PROJECT NAME Marshall Drilling 202T

PROJECT NUMBER 114-910599

PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
			<p>Completed with 6" landscape flush mount vault No heat, odors, or gases were observed. Bottom of Test Hole at 39.0 feet.</p>	

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BOREHOLE ID: MM-11MW
 PAGE 1 OF 2

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **04/03/2023** GROUND ELEVATION: **5579 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771664.306000 N** LOGGED BY: **Zach Spence**
 CONTRACTOR: **Authentic Drilling** EASTING: **3074952.628000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0			SANDSTONE Tan to light gray, dry, hard	
5		5.0 5574.1	INTERBEDDED SHALE AND SANDSTONE Dark gray to tan, fast drilling	
7.0		7.0 5572.1	COAL Black, soft, set thermocouple wire at 7 feet	
10				
15				
17.5		17.5 5561.6	SHALE Gray to dark gray, some coal content in upper 6 inches, hard, slower drilling	
20				
25				
26.0		26.0 5553.1	SANDSTONE Tan to light gray, moist, hard	
28.0		28.0 5551.1	SHALE Gray, slightly moist	
30.0		30.0 5549.1	COAL Black	
35				
35.0		35.0 5544.1	SHALE Gray to dark brown, slightly moist, some coal content in upper foot, steady drilling	
40				

BOREHOLE/TP/WELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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BOREHOLE ID: MM-11MW
 PAGE 2 OF 2

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			<p>SHALE Gray to dark brown, slightly moist, some coal content in upper foot, steady drilling (continued)</p>	
		44.0	Drill chatter	
			Screen placed to 30 feet and sand added to 2 feet below ground surface. Bottom of Test Hole at 44.0 feet.	

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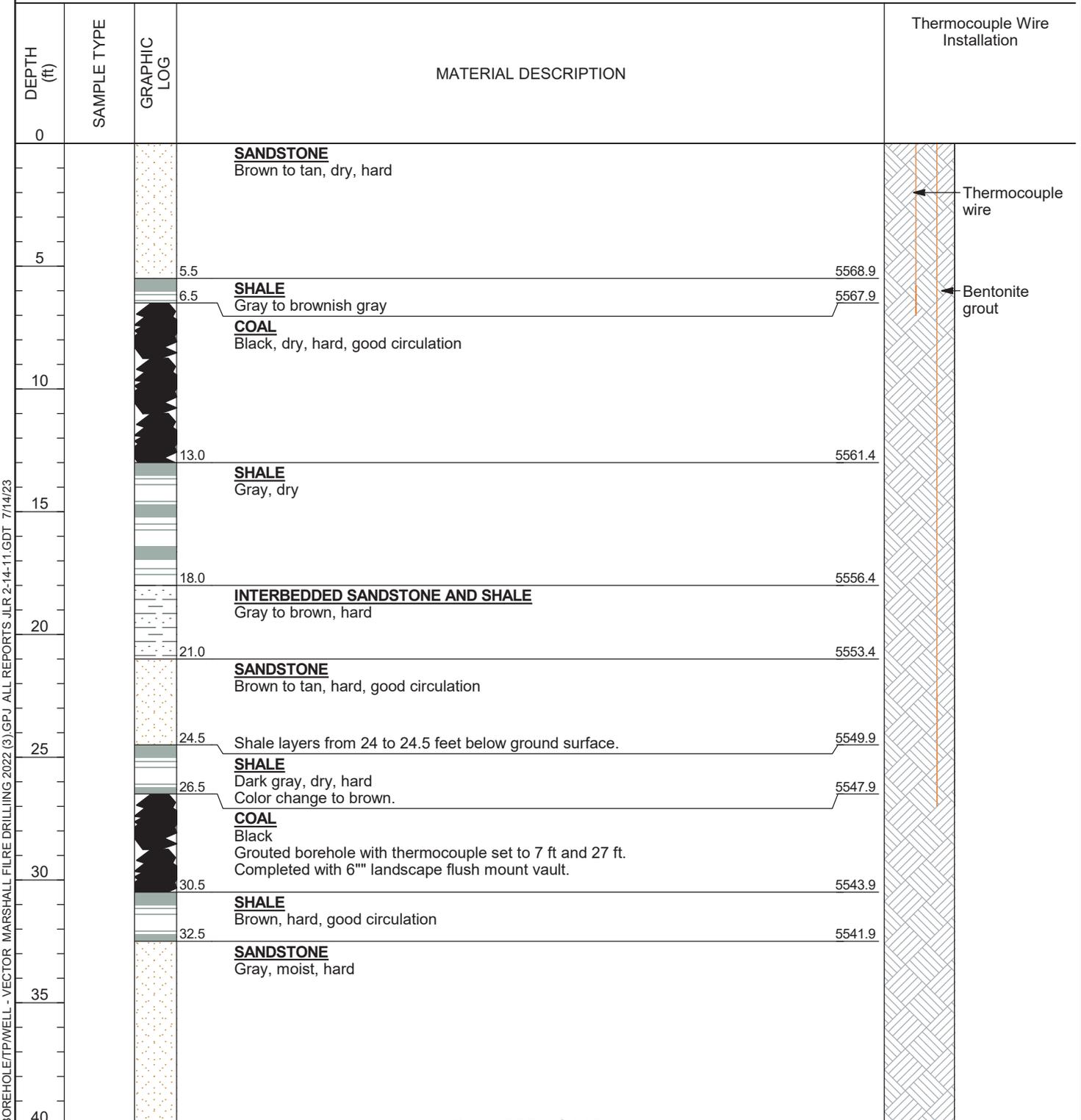


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BOREHOLE ID: MM-12
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **04/03/2023** GROUND ELEVATION: **5574 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771752.504000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3074997.897000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



BOREHOLE/TP/WELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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BOREHOLE ID: MM-12
 PAGE 2 OF 2

CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			<p>SANDSTONE Gray, moist, hard <i>(continued)</i></p>	
45				
			<p>46.0 5528.4</p> <p>SHALE Gray, hard</p>	
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				
				



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BOREHOLE ID: MM-13
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **04/03/2023** GROUND ELEVATION: **5570 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771848.433000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075050.509000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0.5			TOPSOIL 5569.5	<p>Thermocouple wire</p> <p>Bentonite grout</p>
			SANDSTONE Brown to tan, dry	
4.5			5565.5	
5.0			SHALE Brown, dry, hard	
7.5			COAL Black	
			5562.5	
			SHALE Gray to brown	
10			Gray	
			Gray and brown layers	
13.5			5556.5	
14.5			SANDSTONE Brown	
15.5			5555.5	
16.5			SHALE Gray	
			5554.5	
			SANDSTONE Tan to gray	
20			5553.5	
			SHALE Gray to dark gray, dry, hard	
21.0			5549.0	
22.5			COAL Black	
23.0			5547.5	
			SHALE Thin layer	
25			5547.0	
			COAL Black	
25.0			5545.0	
26.0			INTERBEDDED SHALE AND SANDSTONE Gray	
			5544.0	
			SANDSTONE Gray, hard, steady drilling	
29.5			5540.5	
			Grouted borehole with thermocouple set to 6 ft. Completed with 6" landscape flush mount vault.	
			No heat, odors, or gases were observed. Bottom of Test Hole at 29.5 feet.	

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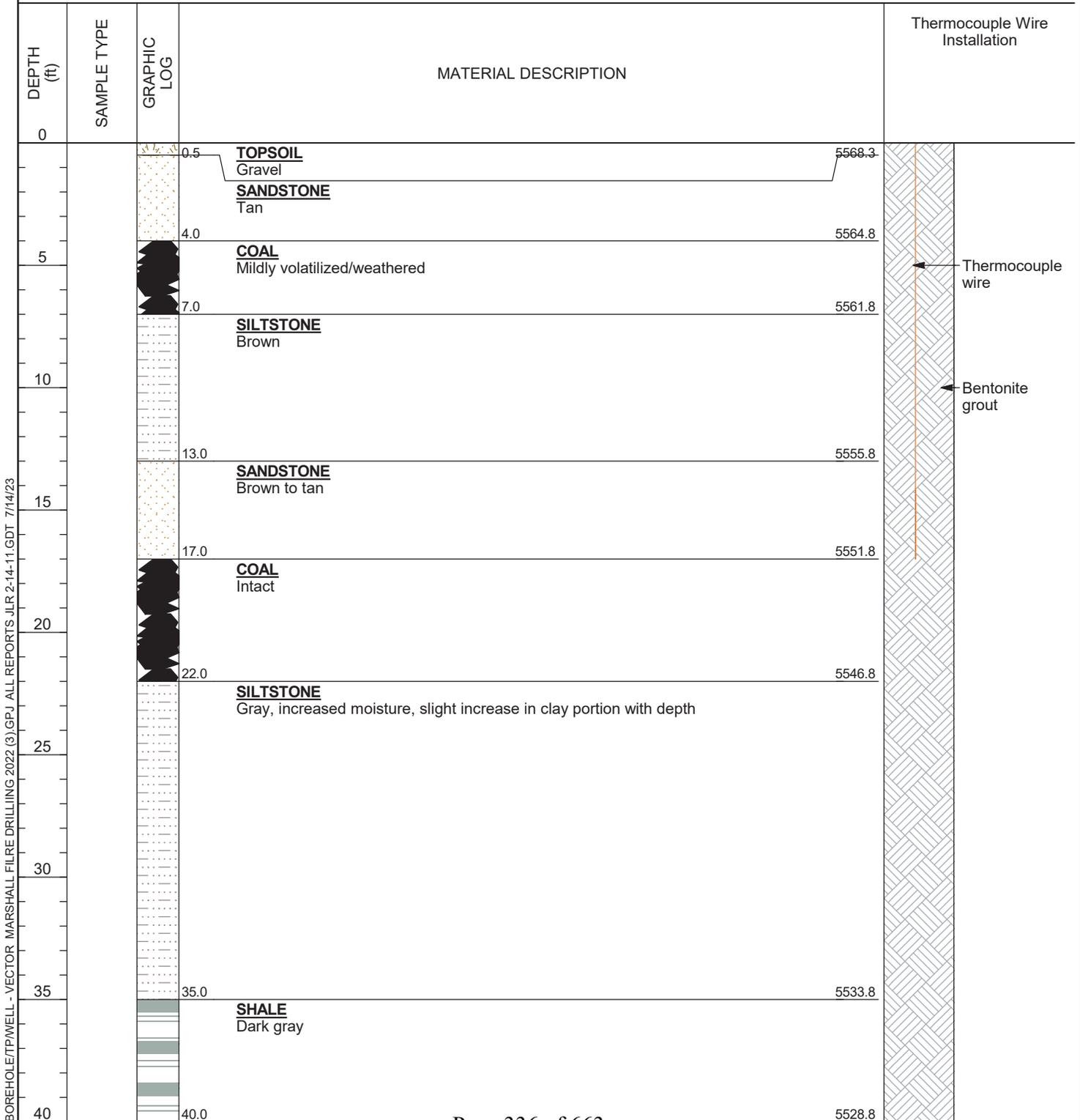


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/30/2023** GROUND ELEVATION: **5569 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771922.767000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075087.597000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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CLIENT State of Colorado DRMS

PROJECT NAME Marshall Drilling 202T

PROJECT NUMBER 114-910599

PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
			Grouted borehole with thermocouple set to 17 ft. Completed with 6" landscape flush mount vault. Bottom of Test Hole at 40.0 feet.	

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

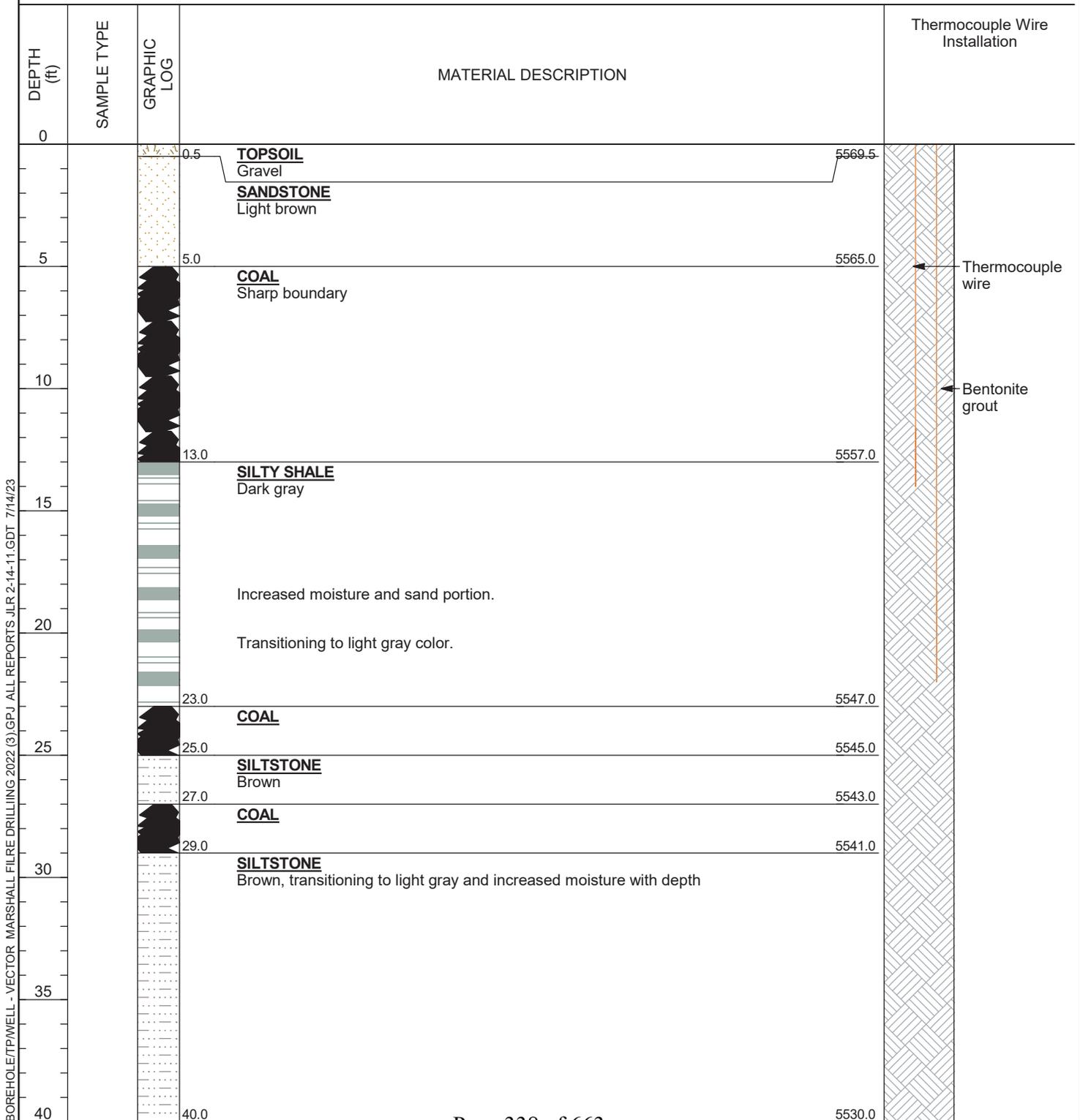


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/30/2023** GROUND ELEVATION: **5570 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771951.843000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075151.684000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**





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BOREHOLE ID: MM-15
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CLIENT State of Colorado DRMS **PROJECT NAME** Marshall Drilling 202T
PROJECT NUMBER 114-910599 **PROJECT LOCATION** Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
			Grouted borehole and thermocouple wires set at 14 and 22 feet below ground surface. Completed with 6-inch flush mount irrigation vault. No heat, odors, or gases were observed. Bottom of Test Hole at 40.0 feet.	

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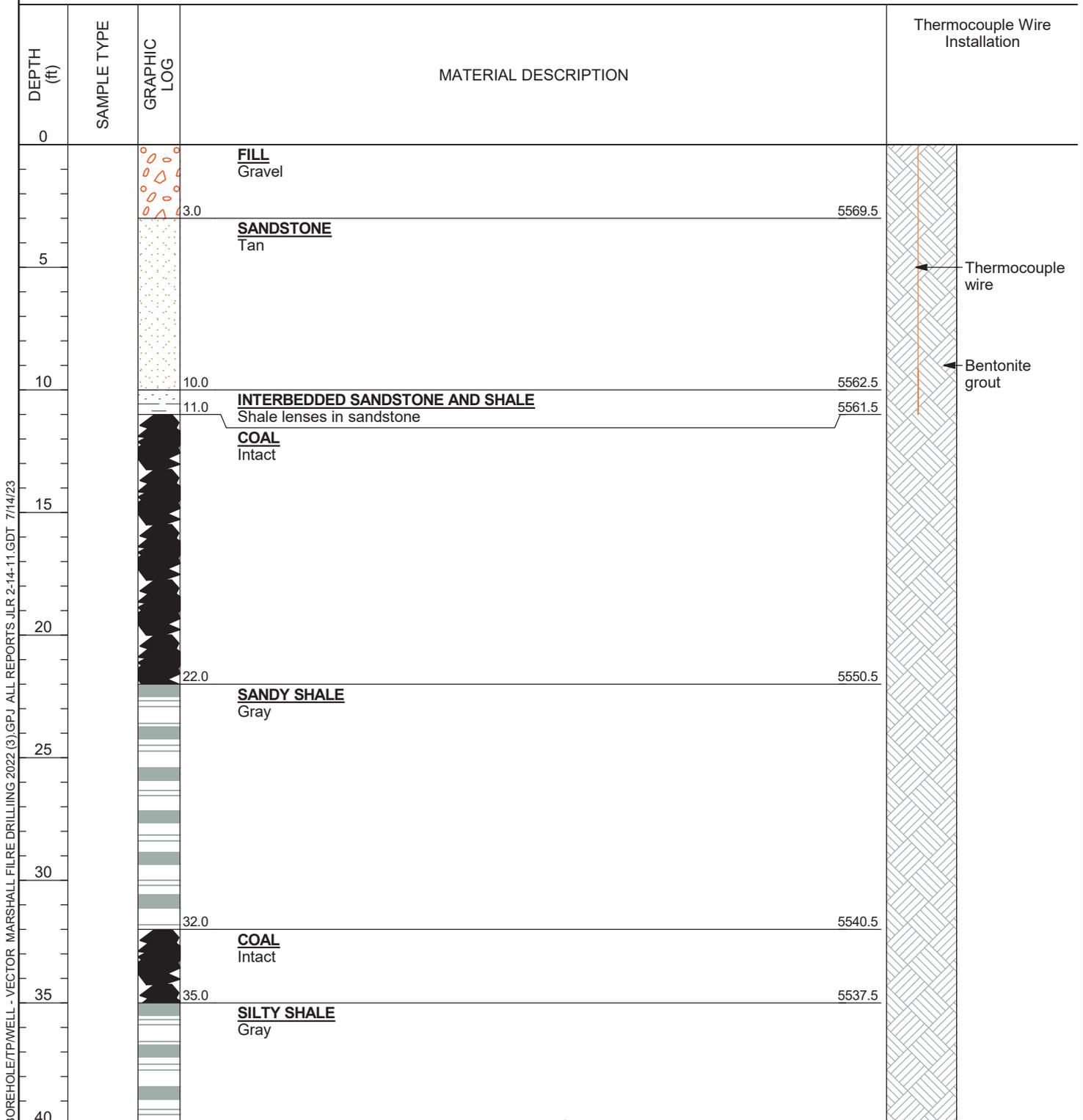


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 03/30/2023 GROUND ELEVATION: 5572 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1771859.370000 N LOGGED BY: Dan Bochicchio
 CONTRACTOR: Authentic Drilling EASTING: 3075133.925000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa



BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			SILTY SHALE Gray (continued)	
45		45.0	Grouted borehole with thermocouple set to 11 ft. Completed with 6" landscape flush mount vault. No heat or odors observed. Bottom of Test Hole at 45.0 feet.	5527.5

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

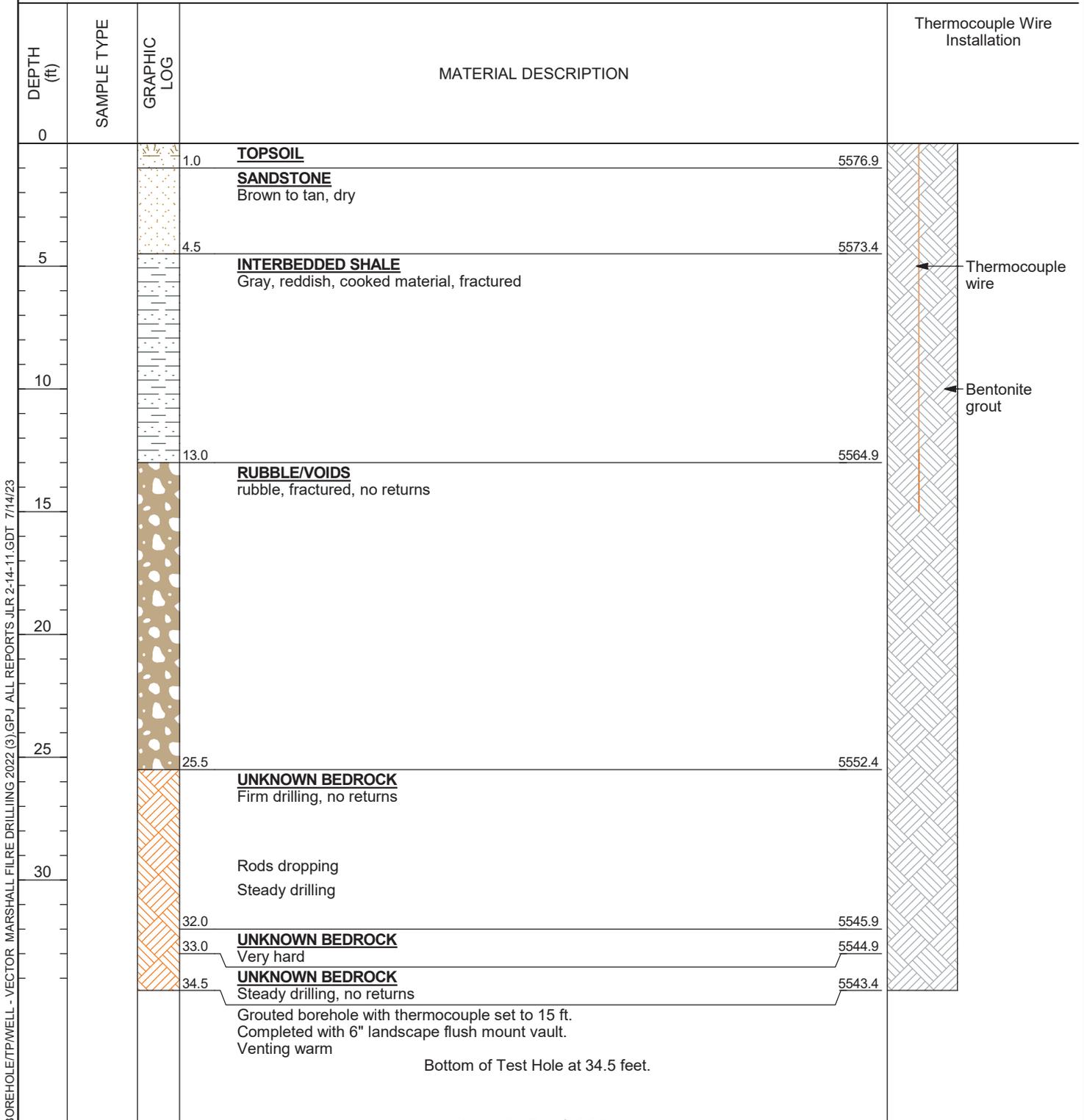


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **04/05/2023** GROUND ELEVATION: **5578 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771658.140000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075062.436000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



BOREHOLE/TP/WELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

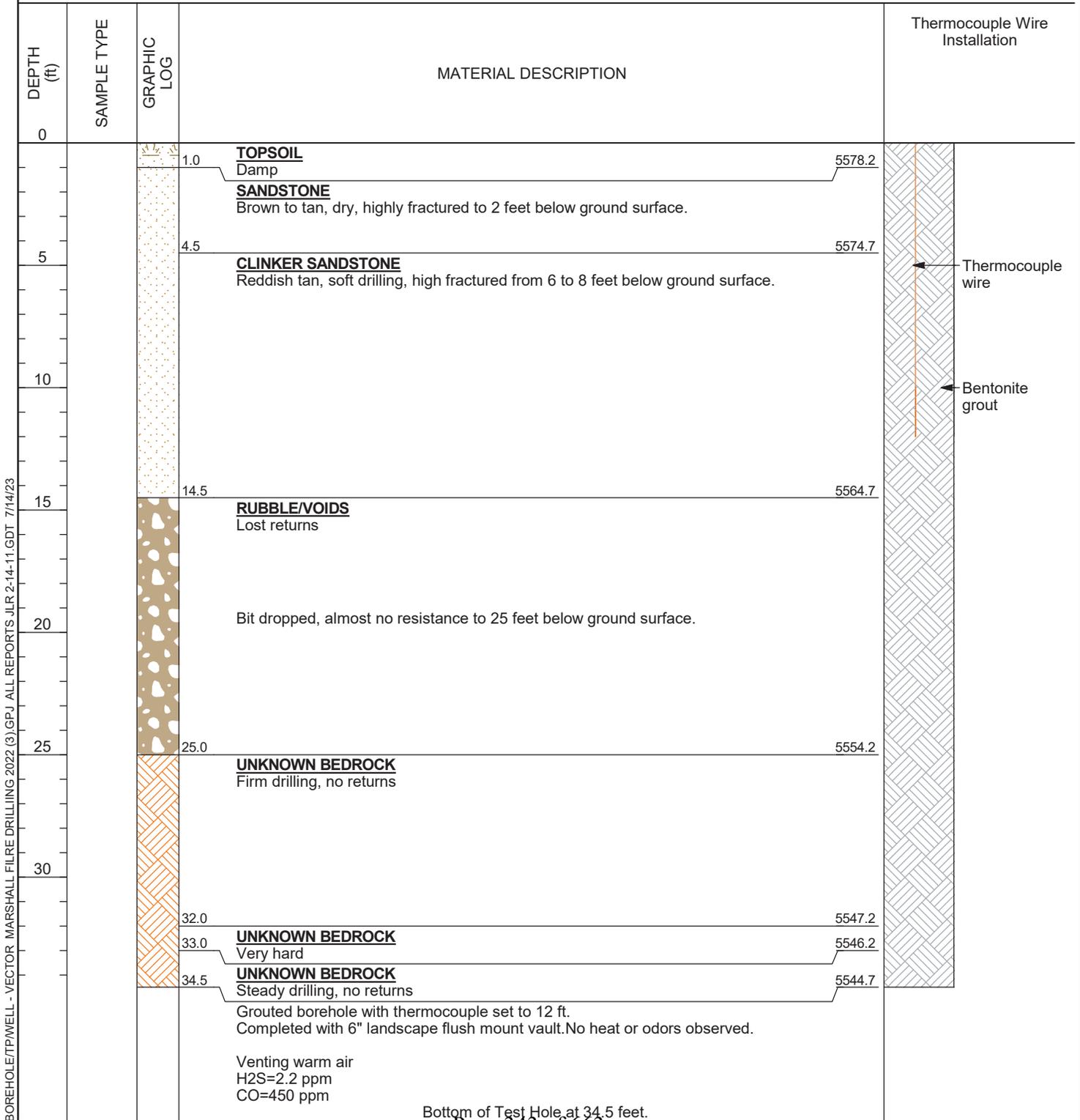


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **04/05/2023** GROUND ELEVATION: **5579 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771608.170000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3074997.408000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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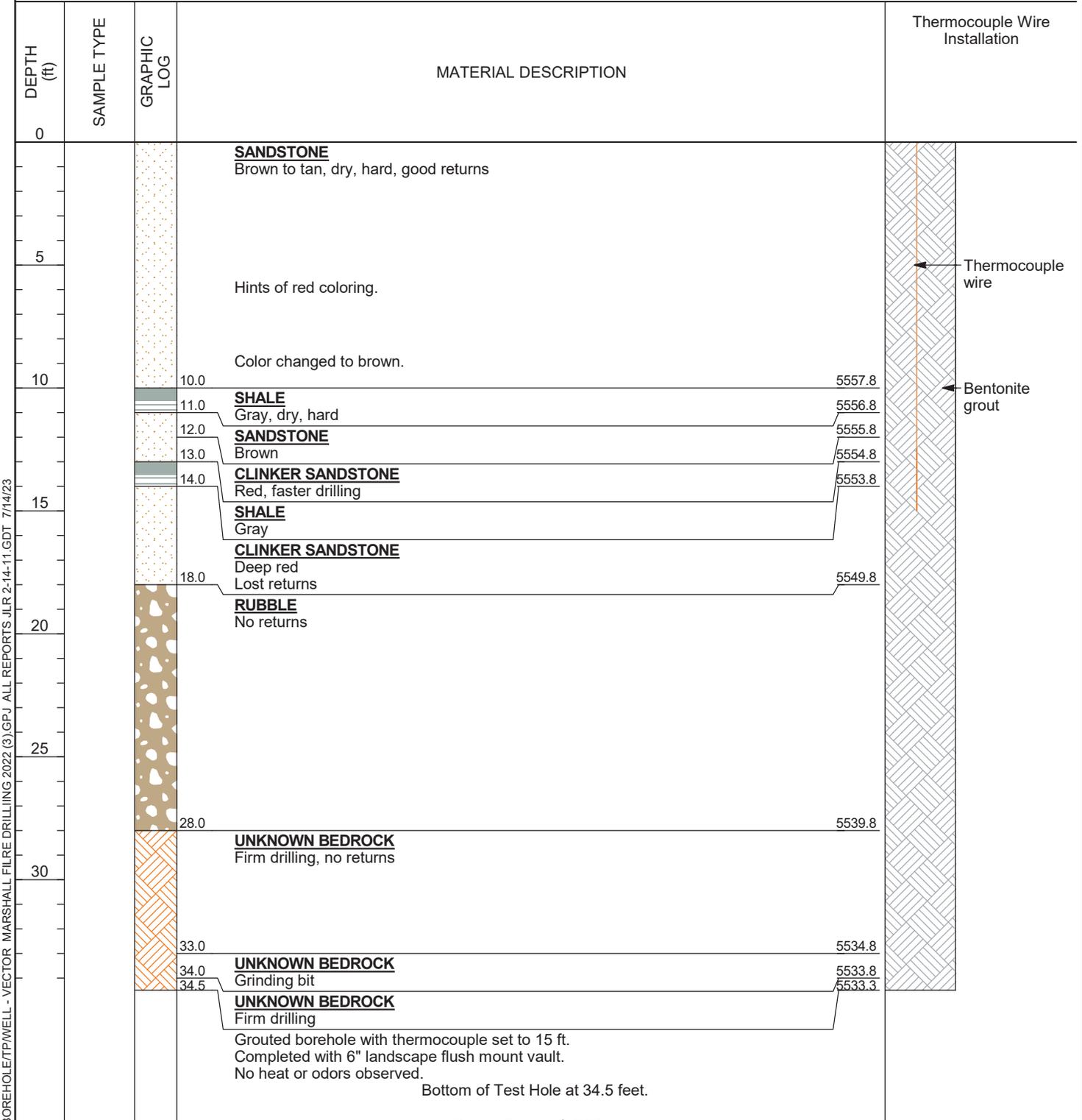


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **04/05/2023** GROUND ELEVATION: **5568 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771833.357000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075237.374000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**





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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: Not Recorded GROUND ELEVATION: 5567 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1771914.545000 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling EASTING: 3075283.966000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0 - 7.0			INTERBEDDED SANDSTONE AND SHALE Light brown to gray	<p>Thermocouple wire</p> <p>Bentonite grout</p>
7.0 - 9.0			SHALE Brown with a hint of red coloring	
9.0 - 11.5			SANDSTONE Yellowish brown	
11.5 - 27.0			RUBBLE/VOID Lost circulation	
27.0 - 34.5			UNKNOWN BEDROCK No returns, firm drilling	
34.5			Grouted borehole with thermocouple set to 10 ft. Completed with 6" landscape flush mount vault. No heat or odors observed. Bottom of Test Hole at 34.5 feet.	

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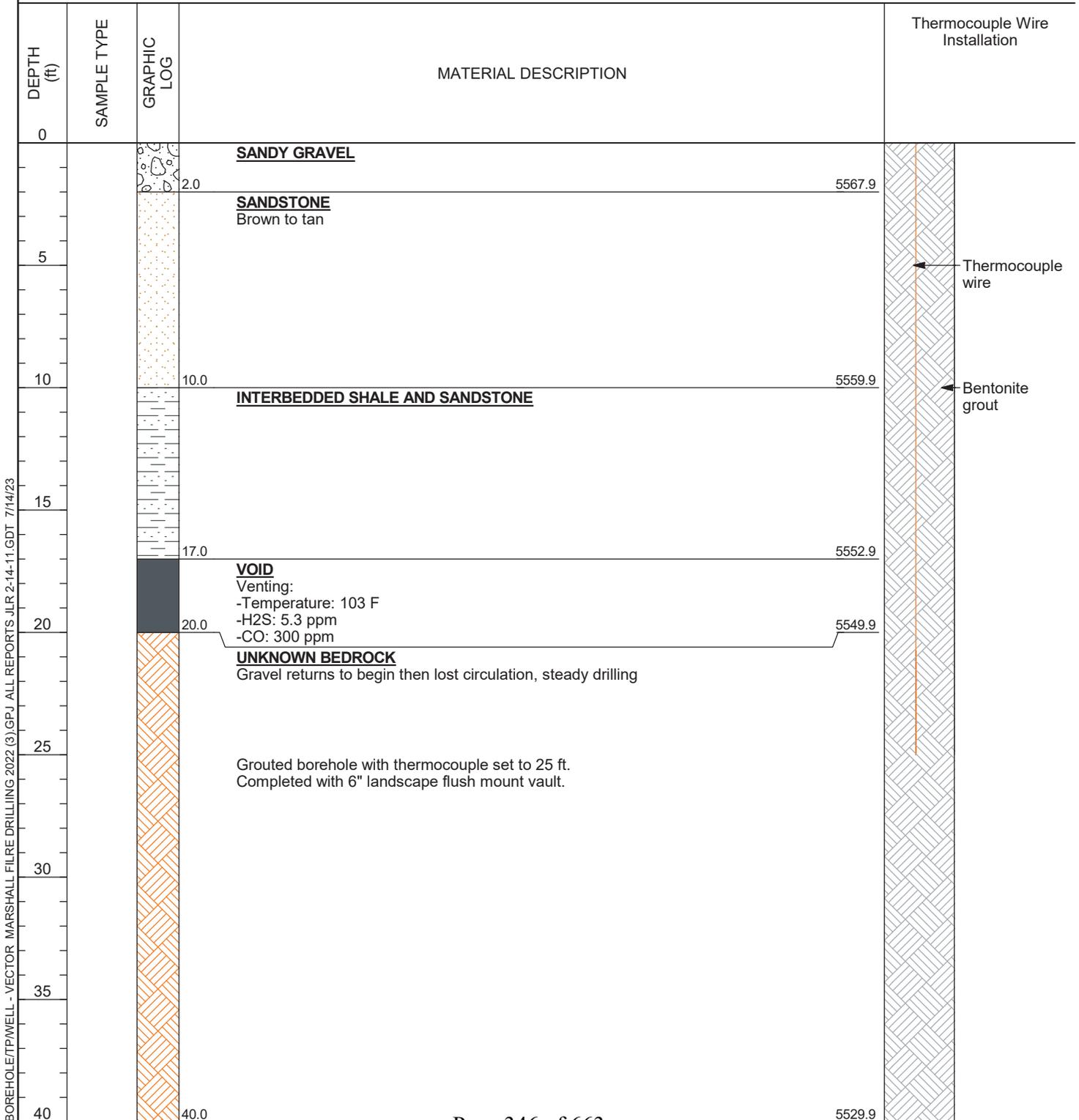


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/08/2023** GROUND ELEVATION: **5570 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772137.210000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075429.670000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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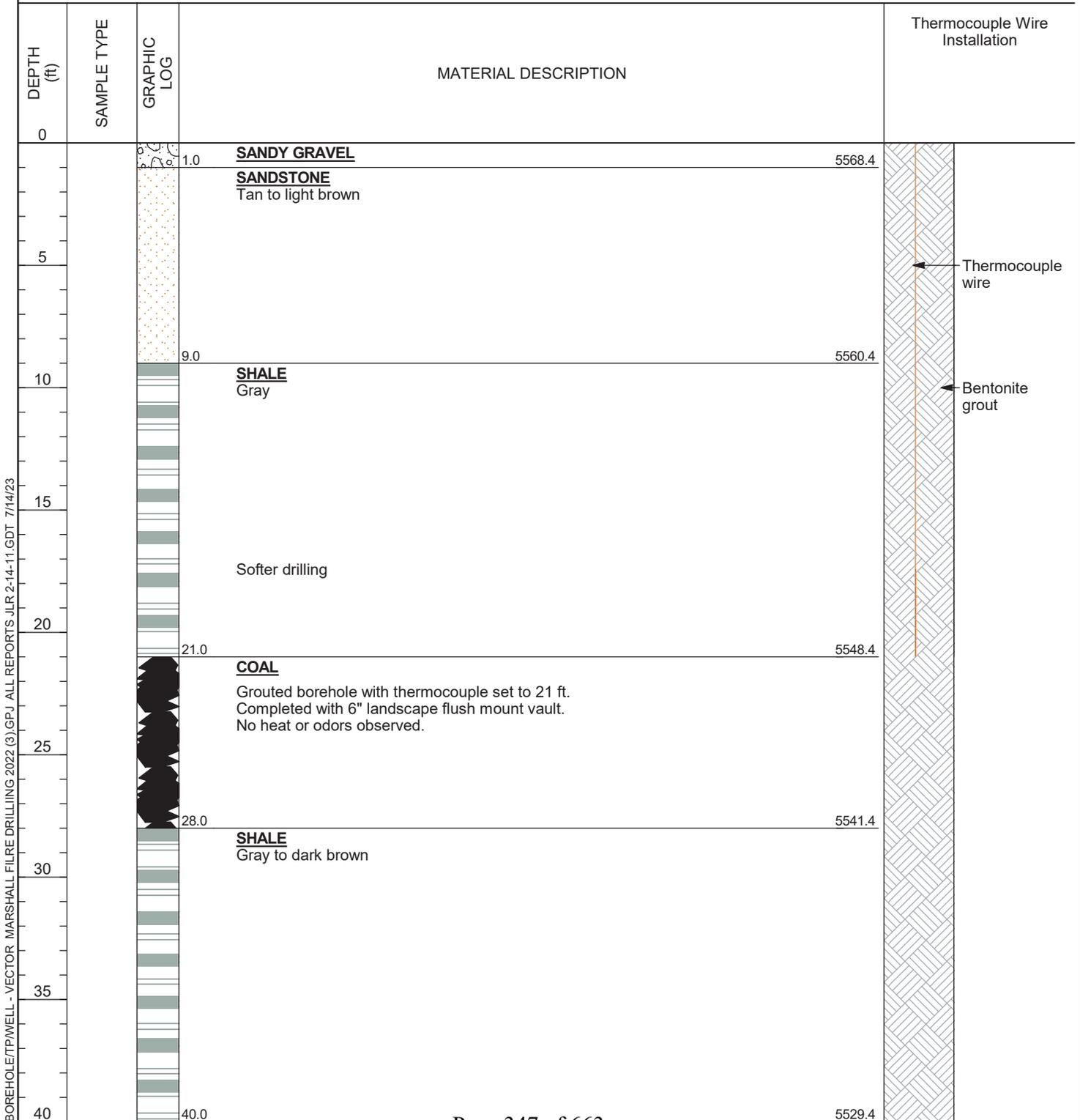


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/07/2023** GROUND ELEVATION: **5569 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772147.745000 N** LOGGED BY: **Jeff DeTienne**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075407.518000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/07/2023** GROUND ELEVATION: **5569 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772161.898000 N** LOGGED BY: **Not Recorded**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075440.578000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	
0				
1.0			SANDY GRAVEL	5568.0
2.0			SILTY SAND Brown	5567.0
5			SANDSTONE Tan to light brown	
8.0			SHALE	5561.0
9.0			SHALE Gray	5560.0
10			SHALE Tan to light brown	
13.0			SHALE	5556.0
14.0			SHALE Gray	5555.0
15			SANDSTONE Tan with reddish staining	
21.0			VOID Lost circulation	5548.0
23.0			Grouted borehole with thermocouple set to 22 ft. Completed with 6" landscape flush mount vault. No heat or odors observed.	5546.0
25			RUBBLE	
27.0			ASSUMED SHALE No returns, hard, drilling	5542.0
30				
35				
39.0				5530.0
40				

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
40			<p>UNKNOWN BEDROCK Soft drilling (<i>continued</i>)</p>
45			
50		50.0	5519.0
			<p>Bottom of Test Hole at 50.0 feet.</p>

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/06/2023** GROUND ELEVATION: **5569 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772174.889000 N** LOGGED BY: **Jeff DeTienne**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075477.189000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
1.0			SANDY GRAVEL 5567.6	
2.5			SILTY SAND 5566.1 Brown	
			SANDSTONE Tan to light brown	
5				
8.0			5560.6 SHALE	
8.5			5560.1 Gray	
10			SHALE Tan to light brown	← Thermocouple wire
13.0			5555.6	
14.0			SHALE 5554.6 Gray	
15			SANDSTONE Tan with reddish staining	
20				
21.0			5547.6 VOID	
23.0			5545.6 Lost circulation Grouted borehole with thermocouple set to 22 ft. Completed with 6" landscape flush mount vault. No heat or odors observed.	← Bentonite grout
25			RUBBLE	
27.0			5541.6 ASSUMED SHALE No returns, hard, drilling ?	
30				
35				
39.0			5529.6	
40				

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/07/2023** GROUND ELEVATION: **5568 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772183.223000 N** LOGGED BY: **Jeff DeTienne**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075419.912000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
1.0			SANDY GRAVEL 5567.4	<p>Thermocouple wire</p> <p>Bentonite grout</p>
5			SANDSTONE Tan	
10.0			SHALE Gray 5558.4	
12.0			5556.4	
15			COAL Black, good circulation	
20			Grouted borehole with thermocouple set to 17 ft. Completed with 6" landscape flush mount vault. No heat or odors observed.	
25				
27.0			SHALE Dark gray to dark brown, steady drilling, good circulation 5541.4	
30				
37.0			COAL Black 5531.4	
39.0			Black 5529.4	
40				

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			INTERBEDDED SHALE AND SANDSTONE Tan to gray (<i>continued</i>)	
		42.0	5526.4	
		43.0	COAL Black	
			5525.4	
		45.0	SANDSTONE Light brown	
			5523.4	
			SHALE Gray	
		50.0	5518.4	
			Bottom of Test Hole at 50.0 feet.	

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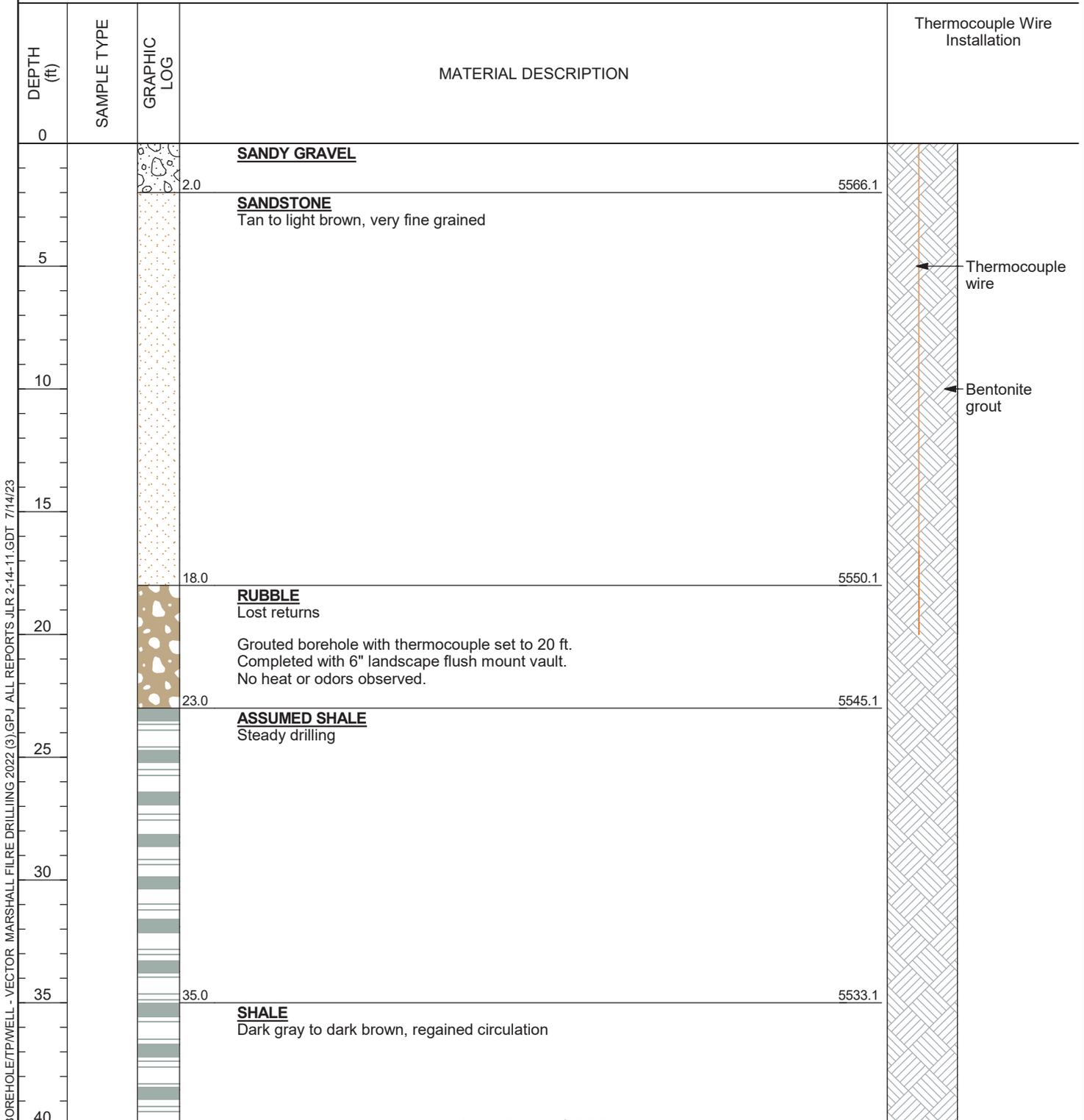


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 03/06/2023 GROUND ELEVATION: 5568 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1772196.356000 N LOGGED BY: Jeff DeTienne
 CONTRACTOR: Authentic Drilling EASTING: 3075459.040000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa



BOREHOLE/TP/WELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			SHALE Dark gray to dark brown, regained circulation (<i>continued</i>)	
45		45.0	Bottom of Test Hole at 45.0 feet.	5523.1

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 03/06/2023 GROUND ELEVATION: 5568 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1772200.627000 N LOGGED BY: Jeff DeTienne
 CONTRACTOR: Authentic Drilling EASTING: 3075471.522000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
1.0			SANDY GRAVEL 5567.0	<p>Thermocouple wire</p> <p>Bentonite grout</p>
2.0			FILL 5566.0	
6.0			SANDSTONE Tan with reddish staining 5562.0	
9.0			SHALE 5559.0	
21.0			SANDSTONE Tan with reddish staining 5547.0	
28.0			RUBBLE Did not lose circulation, soft Grouted borehole with thermocouple set to 22 ft. Completed with 6" landscape flush mount vault. No heat or odors observed. Dark red returns to 27 feet. 5540.0	
31.0			COAL Black 5537.0	
31.0			SHALE Gray, moderate drilling	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			41.0 <u>COAL</u> Black 5527.0	
			43.0 <u>SHALE</u> Gray 5525.0	
45			46.0 <u>COAL</u> Black 5522.0	
			48.0 <u>SHALE</u> Gray 5520.0	
50			<u>SHALE</u> Gray 5508.0	
55				
60			60.0 Bottom of Test Hole at 60.0 feet. 5508.0	

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/07/2023** GROUND ELEVATION: **5567 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772221.406000 N** LOGGED BY: **Jeff DeTienne**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075458.301000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0 - 4.0			SANDY GRAVEL	
4.0 - 5.0			SANDSTONE	
5.0 - 11.0			INTERBEDDED SHALE AND SANDSTONE Dark red, very fine grained	
11.0 - 27.0			UNKNOWN BEDROCK Steady drilling, not hard	
27.0 - 28.0			RUBBLE Drill chatter	
28.0 - 30.0			UNKNOWN BEDROCK Steady drilling	
30.0 - 40.0			Grouted borehole with thermocouple set to 20 ft. Completed with 6" landscape flush mount vault. No heat or odors observed.	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
45			<p>UNKNOWN BEDROCK Steady drilling (<i>continued</i>)</p>	
50		50.0	Bottom of Test Hole at 50.0 feet.	5517.5

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

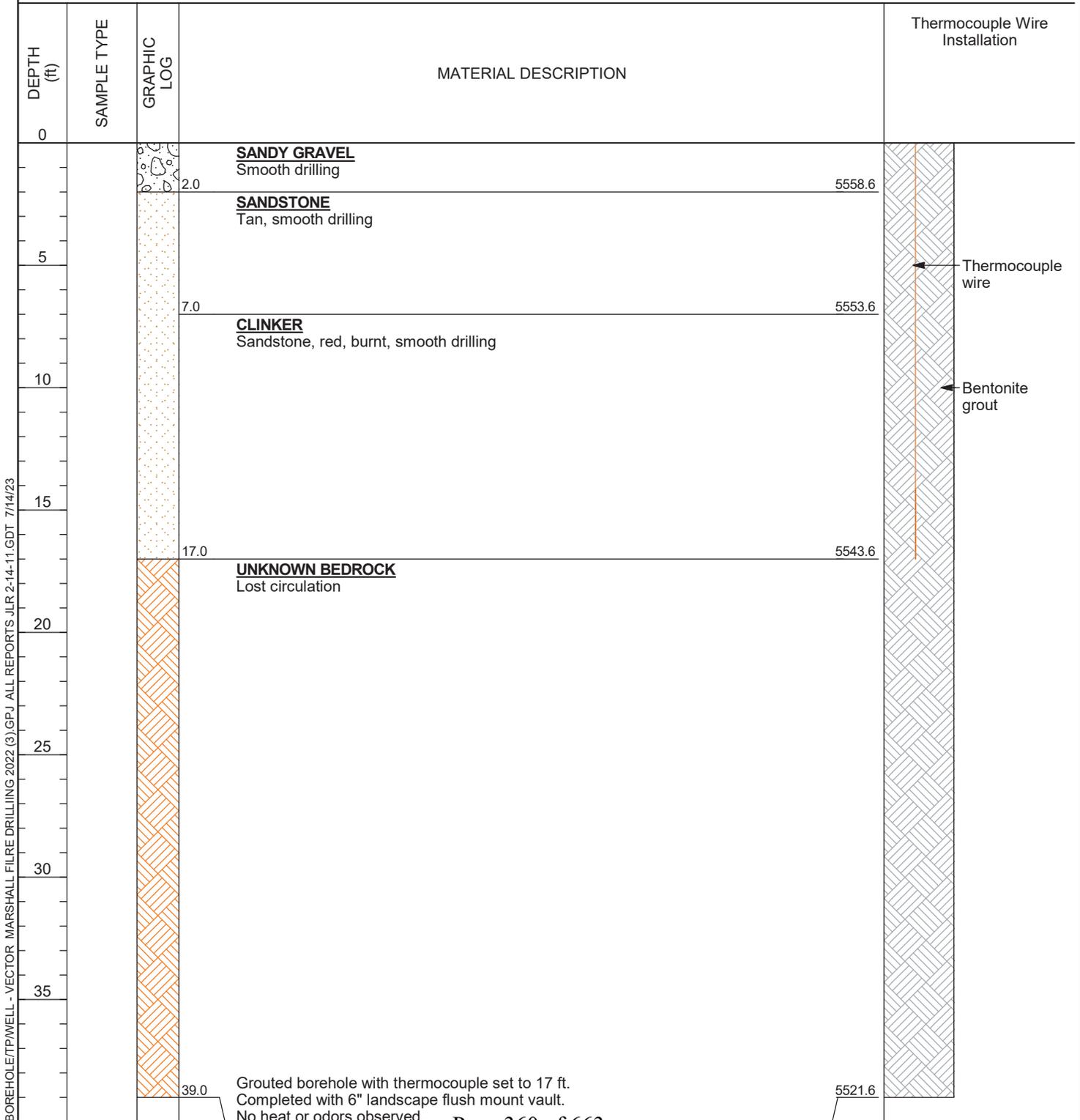


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/09/2023** GROUND ELEVATION: **5561 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772364.097000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075582.651000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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CLIENT State of Colorado DRMS

PROJECT NAME Marshall Drilling 202T

PROJECT NUMBER 114-910599

PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
			Bottom of Test Hole at 39.0 feet.	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/08/2023** GROUND ELEVATION: **5553 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772403.300000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075545.245000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
1.0			SANDY GRAVEL 5552.1	<p>Thermocouple wire</p> <p>Bentonite grout</p>
			SANDSTONE Brown to tan	
5				
9.0			COAL Brown, weathered/burnt 5544.1	
11.0			INTERBEDDED SHALE AND SANDSTONE Light gray 5542.1	
15				
18.0			COAL 5535.1	
21.0			INTERBEDDED SHALE AND SANDSTONE Gray 5532.1	
25				
26.0			COAL Brown 5527.1	
29.0			INTERBEDDED SHALE AND SANDSTONE Brown to gray 5524.1	
30				
35				
40				

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			<p><u>INTERBEDDED SHALE AND SANDSTONE</u> Brown to gray (<i>continued</i>)</p> <p>Grouted borehole with thermocouple set to 11 ft. Completed with 6" landscape flush mount vault. No heat or odors observed.</p> <p>Bottom of Test Hole at 44.0 feet.</p>	
			<p>44.0</p> <p>5509.1</p>	

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 03/08/2023 GROUND ELEVATION: 5555 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1772403.050000 N LOGGED BY: Dan Bochicchio
 CONTRACTOR: Authentic Drilling EASTING: 3075571.754000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0 - 2.0			SANDY GRAVEL	<p>Thermocouple wire</p> <p>Bentonite grout</p>
2.0 - 3.0			FILL	
3.0 - 12.0			SANDSTONE Brown to tan	
12.0 - 15.0			COAL	
15.0 - 22.0			INTERBEDDED SHALE AND SANDSTONE Light gray	
22.0 - 24.0			COAL	
24.0 - 31.0			INTERBEDDED SHALE AND SANDSTONE Dark gray to gray	
31.0 - 33.0			COAL	
33.0 - 39.0			INTERBEDDED SHALE AND SANDSTONE Light gray	
39.0			Bottom of Test Hole at 39.0 feet.	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/29/2023** GROUND ELEVATION: **5551 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772479.505000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075646.705000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0 - 7.0			FILL Gravel	<p>Thermocouple wire</p> <p>Bentonite grout</p>
7.0 - 10.0			COAL Intact	
10.0 - 22.0			SHALE Gray Grouted borehole with thermocouple set to 11 ft. Completed with 6" landscape flush mount vault. No heat or odors observed.	
22.0 - 23.5			COAL	
23.5 - 31.0			SHALE Transition to brown Color changed to gray.	
31.0 - 33.0			COAL	
33.0 - 40.0			SHALE Light gray	
40.0				

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/09/2023** GROUND ELEVATION: **5555 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772426.840000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075571.704000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
1.0			SANDY GRAVEL 5554.5	<p>Thermocouple wire</p> <p>Bentonite grout</p>
5.0			SANDSTONE Tan 5550.5	
12.5			COAL 5543.0	
12.5			-Grouted borehole with thermocouple set to 12 ft. -Completed with 6" landscape flush mount vault	
15			INTERBEDDED SHALE AND SANDSTONE Dark gray to light gray, shale content increasing with depth, slow drilling and chatter to 15 feet. 5534.5	
21.0			COAL 5532.5	
23.0			SHALE Gray to dark gray Hard to 30 feet. 5525.5	
30.0			COAL 5523.5	
32.0			SILTSTONE Dark grayish brown to light gray 5515.5	
40.0			5515.5	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/13/2023** GROUND ELEVATION: **5554 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772422.158000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075749.344000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
2.0			FILL Brown, little resistance 5551.5	
5			INTERBEDDED SHALE AND SANDSTONE Tan to brown 5543.5	Thermocouple wire Bentonite grout
10.0			CLINKER Reddish brown to red, good circulation 5536.5	
15			-Grouted borehole with thermocouple set to 15 ft. -Completed with 6" landscape flush mount vault 5536.5	
17.0			RUBBLE fractures Lost circulation at 17', some bit chatter, no odors or gases 5525.5	
20				
25				
28.0			SHALE firm drilling, no returns 5519.0	
30				
34.5			Bottom of Test Hole at 34.5 feet.	

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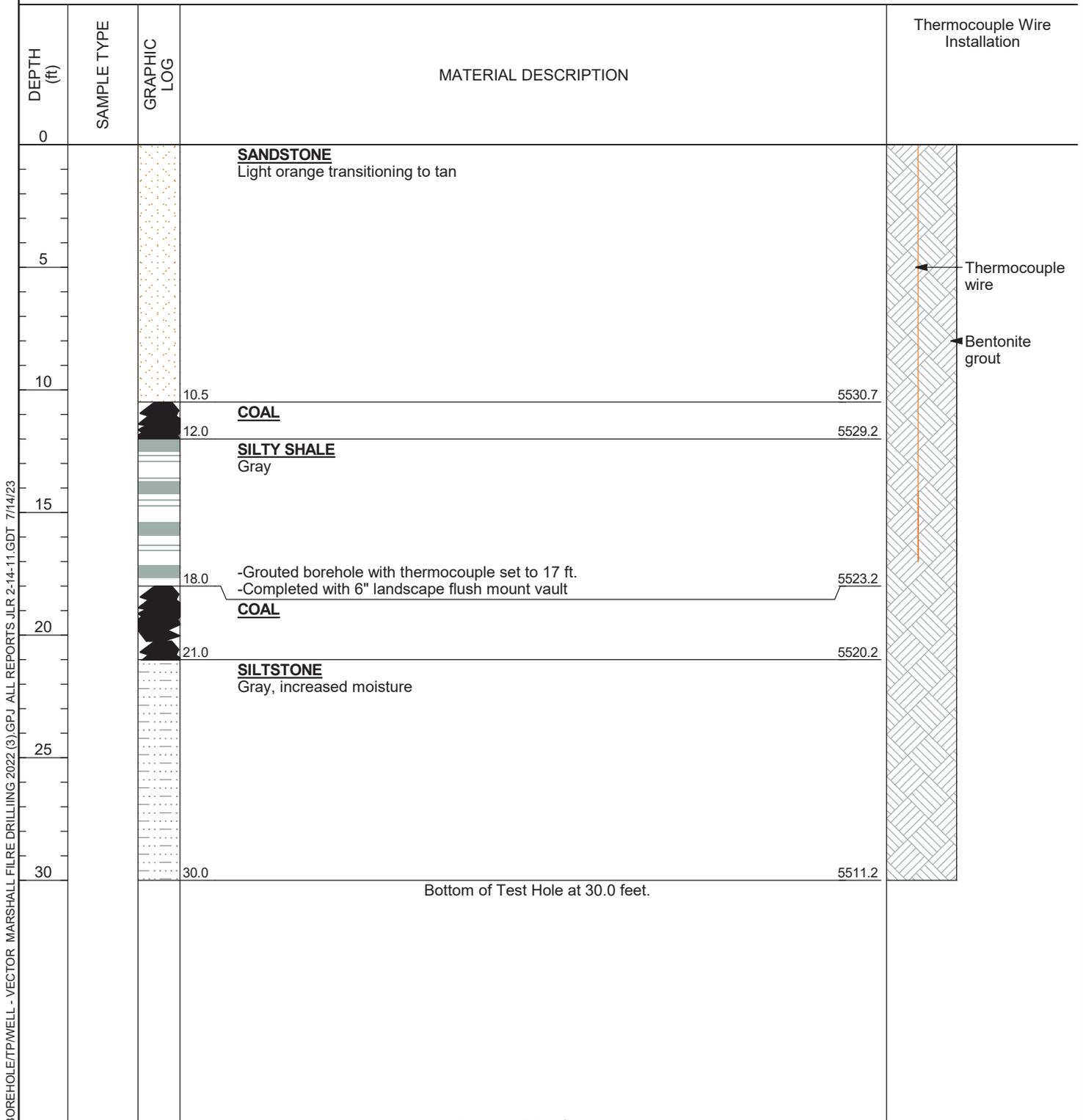


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/29/2023** GROUND ELEVATION: **5541 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772657.862000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075725.745000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/13/2023** GROUND ELEVATION: **5541 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772561.109000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075956.390000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0 - 3.0			FILL Brown, dry 5537.6	
3.0 - 9.5			SANDSTONE Tan to brown, steady, good circulation 5531.1 Drill chatter	Thermocouple wire Bentonite grout
9.5 - 22.5			SHALE Brown, dry, good circulation 5518.1 Color change to light gray Color change to brown Color change to reddish brown Color change to gray Color change to reddish brown, drill chatter -Grouted borehole with thermocouple set to 20 ft. -Completed with 6" landscape flush mount vault	
22.5 - 28.0			RUBBLE Lost circulation 5512.6	
28.0 - 34.5			SHALE firm drilling, no returns 5506.1	
34.5			Bottom of Test Hole at 34.5 feet.	

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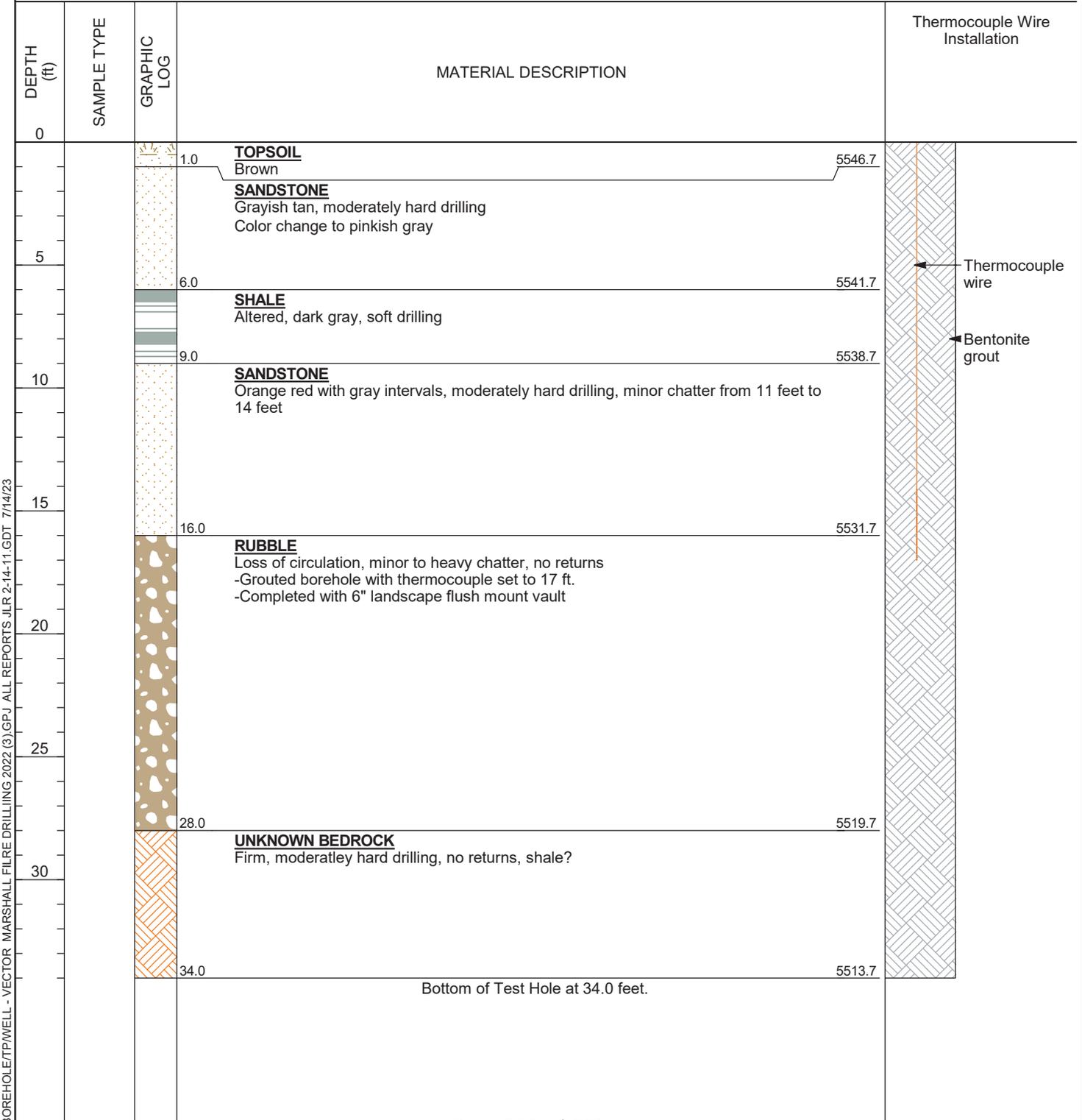


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/15/2023** GROUND ELEVATION: **5548 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772728.666000 N** LOGGED BY: **Ed Muller**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075969.512000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 03/13/2023 GROUND ELEVATION: 5533 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1772608.353000 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling EASTING: 3076114.609000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
			TOPSOIL Brown, soft, dry	
2.5			5530.8	
3.5			SANDSTONE Tan to light brown, dry, no odor	5529.8
5.0			INTERBEDDED SANDSTONE AND SHALE Gray to light gray	5528.3
6.0			SANDSTONE Tan	5527.3
7.0			Tan	5526.3
9.0			SHALE Gray, dry, steady drilling, good circulation	5524.3
10.0			COAL Black, dry	5523.3
12.0			SHALE Brown	5521.3
15.0			SANDSTONE Tan	
17.0			SHALE Gray, dry, good circulation Color change to reddish brown. Color change to brown.	5516.3
20.0			SANDSTONE Gray Intense burned red zone to 18 feet. Color change to reddish brown to tan. A little drill chatter. Color changed to reddish tan to reddish brown.	
25.0			More tan than red returns. Drill chatter and quick drilling	
30.0			Steady drilling Color change to brown to reddish brown. -Grouted borehole with thermocouple set to 30 ft. -Completed with 6" landscape flush mount vault	5501.3
32.0			RUBBLE Lost circulation, drill chatter	
35.0				5496.8
36.5			SHALE Steady drilling, no returns	
40.0				

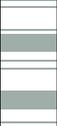
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CLIENT State of Colorado DRMS **PROJECT NAME** Marshall Drilling 202T
PROJECT NUMBER 114-910599 **PROJECT LOCATION** Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			<p>SHALE Steady drilling, no returns (<i>continued</i>)</p>	
		44.5	Rubble falling on bit while tripping out. Bottom of Test Hole at 44.5 feet.	5488.8

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/15/2023** GROUND ELEVATION: **5548 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772844.439000 N** LOGGED BY: **Ed Muller**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075895.890000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0			SANDSTONE Tannish gray to tan, moderate to soft drilling	<p>Thermocouple wire</p> <p>Bentonite grout</p>
7.0			SHALE Altered, very soft drilling, brown	
11.0			COAL Dark brown to black, soft -Grouted borehole with thermocouple set to 12 ft. -Completed with 6" landscape flush mount vault	
14.0			SHALE Gray, moderate to hard drilling	
23.0			COAL Black	
25.0			SHALE Gray, moderate to hard drilling	
33.0			COAL Black	
36.0			SHALE Light gray, moderate to hard drilling, slightly moist	
40				

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
45			SHALE Light gray, moderate to hard drilling, slightly moist (<i>continued</i>)	
50				
55			56.0 SILTSTONE Orangish brown, minor clay, slightly moist, moderate to hard drilling	5491.5
60				
65			64.0 CLAYEY SILTSTONE Brown, slightly moist	5483.5
70				
72.0			SILTY CLAYSTONE Dark brown, soft drilling	5475.5
74.0				5473.5
75.0			COAL Black	5472.5
			SILTSTONE Dark brown, dry	
79.0				5468.5
			Bottom of Test Hole at 79.0 feet.	

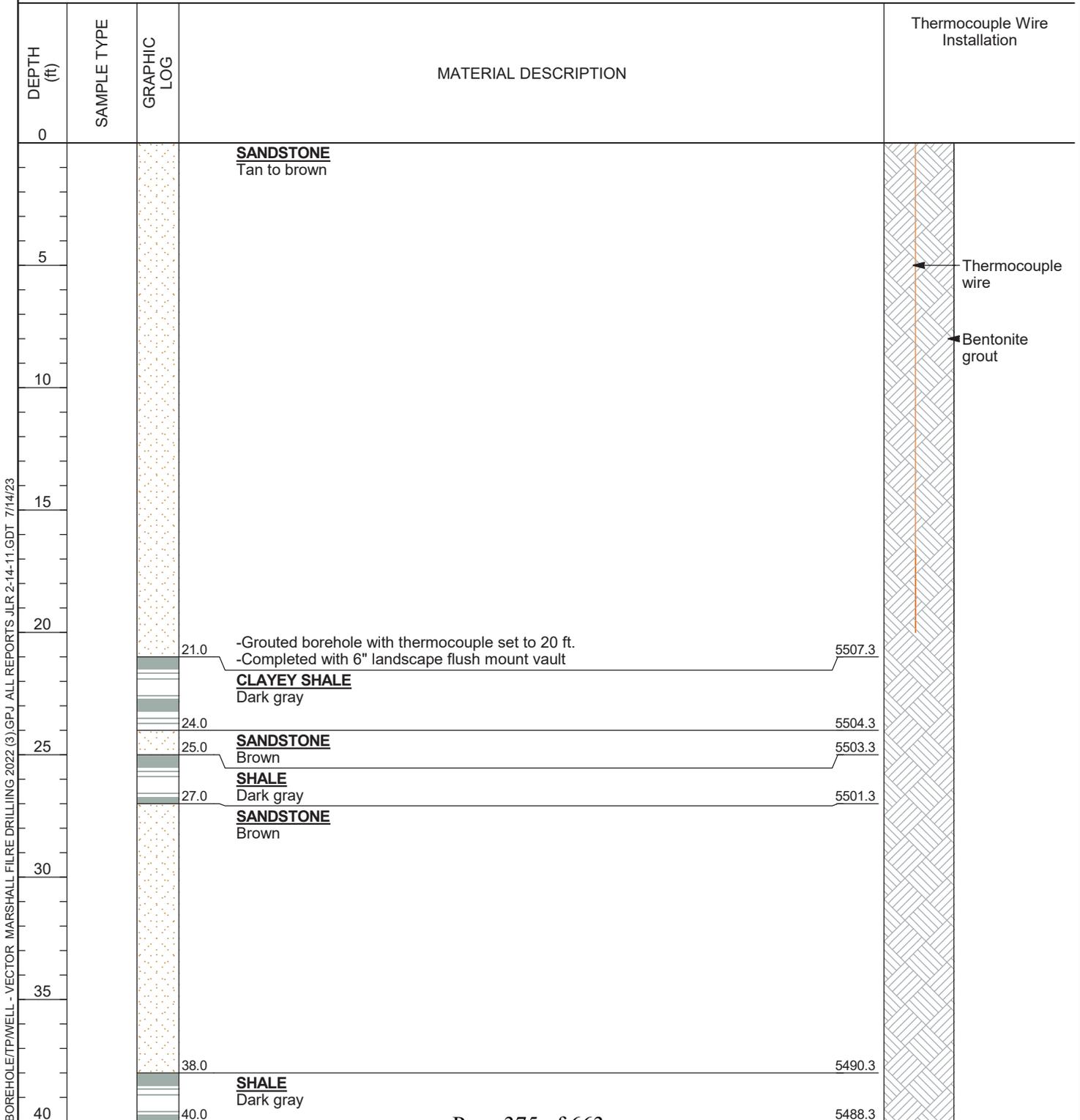


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BOREHOLE ID: MM-40
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 03/29/2023 GROUND ELEVATION: 5528 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1772958.791000 N LOGGED BY: Dan Bochicchio
 CONTRACTOR: Authentic Drilling EASTING: 3075834.112000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa



BOREHOLE/TP/WELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/29/2023** GROUND ELEVATION: **5525 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1773046.792000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075909.498000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0 - 17.0			SANDSTONE Tan to light brown	<p>Thermocouple wire</p> <p>Bentonite grout</p>
17.0 - 18.0			17.0 5508.4 CLAYSTONE Red to brown 18.0 5507.4	
18.0 - 20.0			SANDSTONE Tan to light brown -Grouted borehole with thermocouple set to 20 ft. -Completed with 6" landscape flush mount vault	
20.0 - 28.0			28.0 5497.4	
28.0 - 30.0			SILTSTONE Gray 30.0 5495.4	
30.0 - 37.0			SANDSTONE Tan to light brown, consistent throughout	
37.0 - 40.0			37.0 5488.4 Increased moisture SHALE Brown to black, high organics, increased silt and clay	
40.0			40.0 5485.4	

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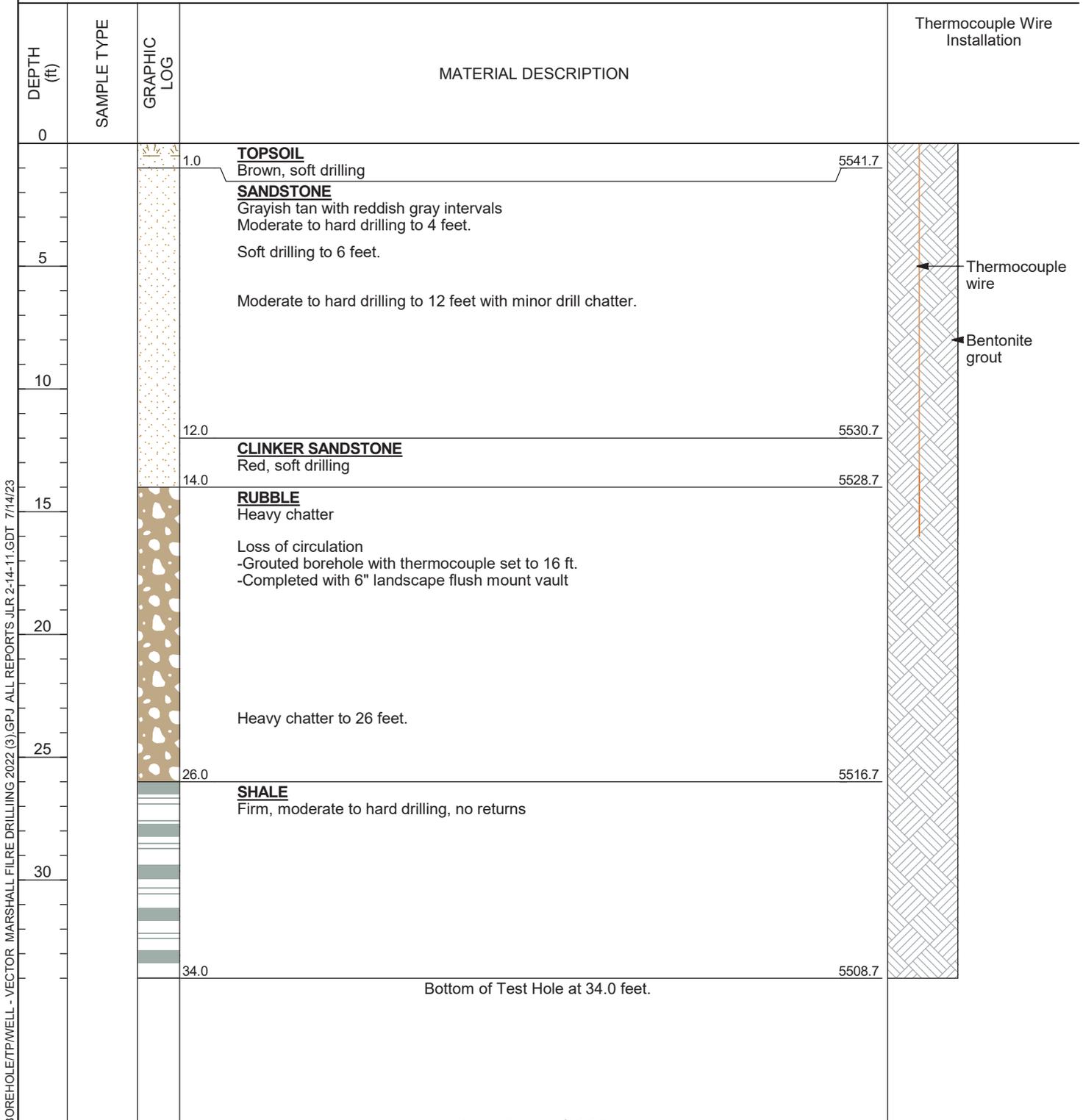


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/15/2023** GROUND ELEVATION: **5543 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772967.228000 N** LOGGED BY: **Ed Muller**
 CONTRACTOR: **Authentic Drilling** EASTING: **3076131.356000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/15/2023** GROUND ELEVATION: **5538 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772885.806000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3076238.176000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0			SANDSTONE Tan to light gray	<p>Thermocouple wire</p> <p>Bentonite grout</p>
5				
8.0			Color changed to brown. 5529.5	
9.5			SHALE Gray, hard, steady drilling 5528.0	
10			INTERBEDDED SANDSTONE AND SHALE Brown to gray, dry, hard, 4 to 6 inch coal seam	
14.5			INTERBEDDED CLINKER SHALE AND SANDSTONE Red to reddish brown to gray Drill chatter to 17.5 feet. 5523.0	
19.5			5518.0	
20.5			SHALE Gray, steady drilling 5517.0	
22.0			SANDSTONE Brown 5515.5	
22.5			SHALE Gray 5515.0	
25			CLINKER SANDSTONE Red to gray -Grouted borehole with thermocouple set to 25 ft. -Completed with 6" landscape flush mount vault	
27.0			5510.5	
30			RUBBLE Loss of circulation, drill chatter Some clinker falling in on bit, fast penetration	
35			Intermittent returns during reaming.	
37.0			5500.5	
39.5			SHALE No returns, steady, hard drilling 5498.0	

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BOREHOLE ID: MM-44
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/13/2023** GROUND ELEVATION: **5528 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772731.881000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3076282.668000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
1.5			TOPSOIL Brown, dry 5526.1	
5			SANDSTONE Tan to light brown 5517.6	Thermocouple wire
10			INTERBEDDED SANDSTONE AND SHALE Brown 5515.6	Bentonite grout
12.0			SHALE Gray, dry Color changed to reddish brown. Color changed to brown 5508.1	
15			INTERBEDDED SANDSTONE AND SHALE Red to brown Color changed to gray to tan. 5499.6	
20			-Grouted borehole with thermocouple set to 30 ft. -Completed with 6" landscape flush mount vault 5497.6	
25			SANDSTONE Tan, dry, good circulation 5490.6	
30			CLINKER SANDSTONE Reddish brown Drill chatter, limited circulation 5488.1	
35			SHALE Steady drilling	
37.0				
39.5				

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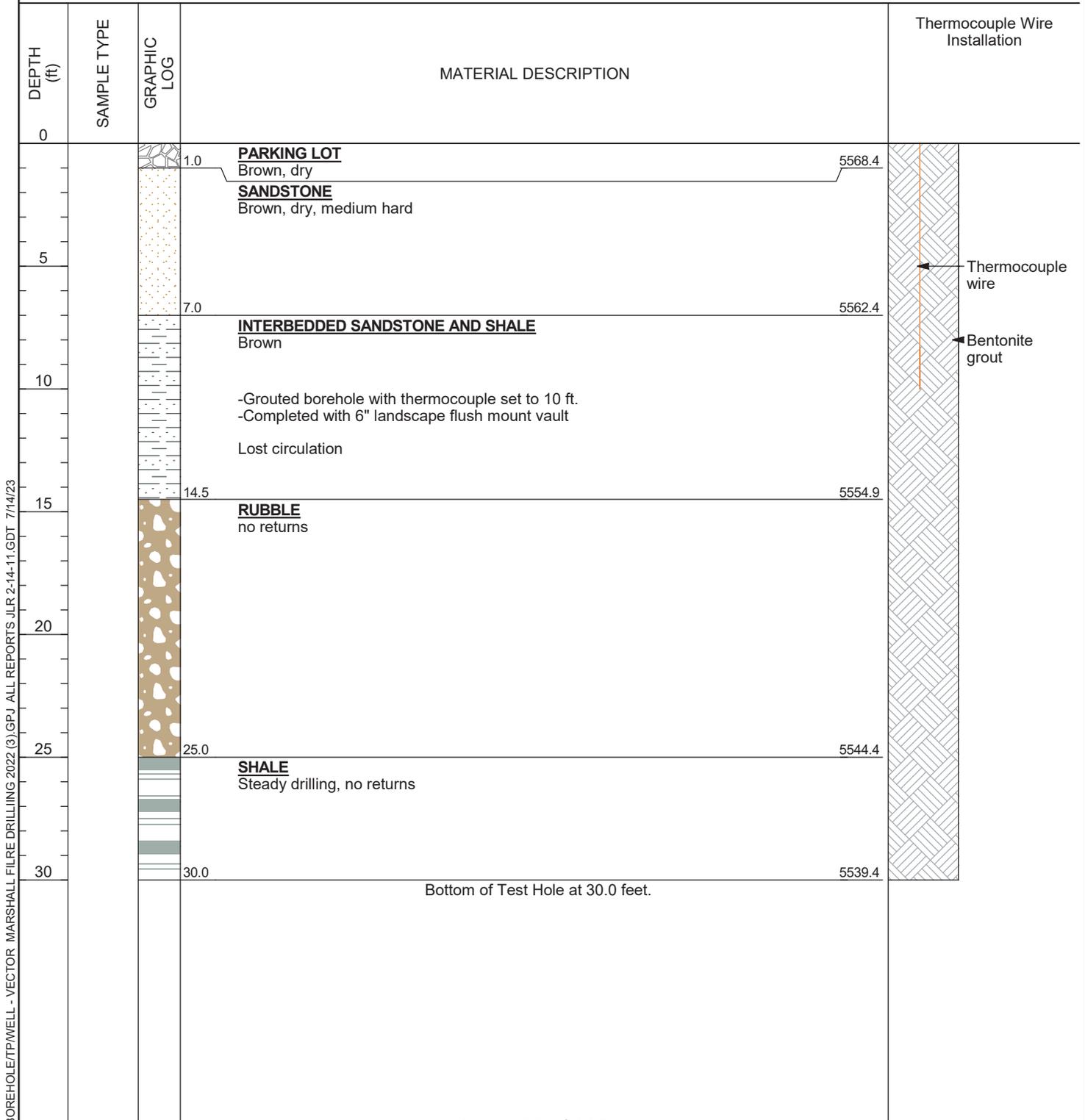


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **04/05/2023** GROUND ELEVATION: **5569 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772035.361000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075288.150000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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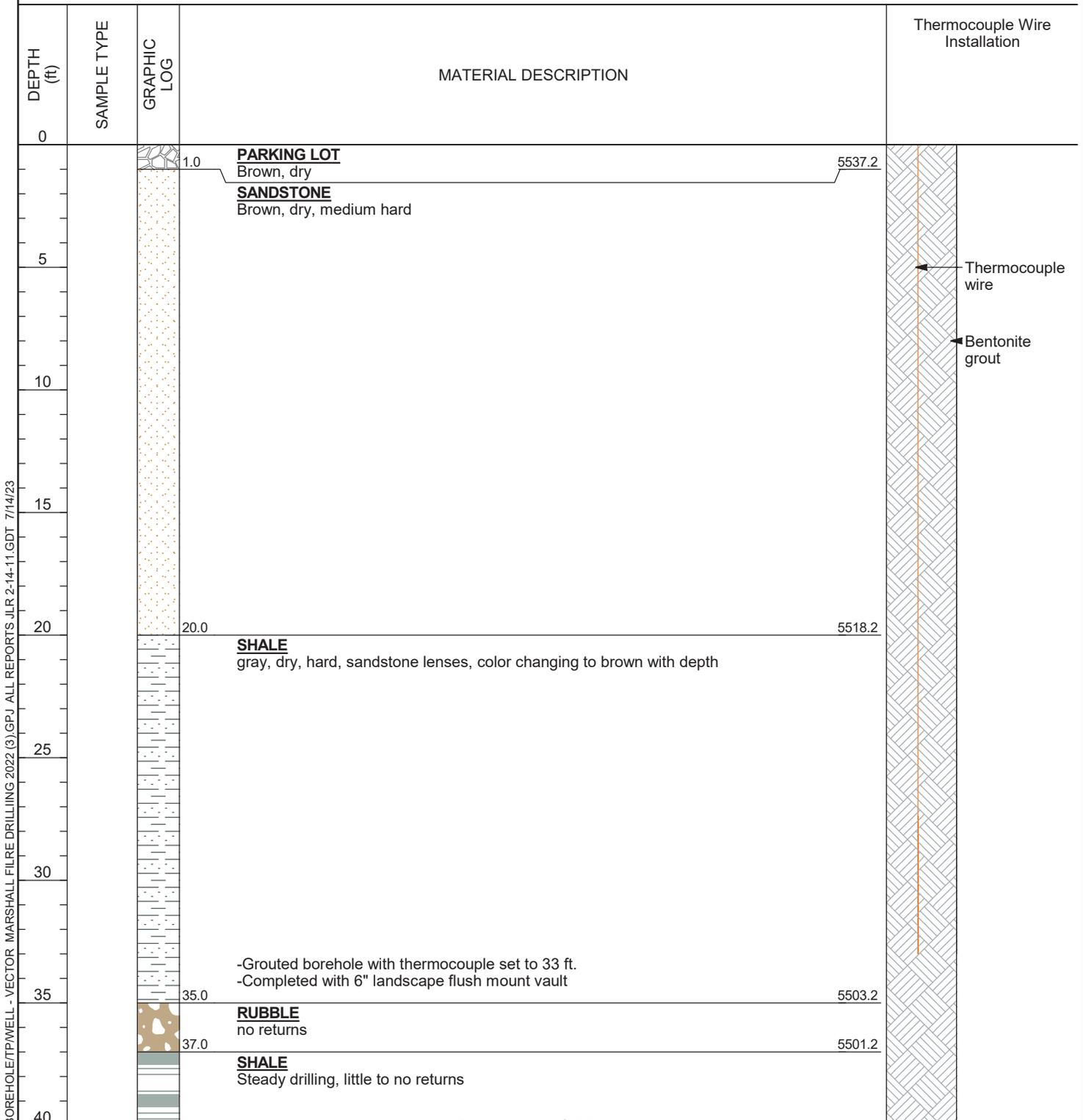


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/27/2023** GROUND ELEVATION: **5538 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772221.759000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075921.009000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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CLIENT State of Colorado DRMS

PROJECT NAME Marshall Drilling 202T

PROJECT NUMBER 114-910599

PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			<p>SHALE Steady drilling, little to no returns <i>(continued)</i></p>	
45			<p>49.5</p>	5488.7
Bottom of Test Hole at 49.5 feet.				

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/22/2023** GROUND ELEVATION: **5555 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772273.404000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075740.116000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0 - 11.0			SANDSTONE brown to light brown	<p>Thermocouple wire</p> <p>Bentonite grout</p>
11.0 - 19.5			SHALE/SANDSTONE interbedded layers, gray/dark brown, possible rider seam interbedded	
19.5 - 37.0			CLINKER reddish layers, limited returns, shale and sandstone, red/gray/brown	
37.0 - 40			SHALE gray, dry, hard, reddish sandstone layers -Grouted borehole with thermocouple set to 38 ft. -Completed with 6" landscape flush mount vault	

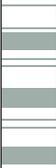
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BOREHOLE ID: MM-47
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			SHALE gray, dry, hard, reddish sandstone layers <i>(continued)</i>	
45				
			46.5 COAL 5508.6	
			48.5 SHALE 5506.6	
			dark gray, dry, hard	
50			54.5 Bottom of Test Hole at 54.5 feet. 5500.6	

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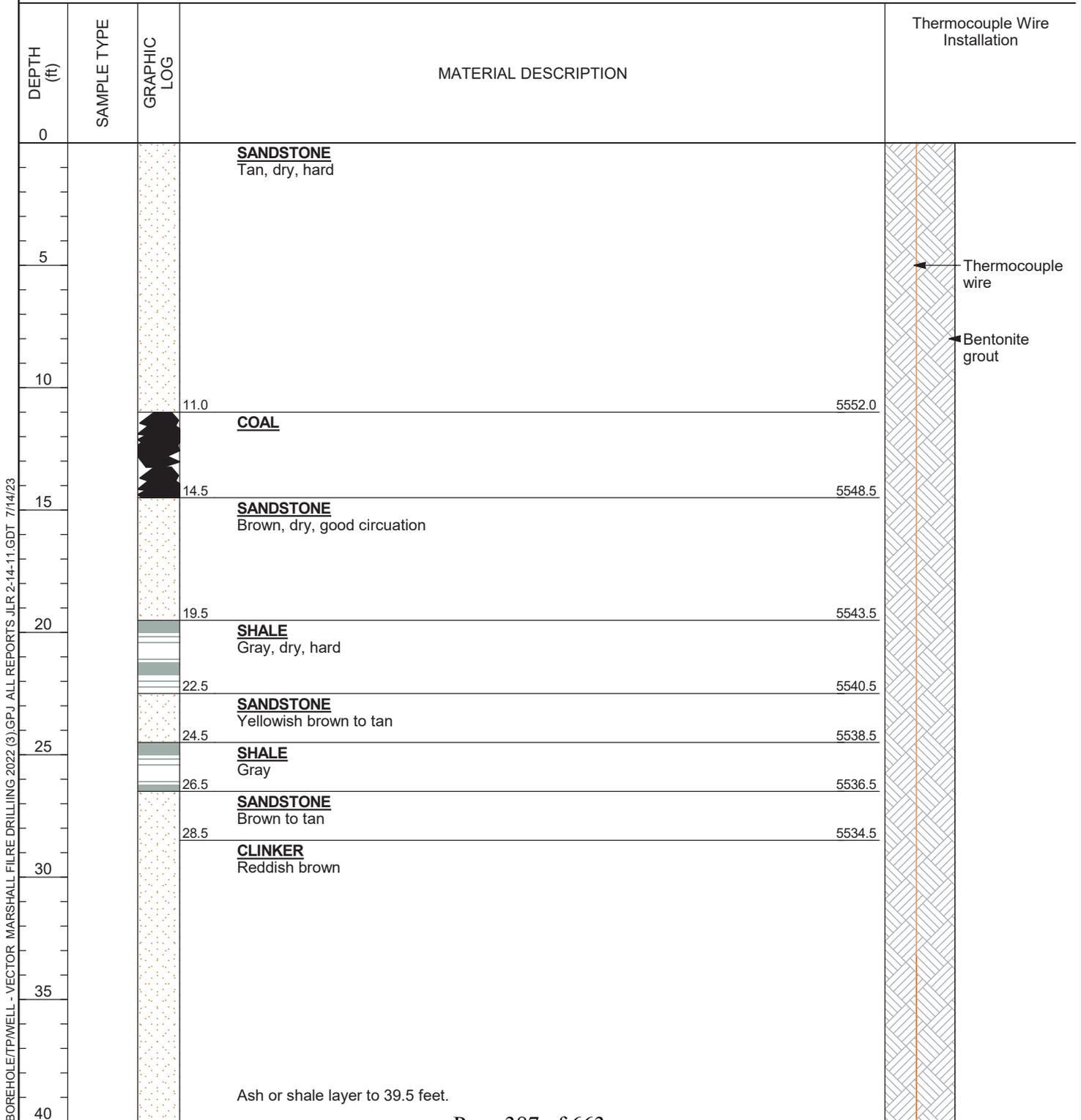


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/22/2023** GROUND ELEVATION: **5563 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772133.710000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075621.092000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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BOREHOLE ID: MM-48
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CLIENT State of Colorado DRMS **PROJECT NAME** Marshall Drilling 202T
PROJECT NUMBER 114-910599 **PROJECT LOCATION** Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			CLINKER Reddish brown (<i>continued</i>) -Grouted borehole with thermocouple set to 40 ft. -Completed with 6" landscape flush mount vault Color changed to red.	
43.0			5520.0	
			RUBBLE Drill chatter Loss of circulation	
45			5516.0	
			SHALE Solid drilling	
			5508.5	
			54.5	
			Bottom of Test Hole at 54.5 feet.	

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

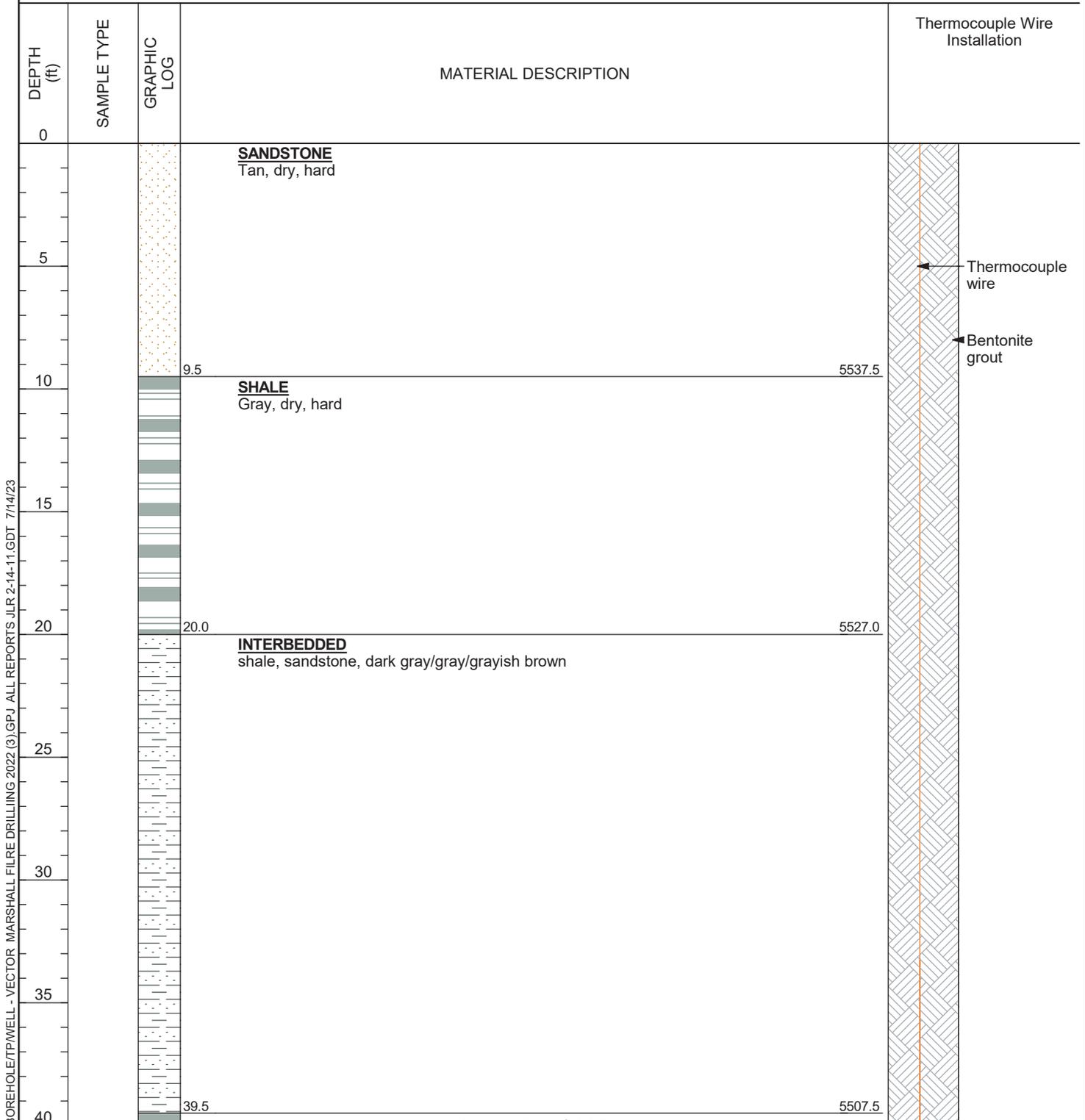


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 03/24/2023 GROUND ELEVATION: 5547 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1771978.391000 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling EASTING: 3075691.638000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			SHALE Gray (continued)	
43.0			COAL	
45			SHALE Gray	
47.0			SHALE Gray	
49.5			-Grouted borehole with thermocouple set to 40 ft. -Completed with 6" landscape flush mount vault Bottom of Test Hole at 49.5 feet.	

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

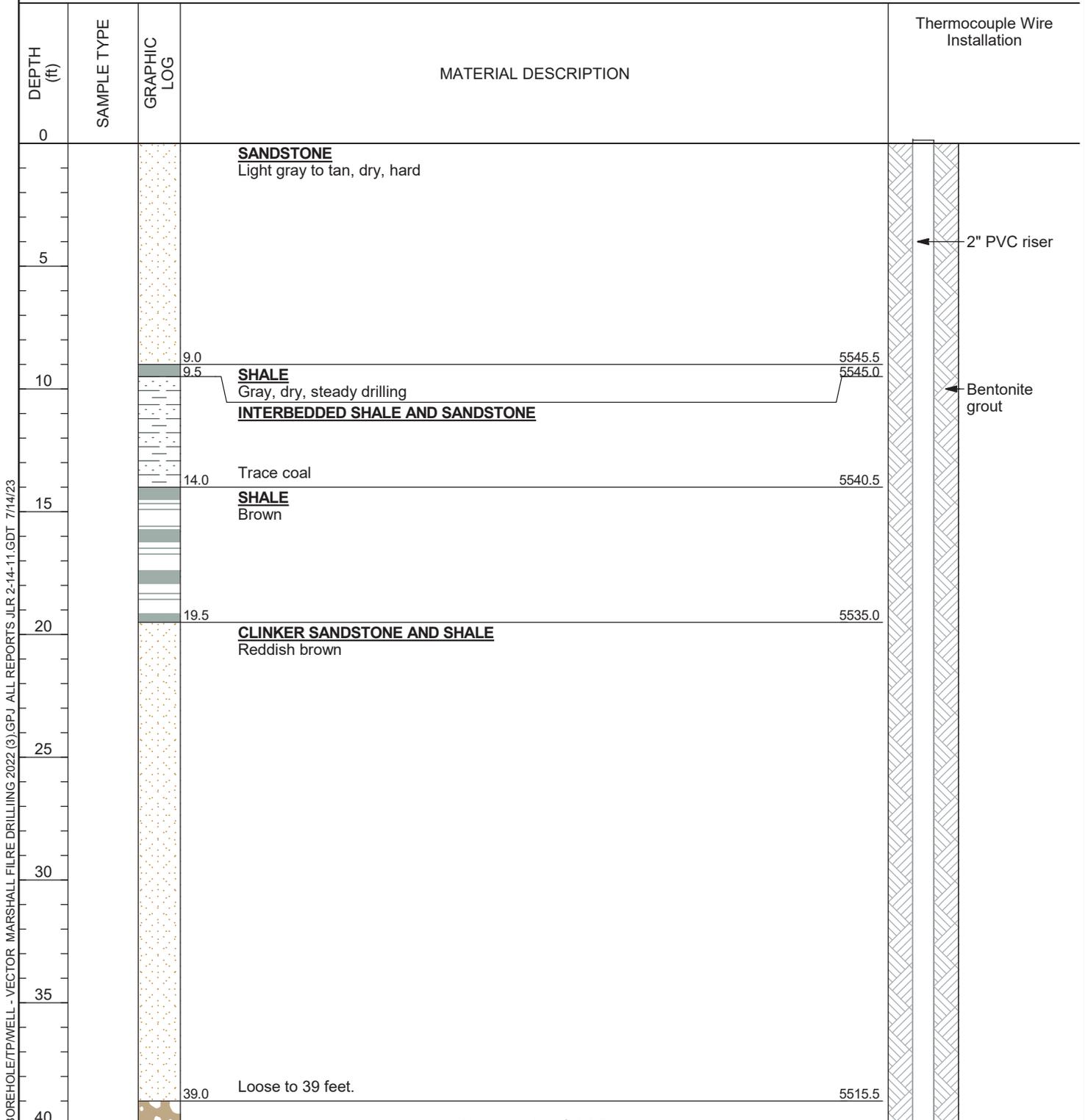


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/21/2023** GROUND ELEVATION: **5555 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771702.127000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075461.002000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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CLIENT State of Colorado DRMS

PROJECT NAME Marshall Drilling 202T

PROJECT NUMBER 114-910599

PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			RUBBLE Soft, loss of circulation (<i>continued</i>)	
45			Ash? Soft, fast drilling	
47.0			5507.5	Bentonite
50			SHALE Firm drilling	
55			Faint returns of greenish gray shale	2" PVC slotted screen
60.0			Let hole sit open 5 minutes, no odor	Filter pack
61.5			COAL Black	
			SHALE	
65			Lost returns	
70				
75				
79.5			5475.0	
Bottom of Test Hole at 79.5 feet.				

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/27/2023** GROUND ELEVATION: **5573 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771995.606000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075428.930000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0 - 4.0			FILL Dark brown, moist	
4.0			5569.1	
4.0 - 7.0			SANDSTONE Light brown, slightly moist, steady drilling	Thermocouple wire
7.0			5566.1	
7.0 - 13.0			SHALE Light gray, slightly moist, hard	Bentonite grout
13.0			5560.1	
13.0 - 16.0			SANDSTONE Tan, slightly moist	
16.0			5557.1	
16.0 - 22.0			CLINKER SANDSTONE Red, slightly moist	
22.0			5551.1	
22.0 - 23.0			SHALE Light gray, slightly moist	
23.0			5550.1	
23.0 - 23.5			SANDSTONE Tan, slightly moist	
23.5			5549.6	
23.5 - 28.5			SHALE Light gray, slightly moist Softer for 2 feet -Grouted borehole with thermocouple set to 26 ft. -Completed with 6" landscape flush mount vault Hard for 2 feet	
28.5			5544.6	
28.5 - 32.0			VOID Loss of circulation	
32.0			5541.1	
32.0 - 35.0			SHALE Poor returns of gray shale Soft to 37 feet, few returns	
35.0				
35.0 - 40.0			No returns Firm	
40.0				

BOREHOLE/TP/WELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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BOREHOLE ID: MM-51
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			Poor returns of dark gray to black shale with some coal SHALE Poor returns of gray shale (<i>continued</i>) Loss of returns, even firmer Hard, drill chatter	
		44.5	Bottom of Test Hole at 44.5 feet.	

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

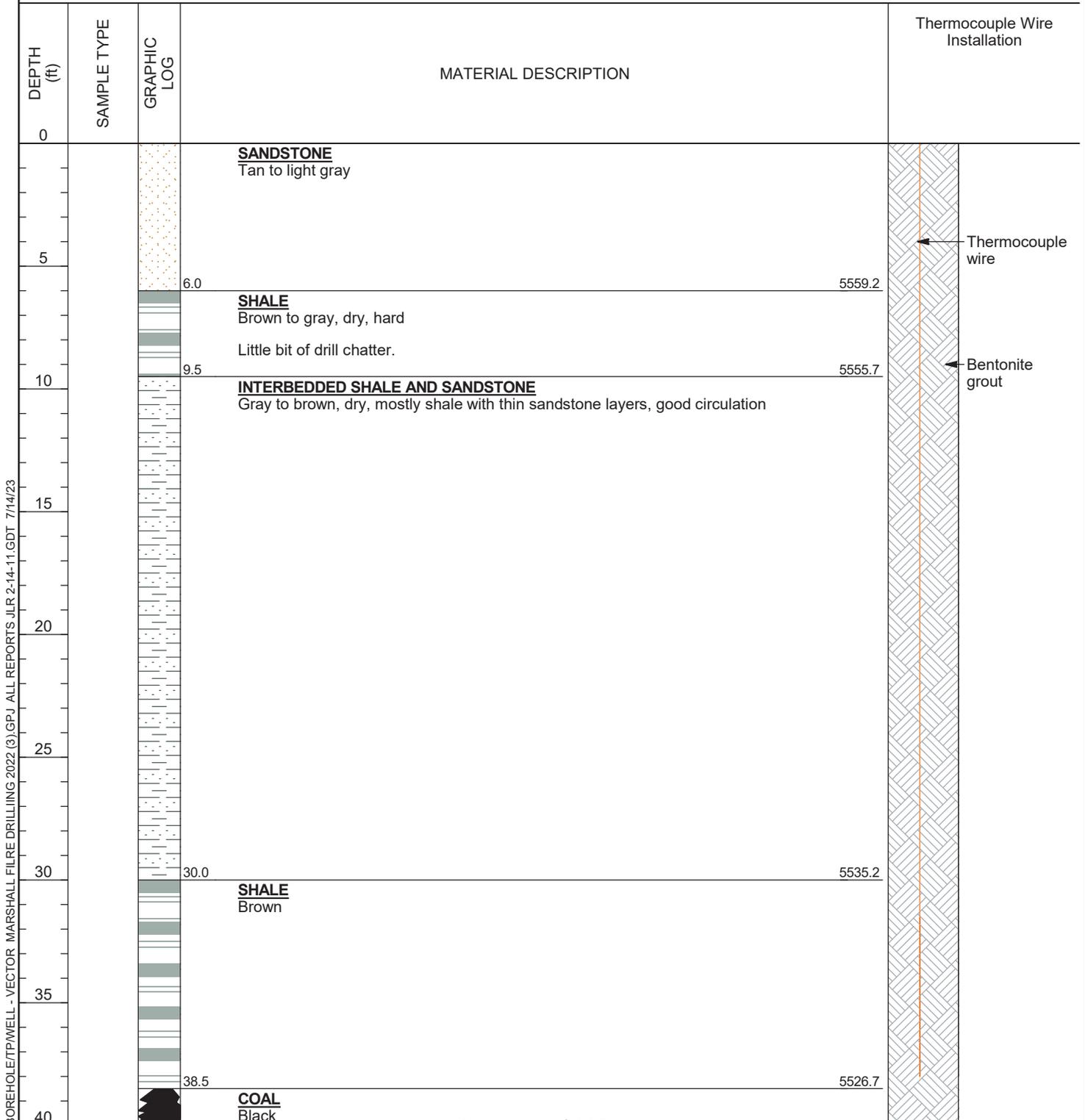


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/20/2023** GROUND ELEVATION: **5565 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771825.850000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075364.944000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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BOREHOLE ID: MM-52
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			COAL Black (continued)	
		42.0		5523.2
			SHALE dark brown	
45				
				
50				
		50.5		5514.7
			COAL black	5513.7
		51.5		
			SHALE brownish gray	5511.7
		53.5		
55				
			COAL black	5509.2
		56.0		
			SHALE brownish gray	
		59.5		5505.7
			-Grouted borehole with thermocouple set to 38 ft. -Completed with 6" landscape flush mount vault Bottom of Test Hole at 59.5 feet.	

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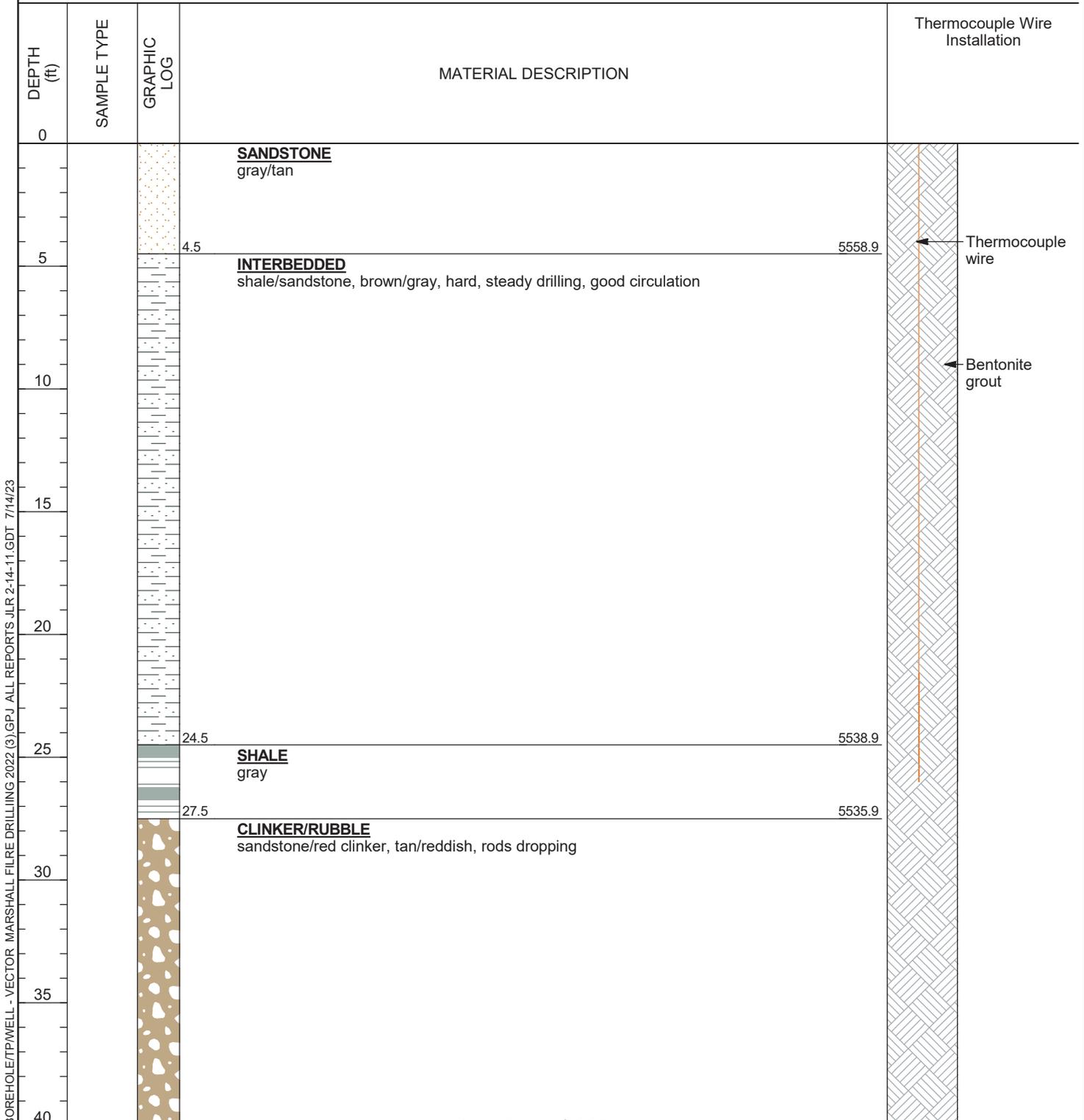


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 03/20/2023 GROUND ELEVATION: 5563 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1771768.182000 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling EASTING: 3075413.974000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa





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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			41.0 SHALE solid drilling 5522.4	
			44.5 -Grouted borehole with thermocouple set to 26 ft. -Completed with 6" landscape flush mount vault 5518.9	
			Bottom of Test Hole at 44.5 feet.	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 03/20/2023 GROUND ELEVATION: 5577 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1771652.781000 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling EASTING: 3075218.160000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0 - 12.0			SANDSTONE brown/tan	<p>Thermocouple wire</p> <p>Bentonite grout</p>
12.0 - 14.5			COAL black	
14.5 - 37.0			INTERBEDDED shale/sandstone, brown/tan/gray	
37.0 - 40.0			RUBBLE/VOID no circulation	
40.0			-Grouted borehole with thermocouple set to 35 ft. -Completed with 6" landscape flush mount vault	
			5565.1	
			5562.6	
			5540.1	

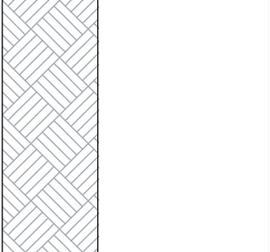
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			RUBBLE/VOID no circulation (<i>continued</i>)	
45				
			47.0 5530.1 SHALE harder drilling	
50				
			54.5 5522.6 Bottom of Test Hole at 54.5 feet.	

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

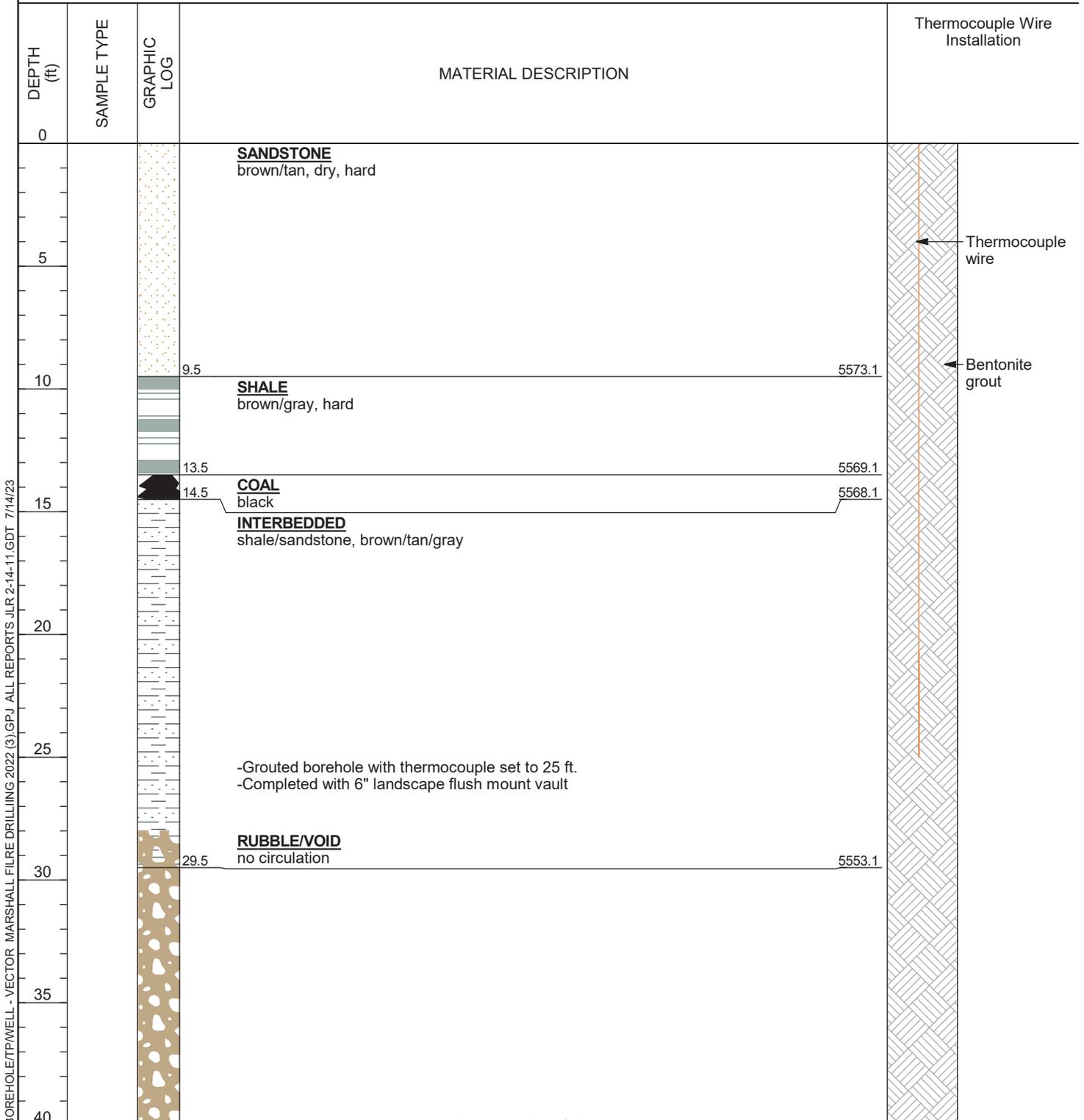


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BOREHOLE ID: MM-55
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **04/05/2023** GROUND ELEVATION: **5583 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771568.375000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075124.478000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**





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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			RUBBLE/VOID no circulation (<i>continued</i>)	
			42.0 5540.6 SHALE steady drilling	
45			46.0 5536.6 COAL very soft drilling, no returns	
			48.0 5534.6 SHALE steady drilling	
50				
			54.5 5528.1 Bottom of Test Hole at 54.5 feet.	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/07/2023** GROUND ELEVATION: **5569 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772142.276000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075379.117000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
5			SANDSTONE brown/tan, dry, hard	<p>Thermocouple wire</p> <p>Bentonite grout</p>
8.0			INTERBEDDED shale/sandstone, brown/tan/gray	
15.0			COAL black, good circulation -Grouted borehole with thermocouple set to 16 ft. -Completed with 6" landscape flush mount vault	
26.0			SHALE brown/gray, hard	
36.0			COAL very soft drilling, no returns	
37.5			SHALE steady drilling, brown	
40.0				

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/08/2023** GROUND ELEVATION: **5556 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772425.830000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075606.736000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0 - 2.0			GRAVEL	
2.0 - 12.0			SANDSTONE brown/tan, dry, hard	
12.0 - 17.0			INTERBEDDED shale/sandstone, brown/tan/gray	
17.0 - 19.0			COAL black, good circulation	
19.0 - 27.0			SHALE light gray, sandstone lenses	
27.0 - 29.0			COAL black	
29.0 - 34.0			SHALE gray	
34.0 - 37.0			COAL black	
37.0 - 40			SHALE dark gray	

Thermocouple wire

Bentonite grout

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			SHALE dark gray (continued)	
45				
50			50.0	5506.1
Bottom of Test Hole at 50.0 feet.				

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/09/2023** GROUND ELEVATION: **5554 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772452.294000 N** LOGGED BY: **Dan Bochicchio**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075615.953000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
2.0			GRAVEL 5551.9	<p>Thermocouple wire</p> <p>Bentonite grout</p>
4.0			FILL sandstone/shale/coal/gravel/sand/debris 5549.9	
6.0			COAL highly weathered, could be fill, dark brown 5547.9	
8.0			INTERBEDDED shale/sandstone, brown/tan/gray 5545.9	
13.0			COAL black 5540.9 -Grouted borehole with thermocouple set to 10 ft. -Completed with 6" landscape flush mount vault	
15.0			INTERBEDDED shale/sandstone, brown/tan/gray	
22.0			COAL black 5531.9	
24.0			COAL black 5529.9	
25.0			SHALE light gray, brown silty/sandy lenses	
40.0			5513.9	

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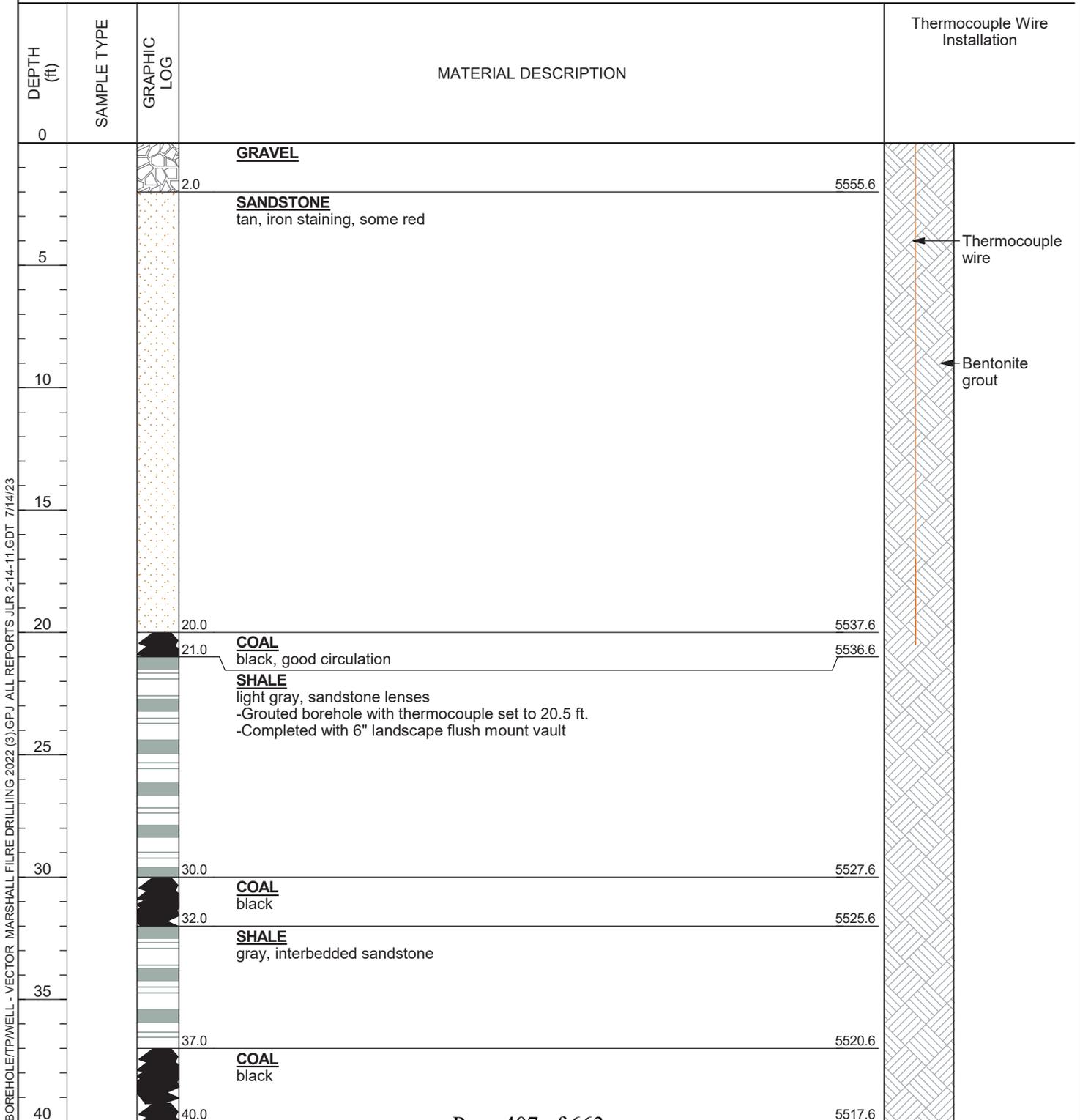


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BOREHOLE ID: MM-59
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 03/08/2023 GROUND ELEVATION: 5558 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1772387.889000 N LOGGED BY: Dan Bochicchio
 CONTRACTOR: Authentic Drilling EASTING: 3075591.795000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa



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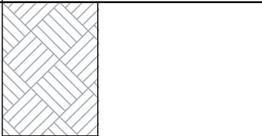
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CLIENT State of Colorado DRMS

PROJECT NAME Marshall Drilling 202T

PROJECT NUMBER 114-910599

PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			<p>SHALE dark gray</p>	
		44.0	Bottom of Test Hole at 44.0 feet.	5513.6

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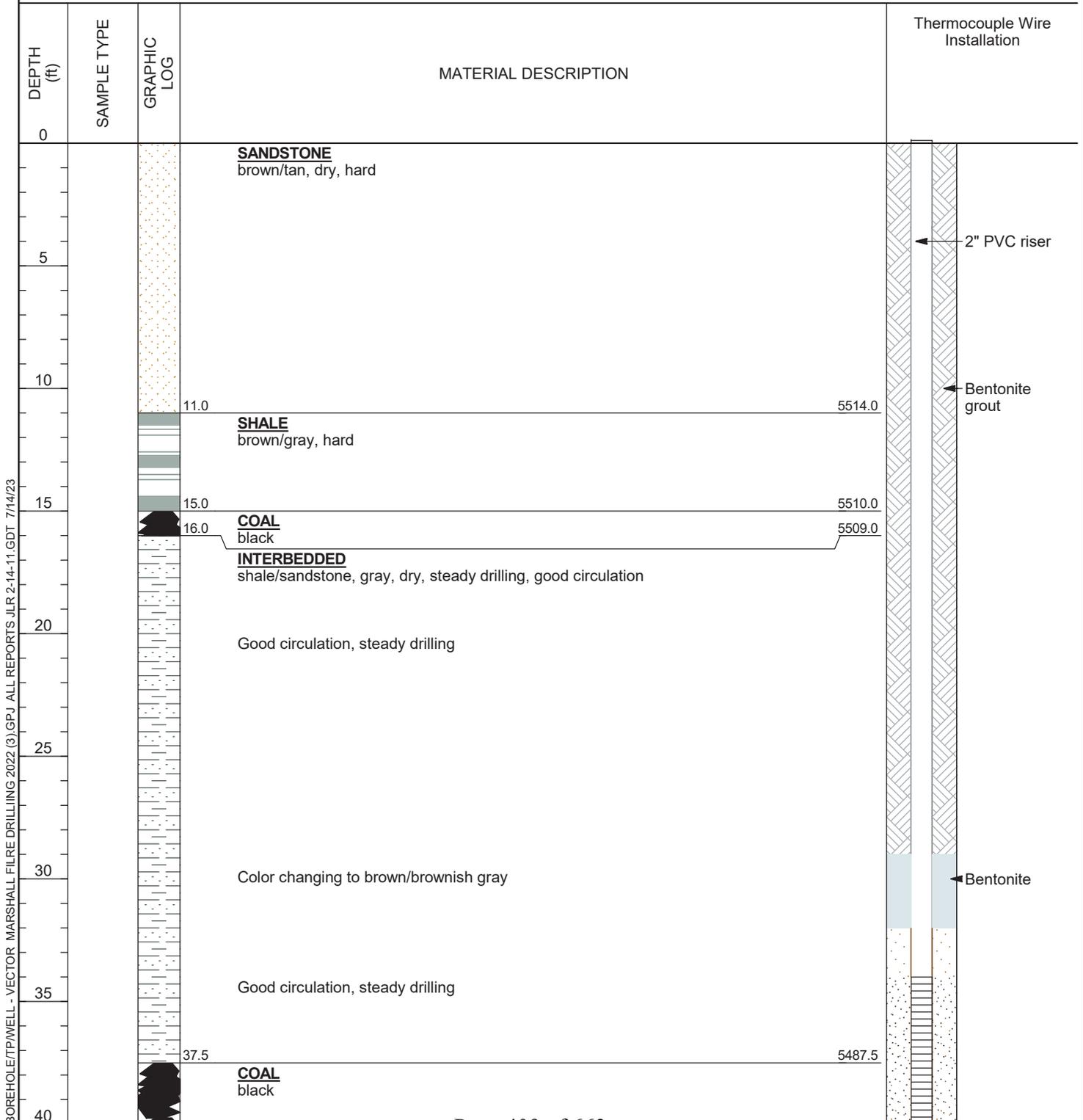


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: 03/13/2023 GROUND ELEVATION: 5525 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1772680.452000 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling EASTING: 3076377.088000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa



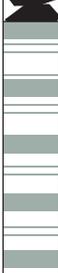
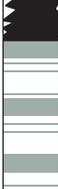
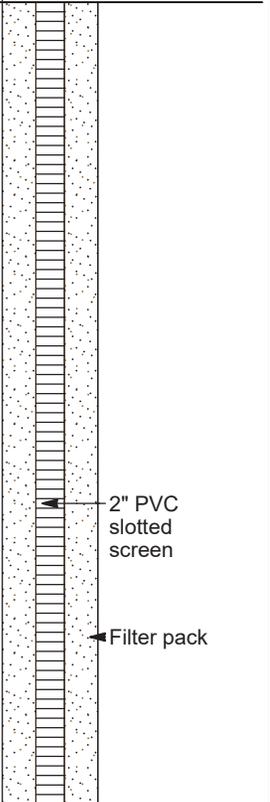
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
			<u>COAL</u> black (continued)	
49.5			<u>SHALE</u> steady drilling	
58.0			<u>COAL</u> black, dry	
59.5			<u>SHALE</u> gray	
64.5			Bottom of Test Hole at 40.0 feet.	
				 <p>2" PVC slotted screen Filter pack</p>

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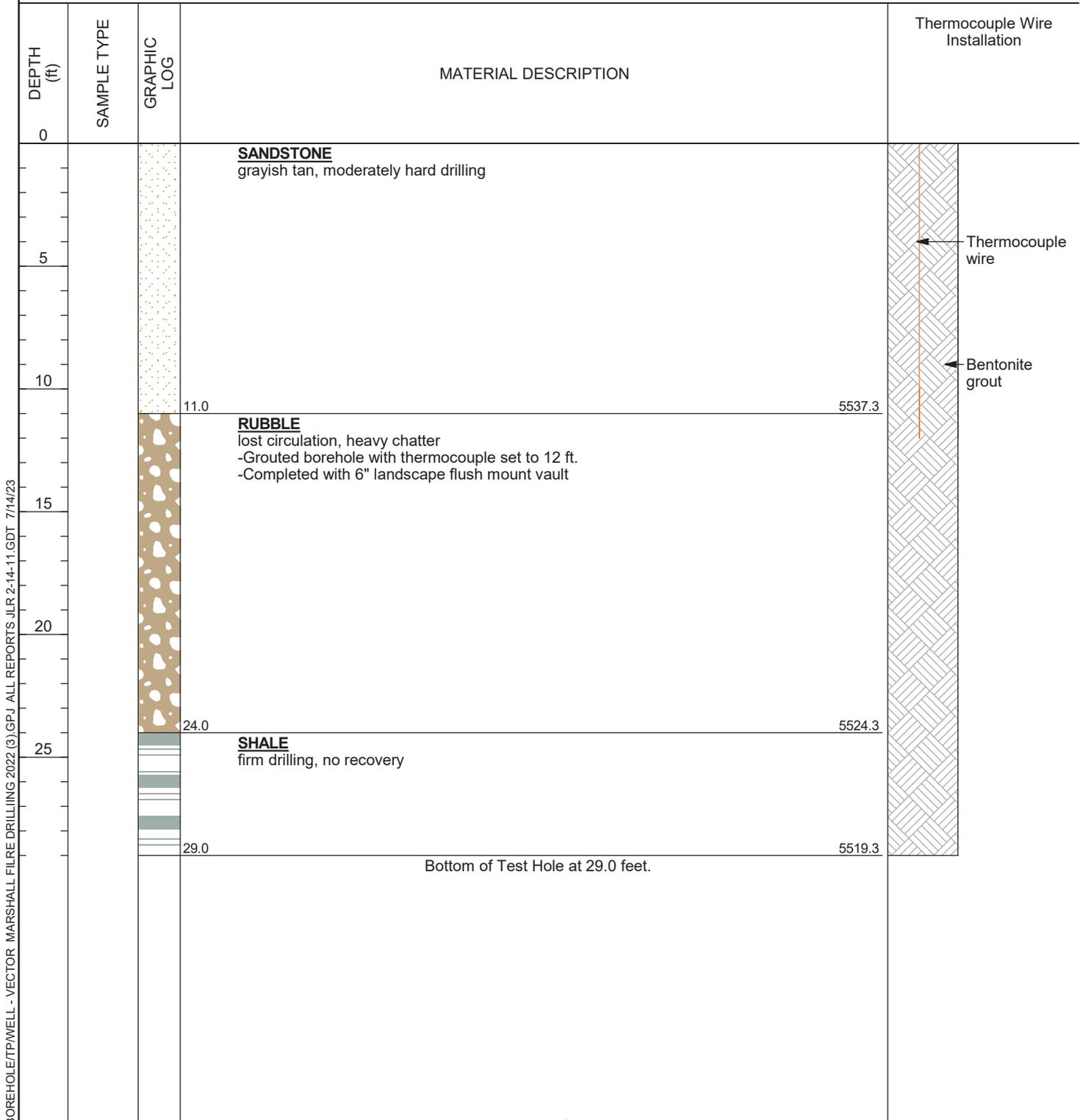


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/15/2023** GROUND ELEVATION: **5548 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772766.905000 N** LOGGED BY: **Ed Muller**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075936.332000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



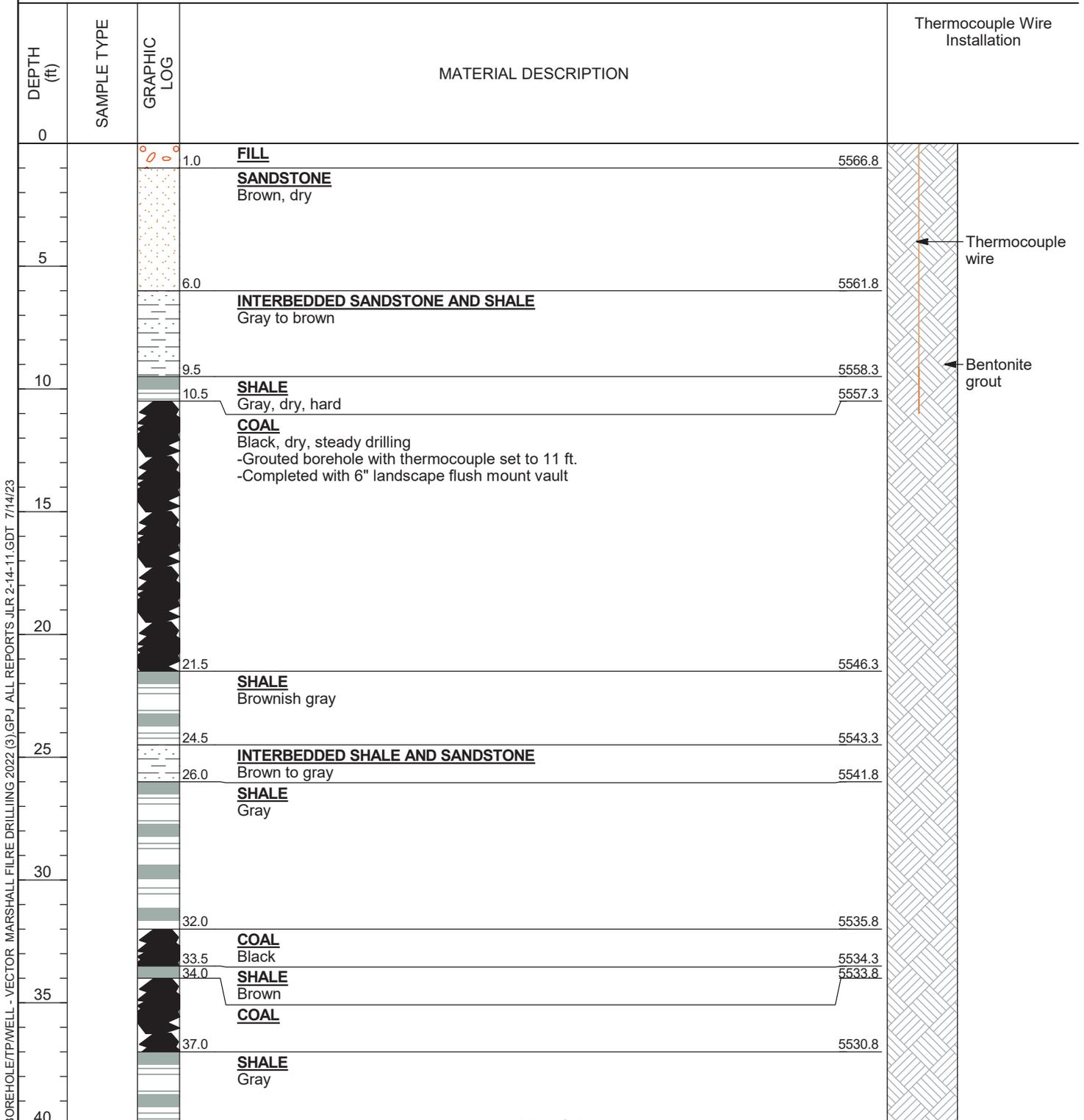


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/30/2023** GROUND ELEVATION: **5568 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772182.898000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075371.976000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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CLIENT State of Colorado DRMS **PROJECT NAME** Marshall Drilling 202T
PROJECT NUMBER 114-910599 **PROJECT LOCATION** Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			SHALE Gray (continued)	
		43.0	5524.8	
			SANDY SHALE Greenish gray	
		44.5	5523.3	
			Bottom of Test Hole at 44.5 feet.	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/27/2023** GROUND ELEVATION: **5569 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772065.355000 N** LOGGED BY: **Zach Spence**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075442.506000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0 - 4.0			FILL Dark brown, moist	
4.0			5565.5	
4.0 - 7.0			SANDSTONE Light brown, slightly moist, steady drilling	Thermocouple wire
7.0			5562.5	
7.0 - 13.0			SHALE Light gray, slightly moist, hard	Bentonite grout
13.0			5556.5	
13.0 - 16.0			SANDSTONE Tan, slightly moist	
16.0			5553.5	
16.0 - 22.0			CLINKER SANDSTONE Red, slightly moist	
22.0			5547.5	
22.0 - 23.0			SHALE Light gray, slightly moist	
23.0			5546.5	
23.0 - 23.5			SANDSTONE Tan, slightly moist	
23.5			5546.0	
23.5 - 28.5			SHALE Light gray, slightly moist Softer for 2 feet	
28.5			5541.0	
28.5 - 32.0			VOID Loss of circulation	
32.0			5537.5	
32.0 - 37.0			SHALE Poor returns of gray shale Soft to 37 feet, few returns	
37.0 - 40.0			No returns Firm	

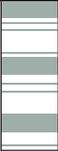
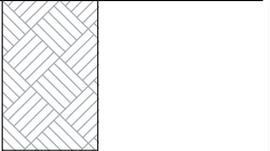
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			Poor returns of dark gray to black shale with some coal SHALE Poor returns of gray shale (<i>continued</i>) Loss of returns, even firmer Hard, drill chatter	
		44.5	Bottom of Test Hole at 44.5 feet.	

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23



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BOREHOLE ID: MM-64
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/27/2023** GROUND ELEVATION: **5569 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772085.697000 N** LOGGED BY: **Zach Spence**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075274.140000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
			FILL Light brown, dry	
4.0			5565.4	
5			SANDSTONE Light brown, slightly moist, hard	Thermocouple wire
5.0			5564.4	
6.0			SHALE Dark brown, slightly moist, with some low grade coal	
			SANDSTONE Tan, slightly moist	
10				Bentonite grout
13.0			5556.4	
15			SHALE Dark gray, slightly moist, with some low grade coal	
17.5			5551.9	
18.0			SANDSTONE Tan	
19.0			5550.4	
20			SHALE Dark gray, slightly moist	
22.0			SANDSTONE Tan, slightly moist	
23.5			CLINKER SANDSTONE Red	
25			SHALE Light gray, dry	
25.0			5544.4	
			CLINKER SANDSTONE Red -Grouted borehole with thermocouple set to 26 ft. -Completed with 6" landscape flush mount vault	
30				
32.0			5537.4	
			SHALE Dark gray, soft	
34.0			5535.4	
34.5			CLINKER SANDSTONE Red	
			SHALE Light gray, dry	
35			5534.9	
38.5			5530.9	
40			CLINKER SANDSTONE Reddish brown, steady drilling	

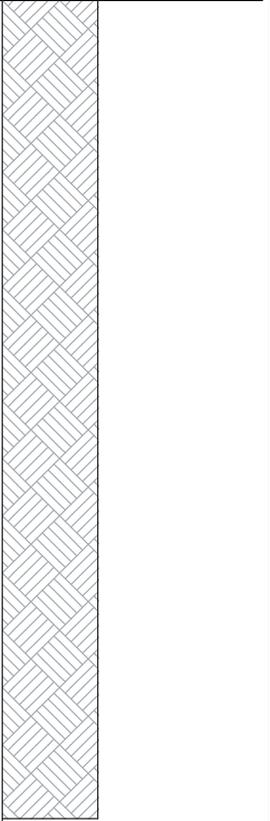
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40				
			41.0 COAL Black, very soft, dry 5528.4	
			43.0 Thermocouple wire at 42 feet. 5526.4	
45			SHALE Dark gray, dry	
50			Color changed to light gray. Some drill chatter. Steady drilling	
			53.0 COAL Black, soft 5516.4	
55			58.0 SHALE Dark gray, dry 5511.4	
60			64.5 5504.9	
			Bottom of Test Hole at 64.5 feet.	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/27/2023** GROUND ELEVATION: **5570 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772026.995000 N** LOGGED BY: **Zach Spence**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075362.649000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
			FILL Brown, dry	
3.0			5566.8	
			SANDSTONE Light brown, dry, hard	
5.5			5564.3	Thermocouple wire
			SHALE Light brown to light gray, slightly moist	
8.0			5561.8	
8.5			SANDSTONE Tan, dry	
10.0			5559.8	Bentonite grout
			SHALE Light brown to light gray	
			CLINKER SANDSTONE Red to grayish red, dry	
15.0			5554.8	
			-Grouted borehole with thermocouple set to 14 ft. -Completed with 6" landscape flush mount vault	
17.0			5552.8	
			CLINKER SANDSTONE Firm, no returns	
20				
			Poor red returns	
25.0			5544.8	
			RUBBLE Loss of circulation, no returns	
27.0			5542.8	
			CLINKER SANDSTONE Poor red returns	
28.5			5541.3	
			RUBBLE Loss of circulation Some drill chatter	
30				
33.0			5536.8	
			SHALE Firm, no returns, steady drilling	
35				
40				

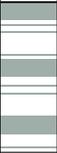
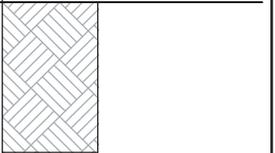
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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			<p>SHALE Firm, no returns, steady drilling (<i>continued</i>)</p>	
		<p>44.5</p>	<p>Bottom of Test Hole at 44.5 feet.</p>	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/28/2023** GROUND ELEVATION: **5569 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772006.142000 N** LOGGED BY: **Zach Spence**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075227.835000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0			TOPSOIL Brown, moist 5566.9	
2.0			SANDSTONE Tan, steady drilling 5561.9	
5				Thermocouple wire
7.0			CLINKER SANDSTONE Brownish red 5555.9	
10				Bentonite grout
13.0			SHALE Gray 5553.9	
15				
15.0			CLINKER SANDSTONE Brownish red 5548.9	
20			RUBBLE No returns, slightly rubbly, collar not allowing returns to come up -Grouted borehole with thermocouple set to 20 ft. -Completed with 6" landscape flush mount vault 5543.9	
25				
25.0			SHALE Hard, chatter to 26 feet Steady drilling, no returns Very dark gray returns of shale with some coal 5535.9	
30				
33.0			SANDSTONE Light gray 5534.9	
34.0			Bottom of Test Hole at 34.0 feet.	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/28/2023** GROUND ELEVATION: **5570 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772075.019000 N** LOGGED BY: **Zach Spence**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075206.121000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
0			TOPSOIL Dark brown, moist 5568.1	
2.0			SANDSTONE Tan, steady drilling 5565.1	
5.0			SHALE Brownish gray 5562.1	Thermocouple wire
8.0			SANDSTONE Brown 5560.1	Bentonite grout
10.0			SHALE Brownish gray 5557.1	
13.0			SANDSTONE Brown 5555.6	
14.5			CLINKER SANDSTONE Brownish red to grayish red	
20.0			-Grouted borehole with thermocouple set to 20 ft. -Completed with 6" landscape flush mount vault Lost returns due to a collar.	
25.0			Regained returns. Color changed to reddish gray. 5544.1	
26.0			RUBBLE Lost returns due to a collar. Slightly rubbly. 5543.1	
27.0			CLINKER SANDSTONE Reddish gray Lost returns due to a collar.	
30.0			5538.1	
32.0			SHALE Very dark gray to dark gray, with some low grade coal to 34 feet.	
35.0			Color changed to dark gray.	
39.0			5531.1	

Bottom of Test Hole at 39.0 feet.

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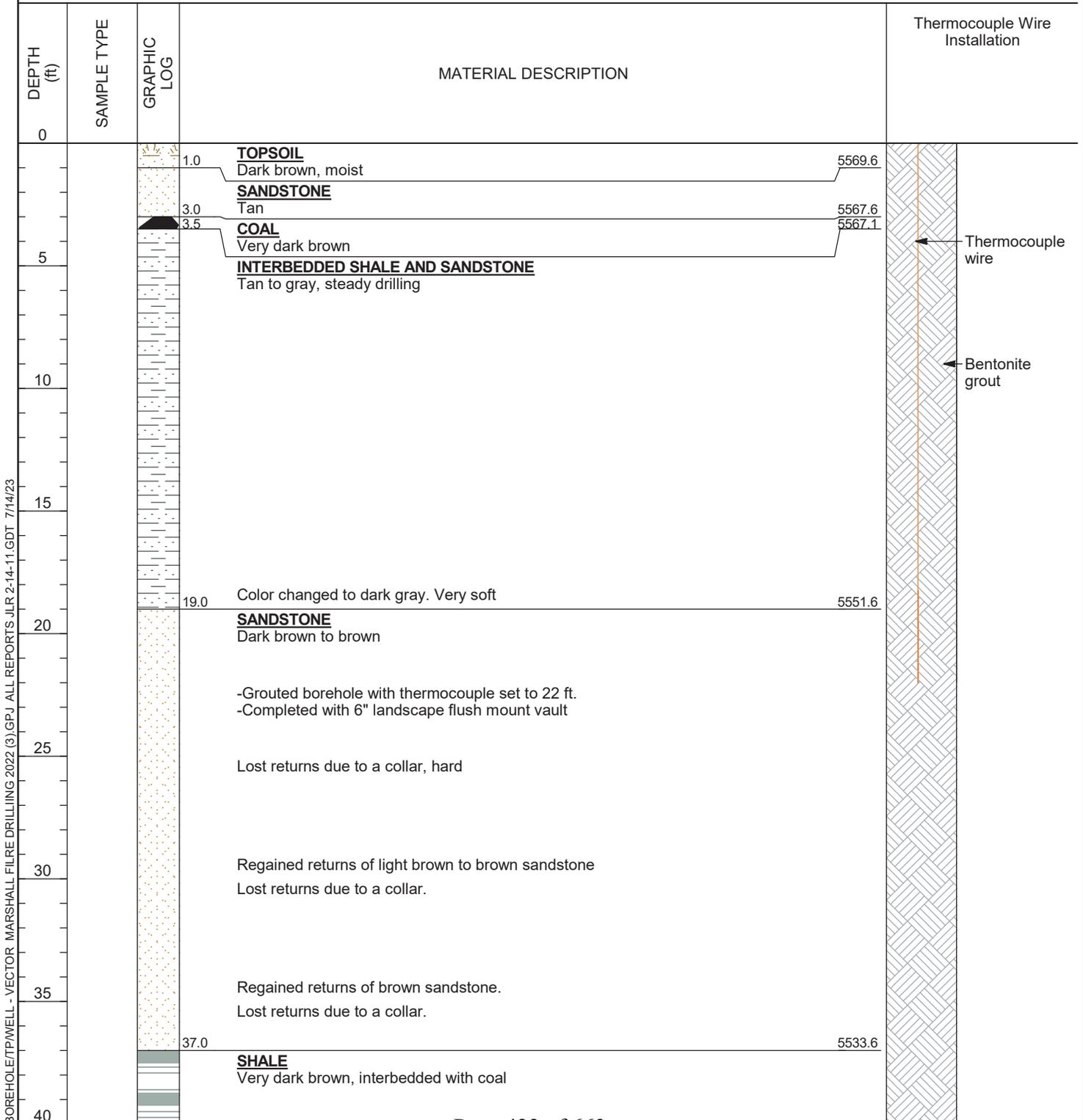


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/28/2023** GROUND ELEVATION: **5571 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1771991.857000 N** LOGGED BY: **Zach Spence**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075174.553000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

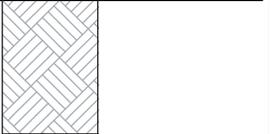




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CLIENT State of Colorado DRMS **PROJECT NAME** Marshall Drilling 202T
PROJECT NUMBER 114-910599 **PROJECT LOCATION** Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
40			<p>SHALE Very dark brown, interbedded with coal (<i>continued</i>) Lost returns due to a collar. Steady drilling, firmer</p>	
		44.0	Bottom of Test Hole at 44.0 feet.	5526.6

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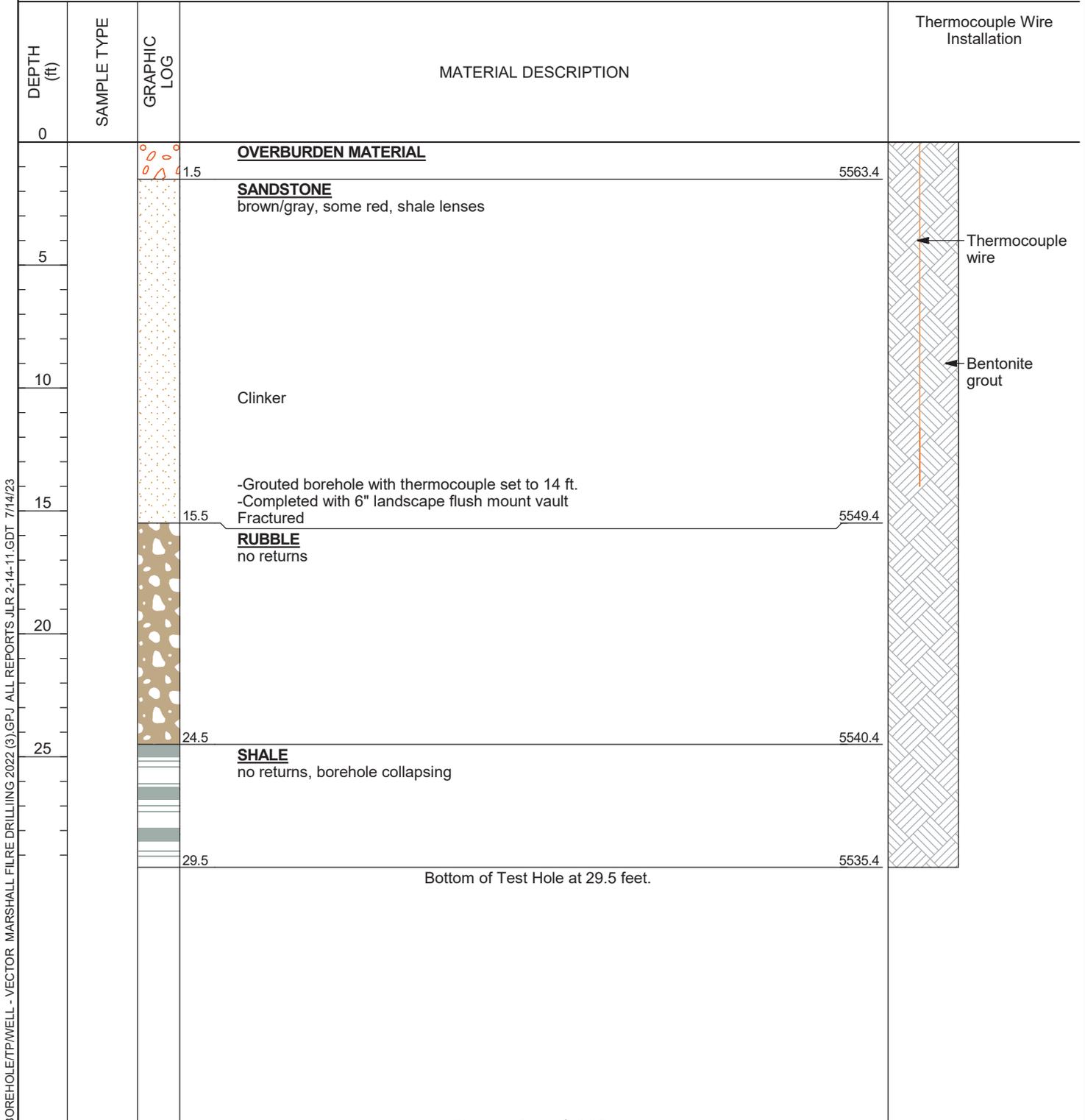


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: Not Recorded GROUND ELEVATION: 5565 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1771954.245000 N LOGGED BY: Jeffrey Nuttall
 CONTRACTOR: Authentic Drilling EASTING: 3075277.417000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/23/2023** GROUND ELEVATION: **5570 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772120.951000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075292.283000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
5			SANDSTONE brown/gray, some red, shale lenses	
10			COAL black, dry, good circulation -Grouted borehole with thermocouple set to 9 ft. -Completed with 6" landscape flush mount vault	
15			SHALE no returns, borehole collapsing	
			Bottom of Test Hole at 19.5 feet.	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/23/2023** GROUND ELEVATION: **5570 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772091.316000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075374.043000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
1.0			OVERBURDEN MATERIAL 5568.7 SHALE/SANDSTONE interbedded layers, brown/tan/gray	<p>Thermocouple wire</p> <p>Bentonite grout</p>
9.5			SANDSTONE 5560.2 clinker, reddish brown	
14.5			RUBBLE 5555.2 lost circulation	
20			-Grouted borehole with thermocouple set to 20 ft. -Completed with 6" landscape flush mount vault	
29.5			SHALE 5540.2 solid drilling, no returns	
34.5			5535.2 Bottom of Test Hole at 34.5 feet.	

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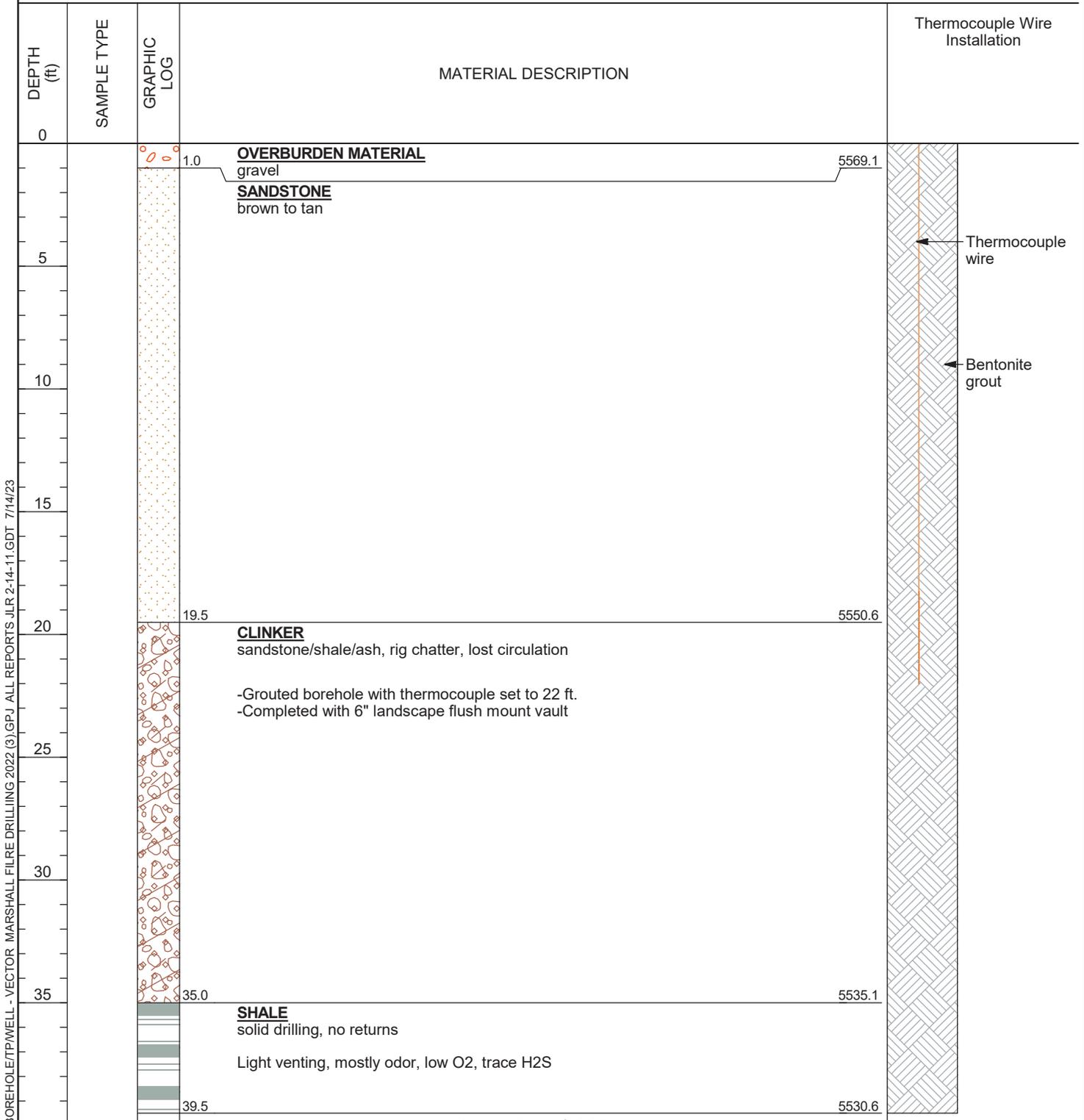


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/23/2023** GROUND ELEVATION: **5570 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772112.151000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075410.450000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



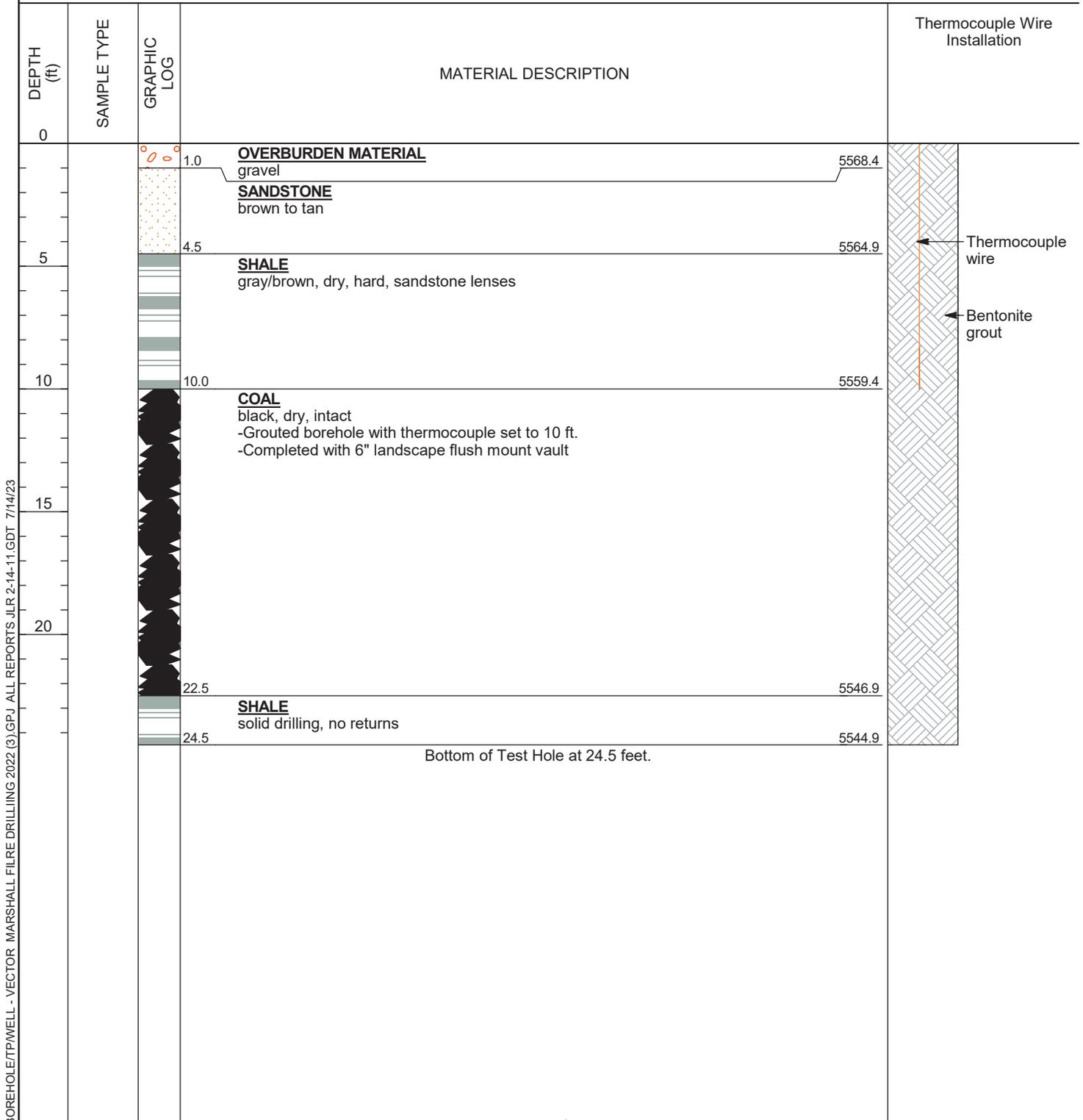


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/23/2023** GROUND ELEVATION: **5569 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772141.233000 N** LOGGED BY: **Jeffrey Nuttall**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075341.340000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



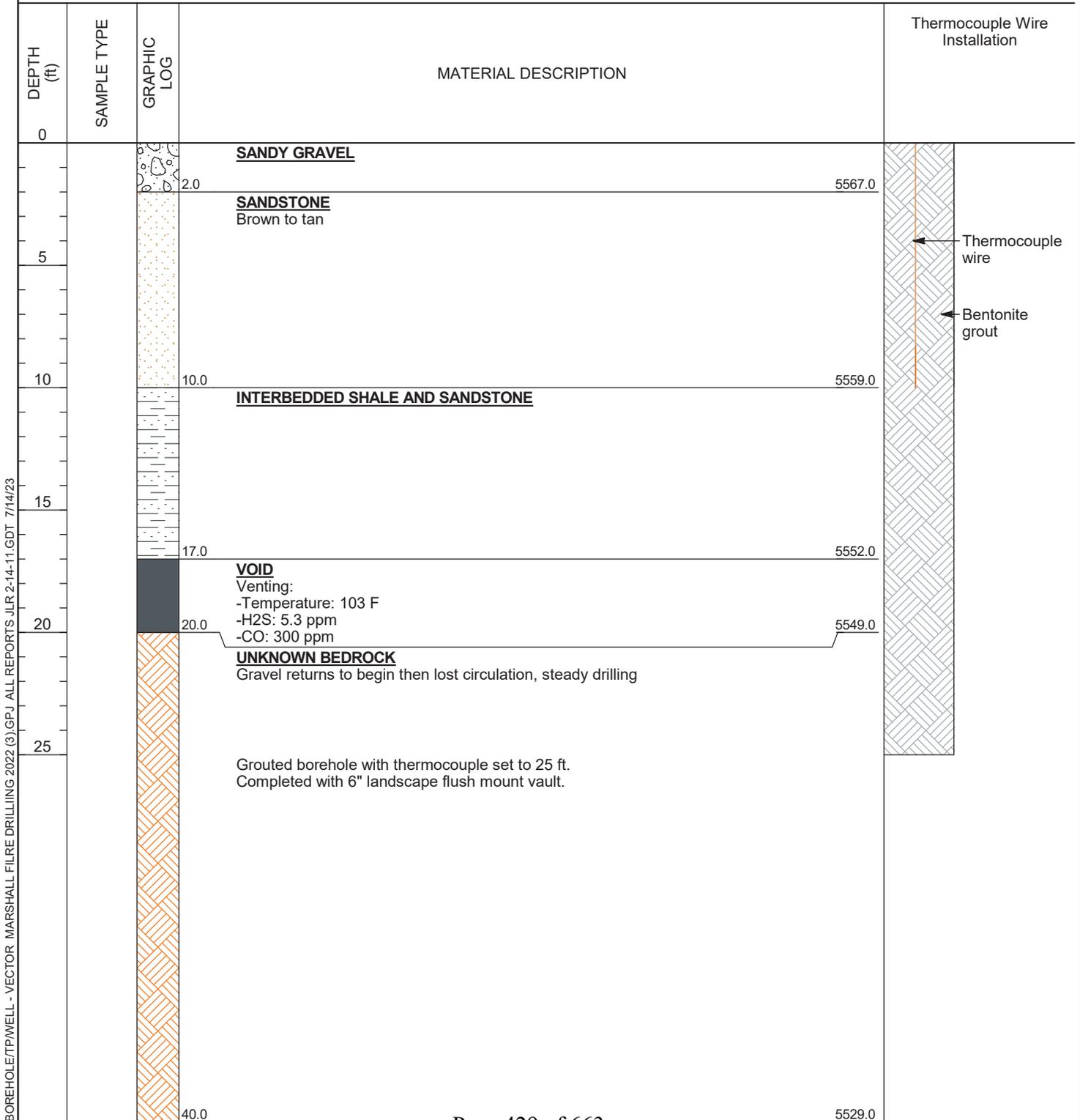


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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: **03/23/2023** GROUND ELEVATION: **5569 ft** METHOD: **Air Rotary**
 CONSULTANT: **Tetra Tech** NORTHING: **1772126.500000 N** LOGGED BY: **Not Recorded**
 CONTRACTOR: **Authentic Drilling** EASTING: **3075487.735000 E** DRILLED BY: **John Tegtmeier**
 EQUIPMENT: **Acker Renegade** INCLINATION: **Vertical** LOCATION: **Marshall Mesa**



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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: Not Recorded GROUND ELEVATION: 5569 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1772184.466000 N LOGGED BY: Not Recorded
 CONTRACTOR: Authentic Drilling EASTING: 3075513.767000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
1.0			SANDY GRAVEL 5567.6	<p>Thermocouple wire</p> <p>Bentonite grout</p>
2.5			SILTY SAND Brown 5566.1	
			SANDSTONE Tan to light brown	
8.0			5560.6	
8.5			SHALE Gray 5560.1	
			SHALE Tan to light brown	
13.0			5555.6	
14.0			SHALE Gray 5554.6	
			SANDSTONE Tan with reddish staining	
21.0			5547.6	
23.0			VOID Lost circulation Grouted borehole with thermocouple set to 22 ft. Completed with 6" landscape flush mount vault. No heat or odors observed. 5545.6	
			RUBBLE	
27.0			5541.6	
			ASSUMED SHALE No returns, hard, drilling ?	
39.0			5529.6	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
			<p>UNKNOWN BEDROCK Soft drilling (<i>continued</i>)</p>	
			<p>50.0 Bottom of Test Hole at 25.0 feet. 5518.6</p>	

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CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DATE(S) OF DRILLING: Not Recorded GROUND ELEVATION: 5567 ft METHOD: Air Rotary
 CONSULTANT: Tetra Tech NORTHING: 1772254.974000 N LOGGED BY: Not Recorded
 CONTRACTOR: Authentic Drilling EASTING: 3075481.878000 E DRILLED BY: John Tegtmeier
 EQUIPMENT: Acker Renegade INCLINATION: Vertical LOCATION: Marshall Mesa

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
0				
			SANDY GRAVEL	
			SANDSTONE	
4.0			5563.4	
5			INTERBEDDED SHALE AND SANDSTONE Dark red, very fine grained	
10				
11.0			5556.4	
			UNKNOWN BEDROCK Steady drilling, not hard	
15				
20			Grouted borehole with thermocouple set to 20 ft. Completed with 6" landscape flush mount vault. No heat or odors observed.	
25				
27.0			5540.4	
			RUBBLE Drill chatter	
28.0			5539.4	
			UNKNOWN BEDROCK Steady drilling	

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BOREHOLE ID: MM-76
 PAGE 2 OF 2

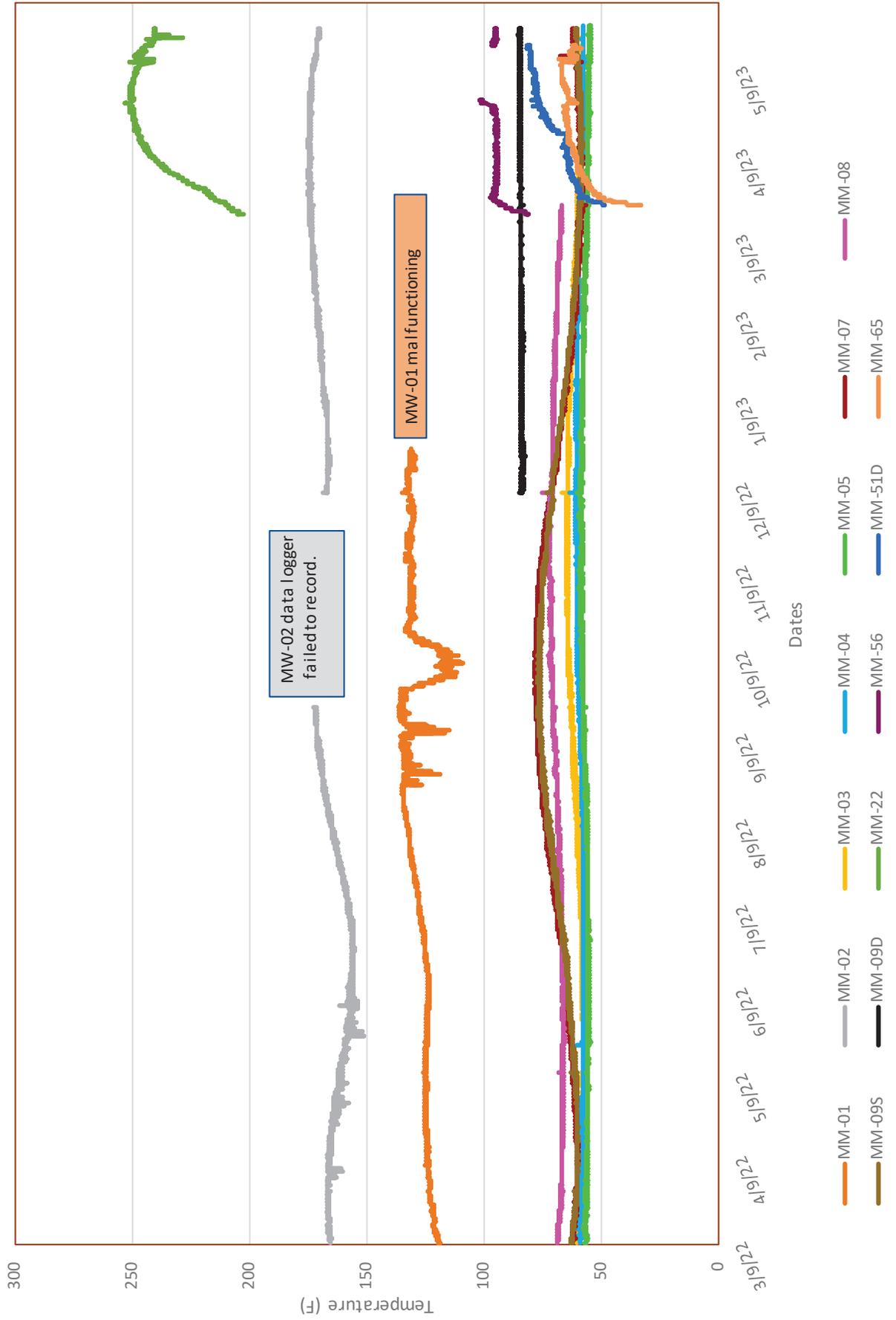
CLIENT State of Colorado DRMS PROJECT NAME Marshall Drilling 202T
 PROJECT NUMBER 114-910599 PROJECT LOCATION Boulder County, CO

DEPTH (ft)	SAMPLE TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION	Thermocouple Wire Installation
			<p>UNKNOWN BEDROCK Steady drilling (<i>continued</i>)</p>	
			<p>50.0 Bottom of Test Hole at 25.0 feet. 5517.4</p>	

BOREHOLE/TPWELL - VECTOR MARSHALL FILRE DRILLING 2022 (3).GPJ ALL REPORTS JLR 2-14-11.GDT 7/14/23

APPENDIX D: Thermocouple Time-Series Data

Appendix D Marshall Mesa Thermocouple Time-Series Data, March 9, 2022 to May 24, 2023





TETRA TECH

1100 S. McCaslin Blvd.
Superior, CO 80027
(303) 447-1823

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Marshall Mesa Trailhead Redesign
City of Boulder Open Space and Mountain Parks
Appendix 3 – Marshall Mine Underground Coal Fire
Mitigation Plan
April 8, 2024



Date: January 16, 2024

To: Bethany Collins, City of Boulder Open Space and Mountain Parks

From: Jeff Graves, Colorado Division of Reclamation, Mining & Safety

Re: Mitigation of Underground Coal Fire, Marshall Mesa Trailhead, Boulder County, Colorado

Dear Bethany,

During the winters of 2021 and 2022 DRMS conducted subsurface investigations in order to determine the nature and extent of the underground coal fire at the Marshall Mesa Trailhead. The detailed findings of these investigations can be found in the *Marshall Mine Underground Coal Fire Report of Investigations* Sept. 2023, located on the DRMS website at drms.colorado.gov. In summary elevated temperatures, defined for this site as greater than 80°F, are being generated from the upper coal bed interval at two areas within the Site: directly north of and under the Trailhead Parking Lot and approximately 1,000 ft south of the parking area. Maximum borehole temperatures of each area are 241°F and 171°F, respectively. These areas of elevated temperatures correlate with the spatial extent of observed snowmelt which delineates the extent of anomalous heat, and minor dispersed surface venting and borehole gas emissions that are commonly associated with coal oxidation and/or low intensity combustion. Outside of the areas where heat was observed, the upper coal interval is characterized as burned-out with clinker/baked zones, rubble, and/or voids. Many of the surface depressions found at the Site, especially north of the parking area, are associated with these subsurface burned-out zones. The upper coal seam lies largely intact with no evidence of mining or mine fire activity further north/northeast of the parking area.

DRMS recommends that a mitigation effort be conducted at the Marshall Mesa Trailhead to remove, to the extent possible, hazards associated with the current and previous subsurface coal fire activity. Additionally DRMS recommends that, where possible, burnt out unburned coal, adjacent to areas with elevated temperatures, should be mitigated to prevent future subsurface ignition and subsidence.

Due to the shallow nature of the coal seam at the Marshall Mesa Site (>35 ft), excavation of the coal seam is the most effective form of mitigation. DRMS proposes total excavation of the two coal

Physical Address: 1313 Sherman Street, Room 215, Denver, CO 80203 P 303.866.3567 F 303.832.8106

Mailing Address: DRMS Room 215, 1001 E 62nd Ave, Denver, CO 80216 <https://drms.colorado.gov>

Jared S. Polis, Governor | Dan Gibbs, Executive Director | Michael Cunningham, Acting Director



seam areas with elevated subsurface temperatures (>80°F). Figure 14 in the *Marshall Mine Underground Coal Fire Report of Investigations* identifies the areas with subsurface temperatures exceeding 80°F. The northern mitigation area will include a portion of the parking area with elevated subsurface temperatures, and extend northward to also remove areas of potential subsidence and unburned coal. The second mitigation area is located south of the trailhead and will remove the area of observed subsurface heat as well as areas of potential future subsidence. Mitigation will be achieved by excavating overburden and coal (burned/unburned) to the bottom of the coal seam, blending and cooling any material exceeding 80° F, and then replacing the material back into the excavation. Following excavation and grading, the mitigated areas will be graded to resemble the natural surrounding topography. OSMP will be responsible for further trail development and revegetation following completion of the work outlined above.

The proposed mitigation for the Marshall Mesa Trailhead is included with this letter. Please review these plans and provide comments or changes to DRMS at your earliest convenience.

Sincerely,

Jeff Graves
Director of Active and Inactive Mines

Marshall Mesa Trailhead Redesign
City of Boulder Open Space and Mountain Parks
Appendix 4 – Marshall Mine Underground Coal Fire
Mitigation Cut & Fill Calculations
April 8, 2024



February 1, 2024

Mr. Jeremy Reineke, P.G.
Environmental Protection Specialist
Colorado Division of Reclamation, Mining, and Safety
1313 Sherman Street, Room 215
Denver, CO 80203
Email: Jeremy.reineke@state.co.us

Subject: Marshall Mitigation – Cut and Fill Calculation

Dear Mr. Reineke:

Please find attached a figure that shows the overall excavation for the Marshall Fire Mitigation in Boulder County. There will be approximately 112,000 cy and 70,000 cy excavation in the north and south excavations, respectively. It is anticipated that most of the excavated materials will be blended and placed back in the excavations. These calculations are based on a 1:1 side slope down from the limits of excavation and an overall depth of 30'. These excavations would likely be staged such that the entire area is not open at one time; excavation and backfill would be happening at the same time to reduce the amount of open excavation at any time.

Sincerely,

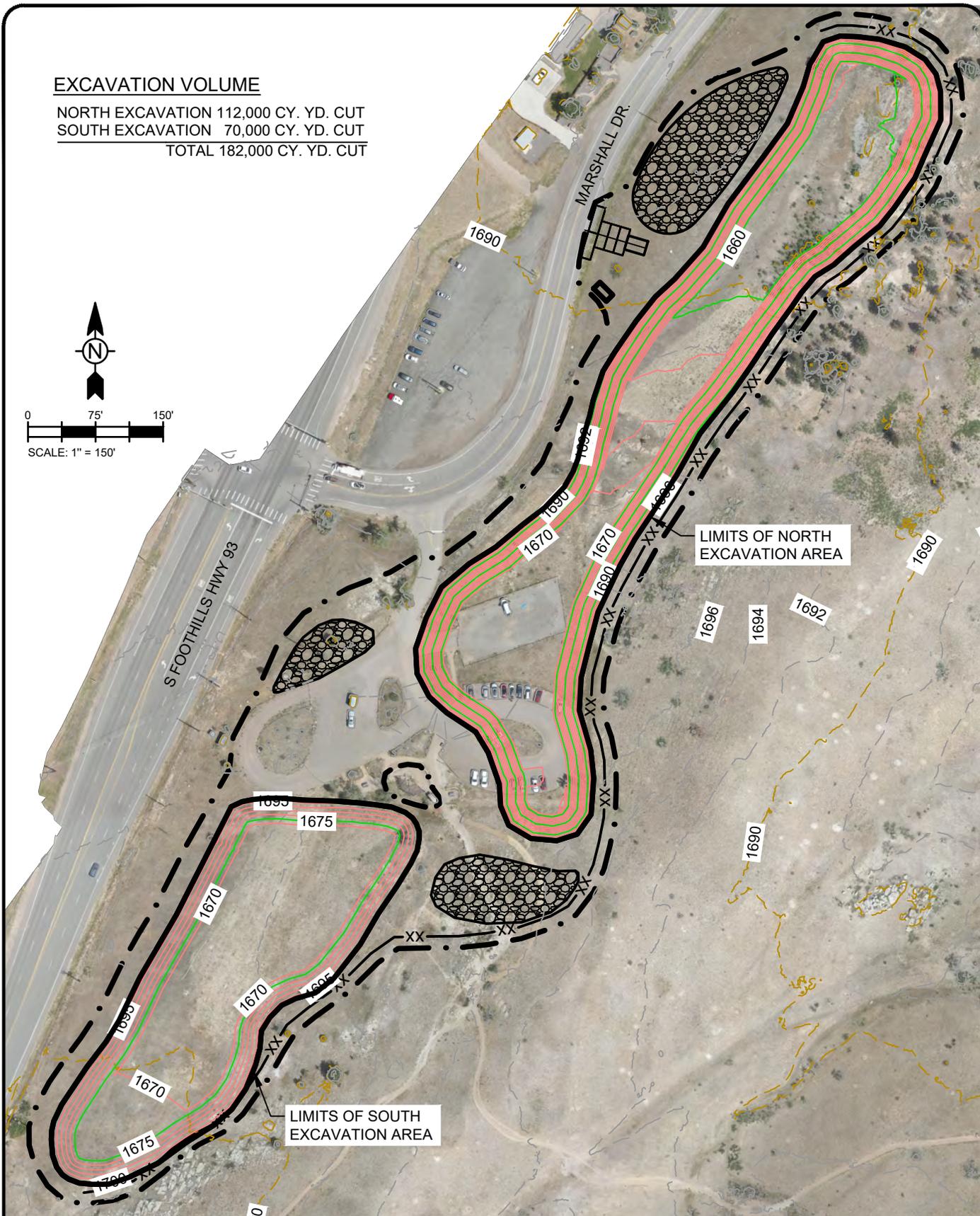
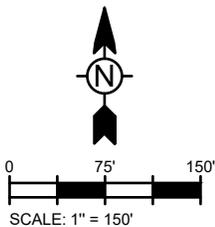
Tetra Tech, Inc.

A handwritten signature in black ink, appearing to read 'Brad Bijold'.

Brad Bijold, P.E.
Department Lead

EXCAVATION VOLUME

NORTH EXCAVATION 112,000 CY. YD. CUT
 SOUTH EXCAVATION 70,000 CY. YD. CUT
 TOTAL 182,000 CY. YD. CUT



1/30/2024 1:48:41 PM - C:\USERS\LAURA.WEATHER\IDC\ACCDOS\TETRA TECH INC\117-8295005 MARSHALL\PROJECT FILES\CAD\MODEL FILES\C-GD-FG NORTH.ZONE.DWG - WEATHERL, LAURA



TETRA TECH

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1100 South McCaslin Blvd
 Superior, CO 80027
 Phone: +1 (303) 448-7453

STATE OF COLORADO

DEPARTMENT OF NATURAL RESOURCES
 DIVISION OF RECLAMATION, MINING AND SAFETY

**MARSHALL MINE FIRE MITIGATION
 BOULDER COUNTY, COLORADO
 EXCAVATION VOLUME**

PROJ: 117-8295005

DATE: 1/30/2024

DESN:

Figure

1

Marshall Mesa Trailhead Redesign
City of Boulder Open Space and Mountain Parks
Appendix 5 – Marshall Mesa Trailhead Redesign Traffic Report
April 8, 2024

MARSHALL MESA TRAILHEAD

TRAFFIC IMPACT STUDY

October 2023

Prepared for:

City of Boulder
2520 55th St
Boulder, CO 80301

Prepared by:

Muller Engineering Company
7245 West Alaska Drive
Suite 300
Lakewood, Colorado 80226
303.988.4939

Muller Project Number: 23-025.01



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Volume Worksheets

APPENDIX C

Synchro reports

APPENDIX D

Pedestrian Crossing worksheets

1 INTRODUCTION

1.1 Project Background

The City of Boulder, Open Space & Mountain Parks (OSMP) is proposing a new access driveway for the Marshall Mesa Trailhead on State Highway (CO) 170 (Eldorado Springs Drive), east of CO 93. The current driveway is a right-in/right-out (RIRO) driveway located approximately 120 feet east of the CO 93/CO 170 intersection in Boulder County.

The proposed access relocation would shift the trailhead parking lot access to be aligned with the recently created Eldorado Park-n-Ride access, located approximately 500 east of the CO 93/CO 170 intersection. The modified intersection would operate as a full access, two-way stop-controlled intersection (TWSC). As part of the driveway relocation, the parking lot will also be expanded from 45 parking spaces to 75 parking spaces.

1.2 Study Area

The following intersections were analyzed as part of this study:

1. CO 93 (Foothills Hwy) and CO 170 (Eldorado Spring Dr) – Signalized
2. CO 170 (Eldorado Spring Dr) and Marshall Mesa Trailhead Driveway – TWSC
3. CO 170 (Eldorado Spring Dr) and Eldorado Park-n-Ride Driveway – TWSC
4. CO 170 (Eldorado Spring Dr) and Marshall Dr – TWSC

A vicinity map, showing the proposed driveway, existing driveway, and study intersection is shown in **Figure 1**.

The 2023 existing intersection geometries are shown in **Figure 2**.

CO 93 (Foothills Hwy), south of CO 170 is an undivided two-lane roadway with a climbing lane in the southbound direction. North of CO 170 is a divided two-lane roadway with a two-way left turn lane (TWLTL). Additional turn lanes are present at the signalized intersection. The posted speed is 45 MPH. The CDOT Access Code classification is R-A: Regional Highway. For the purpose of this study, CO 93 is identified as a north-south facility.

CO 170 (Eldorado Springs Dr) within the project area is an undivided two-lane roadway. The posted speed limit is 30 MPH. The CDOT Access Code classification is R-B: Rural Highway. For the purpose of this study, CO 170 is identified as an east-west facility. At the intersection of CO 170 and Marshall Dr, the portion of CO 170 that is Marshall Rd will be identified as a north-south facility.

Marshall Mesa Trailhead Driveway (Trailhead Driveway) is a private driveway with no posted speed limit. For the purpose of this study, the Trailhead Driveway is identified as a north-south facility.

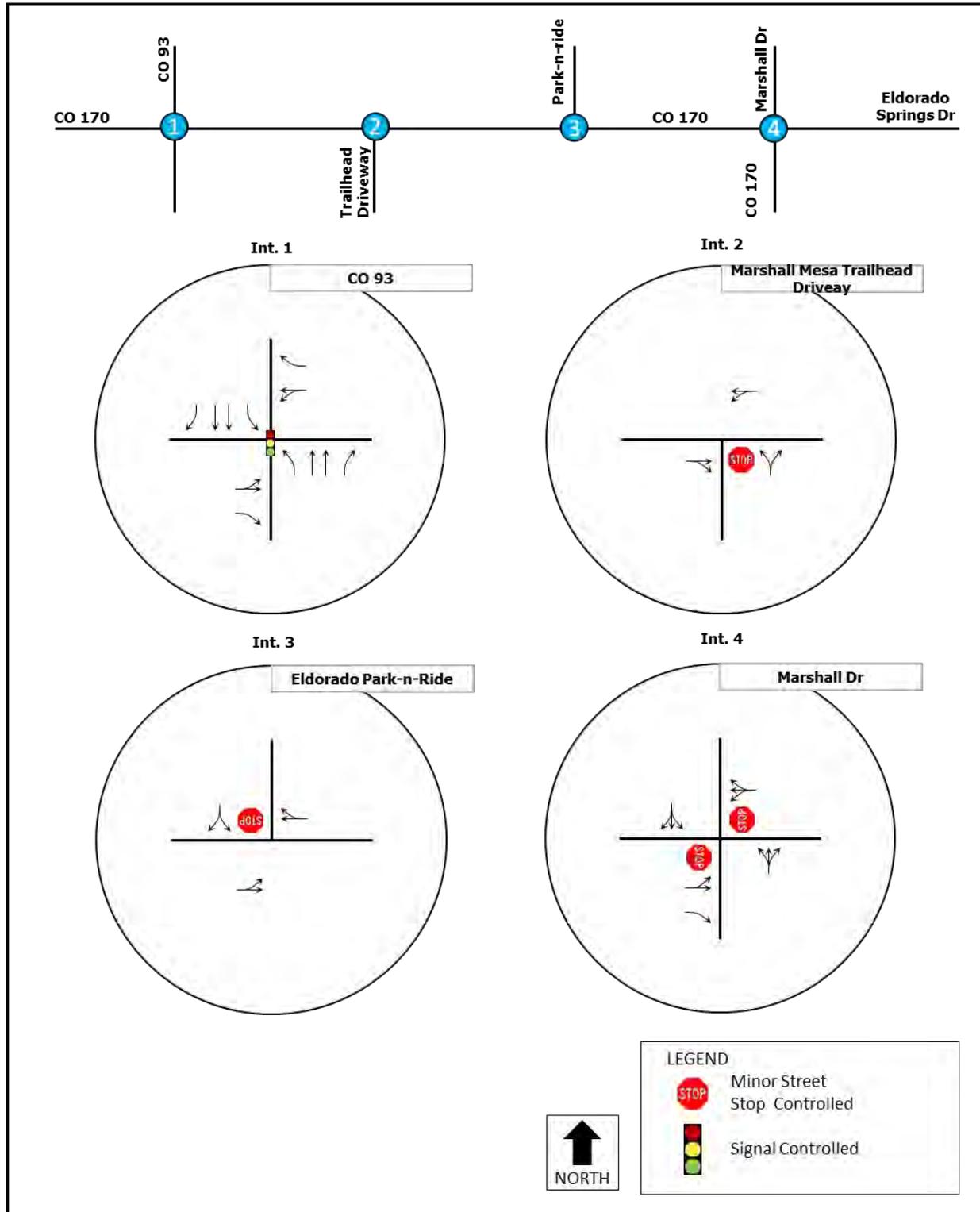
Eldorado Park-n-Ride Driveway (Park-n-Ride Driveway) is a private driveway with no posted speed limit. For the purpose of this study, the Park-n-Ride Driveway is identified as a north-south facility.

Marshall Dr provides access to private driveways and there is no posted speed limit. For the purpose of this study, Marshall Dr is identified as a north-south facility.

Figure 1 – Vicinity Map



Figure 2 – Existing 2023 Geometry



1.3 Study Years and Time Periods

The following analysis years were evaluated at part of this study:

- Existing 2023
- Build 2023
- No Build 2043
- Build 2043

The following peak periods were evaluated for each of the above study years:

- AM Peak Period
- PM Peak Period
- Weekend (Saturday) Peak Period

2 EXISTING CONDITIONS

The existing conditions were evaluated to develop a baseline for comparison with the project's growth. Traffic data, existing operations, and crash data are documented in the following sub sections.

2.1 Data Collection

Turning movement counts (TMCs) were collected at the four study intersections. Counts were collected during the AM peak, PM peak, and Saturday (Weekend peak). At the intersection of CO 93 and CO 170, weekday AM and PM peak period counts from February 2019 were used, and new counts were collected for the Weekday peak period. Turning movement counts were collected on the following dates and time periods:

- 6:45 AM to 8:00 AM - Wednesday, February 20, 2019
 - CO 93 and CO 170
- 4:45 PM to 6:00 PM - Wednesday, February 20, 2019
 - CO 93 and CO 170
- 7:00 AM to 8:30 AM - Wednesday, July 12, 2023
 - CO 170 and Trailhead Driveway
 - CO 170 and Park-n-Ride Driveway
 - CO 170 and Marshall Dr
- 4:30 PM to 6:00 PM - Wednesday, July 12, 2023
 - CO 170 and Trailhead Driveway
 - CO 170 and Park-n-Ride Driveway
 - CO 170 and Marshall Dr
- 11:00 AM to 1:00 PM - Saturday, July 8, 2023
 - CO 93 and CO 170
 - CO 170 and Trailhead Driveway
 - CO 170 and Park-n-Ride Driveway
 - CO 170 and Marshall Dr

Traffic count data can be found in **Appendix A**.

2.2 Existing 2023 Traffic Volumes

As noted above, previous counts from February 2019 were used for the AM and PM peak hours. Upon comparing the 2019 and 2023 turning moving counts, it was noted that the volumes were unbalanced. Volume balancing was applied to the intersection of CO 93 and CO 170 in order to balance volumes along CO 170 with the more recent July 2023 counts. All volume balancing adjustments were applied proportionally to each turning movement.

No volume adjustments were needed at the CO 93 and CO 170 intersection during the PM peak hour counts.

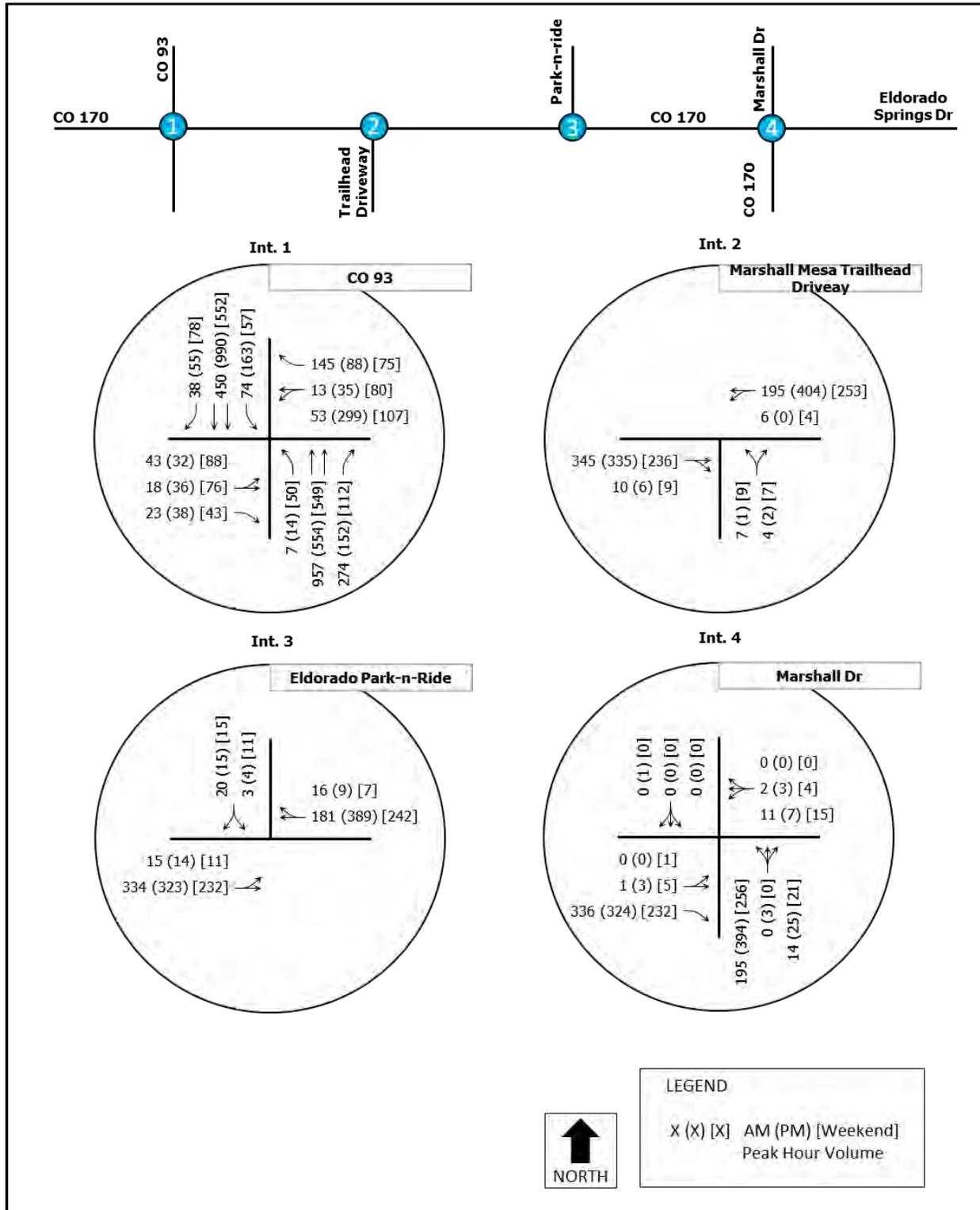
The volume worksheets with the identified volume adjustments can be found in **Appendix B**.

It should be noted that the intersection of CO 170 and Trailhead Driveway is a RIRO, however, in the traffic counts both westbound left-turn and northbound left-turn movements were observed.

During the 5 hours of counts (AM, PM & Weekend), there were no equestrian trailers observed turning in or out of the Trailhead Driveway. Additionally, the City of Boulder previously conducted a parking study. During 25 days of observations, only two trailers were observed using the lot on one day in total. The parking lot expansion will not increase the number of equestrian spaces provided. Since no equestrian usage was observed during the peak hours, no increase in usage is expected in the future. Thus, traffic volumes were not adjusted for passenger car equivalents (PCE).

The Existing 2023 traffic volumes for the AM, PM, and Weekend peak periods are shown in **Figure 3**.

Figure 3 – Existing 2023 Traffic Volumes



2.3 Existing 2023 Traffic Analysis

The Existing 2023 AM, PM, and Weekend scenarios were analyzed using Highway Capacity Manual methods and Synchro 11 software. The existing signal timings and existing geometry were utilized in the existing analysis.

The 95th percentile queue, v/c ratio, delay, and LOS for all movements are shown in **Table 1**, **Table 2**, and **Table 3** for the AM, PM, and Weekend peak hours, respectively.

At the signalized intersection of CO 93 and CO 170 for the AM peak hour, the eastbound left-turn movement and the westbound right-turn movement operate at LOS E. All other movements operate at LOS D or better. No movements are over capacity and no 95th percentile queues extend past the available storage.

In the PM peak hour, at the CO 93 and CO 170 intersection, the eastbound left-turn movement and the eastbound right-turn movement operate at LOS E. The shared westbound through/left-turn movement has a v/c ratio greater than 1 and operates at a LOS F. Additionally the westbound through/left-turn queue extends to approximately 558'. All other movements operate at LOS D, no other movements are over capacity, and no other 95th percentile queues extend past the available storage.

In the Weekend peak hour, at the CO 93 and CO 170 intersection, the eastbound left-turn movement and the westbound left-turn movement operate at LOS E. All other movements operate at LOS D or better. No movements are over capacity and no 95th percentile queues extend past the available storage.

All traffic movements at the existing two access driveways on CO 170 and at the CO 170 and Marshall Dr / Eldorado Springs Dr intersection operate at LOS C or better, with the exception of the westbound left-turn movement at the CO 170 and Marshall Dr / Eldorado Springs Dr Intersection. This movement operates at a LOS D in the PM peak hour.

The Synchro Reports are shown in **Appendix C**.

Table 1. Existing 2023 AM Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	Existing 2023 AM			
					95th Queue (ft)	v/c	delay (s)	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	95	0.54	61.3	E
			EBT	-		0	0.0	A
			EBR	55	0	0.23	51.6	D
		Westbound (SH 170)	WBL	450*	100	0.31	45.1	D
			WBT			0	0.0	A
			WBR	100	59	0.78	64.7	E
		Northbound (SH 93)	NBL	205	10	0.02	14.1	B
			NBT	-	444	0.64	23.2	C
			NBR	205	107	0.41	20.1	C
		Southbound (SH 93)	SBL	320	53	0.3	15.8	B
			SBT	-	178	0.28	14.5	B
			SBR	325	0	0.05	12.5	B
Intersection				-	-	-	25.4	C
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125	0	0.01	10.6	B
		WBL (SH 170)		335	0	0.01	8.1	A
		Intersection		-	-	-	0.3	-
CO 170 & Park-n-Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100				
		EBL (SH 170)		480*	0	0.01	7.7	A
		WBL (SH 170)		775*				
		SBL (Park-n-ride)		100	3	0.04	10.2	B
		Intersection		-	-	-	0.6	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	13	0.14	7.6	A
		EBL (SH 170)		775*	43	0.36	10.2	B
		WBL (Eldorado Springs Dr)		165	5	0.05	17.5	C
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	9.2	-

* Length to next intersection

Table 2. Existing 2023 PM Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	Existing 2023 PM			
					95th Queue (ft)	v/c	delay	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	107	0.62	70.9	E
			EBT	-		0	0.0	A
			EBR	55	0	0.4	61.6	E
		Westbound (SH 170)	WBL	450*	#558	1.04	107.5	F
			WBT			0	0.0	A
			WBR	100	19	0.31	42.8	D
		Northbound (SH 93)	NBL	205	17	0.06	19.0	B
			NBT	-	243	0.39	23.0	C
			NBR	205	44	0.24	21.4	C
		Southbound (SH 93)	SBL	320	116	0.43	16.7	B
			SBT	-	480	0.63	24.3	C
			SBR	325	0	0.08	16.5	B
Intersection				-	-	-	37.0	D
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125	0	0.00	10.4	B
		WBL (SH 170)		335	0	0	0.0	A
		Intersection		-	-	-	0.0	-
CO 170 & Park-n-Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100				
		EBL (SH 170)		480*	0	0.01	8.3	A
		WBL (SH 170)		775*				
		SBL (Park-n-ride)		100	3	0.04	12.1	B
		Intersection		-	-	-	0.4	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	28	0.27	8.0	A
		EBL (SH 170)		775*	35	0.33	9.9	A
		WBL (Eldorado Springs Dr)		165	5	0.07	30.2	D
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	8.8	-

* Length to next intersection

95th Percentile Volume exceeds capacity, queue may be longer

Table 3. Existing 2023 Weekend Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	Existing 2023 Saturday			
					95th Queue (ft)	v/c	delay	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	211	0.74	64.5	E
			EBT	-		0	0.0	A
			EBR	55	0	0.22	48.0	D
		Westbound (SH 170)	WBL	450*	238	0.75	63.6	E
			WBT			0	0.0	A
			WBR	100	0	0.36	49.0	D
		Northbound (SH 93)	NBL	205	44	0.12	15.5	B
			NBT	-	237	0.35	21.7	C
			NBR	205	30	0.17	19.7	B
		Southbound (SH 93)	SBL	320	49	0.14	15.5	B
			SBT	-	237	0.36	21.6	C
			SBR	325	6	0.11	18.8	B
		Intersection				-	-	-
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125	0	0.01	9.7	A
		WBL (SH 170)		335	0	0.00	7.8	A
		Intersection		-	-	-	0.3	-
CO 170 & Park-n-Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100				
		EBL (SH 170)		480*	0	0.01	7.8	A
		WBL (SH 170)		775*				
		SBL (Park-n-ride)		100	3	0.04	11.2	B
		Intersection		-	-	-	0.7	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	15	0.18	7.7	A
		EBL (SH 170)		775*	23	0.24	9.3	A
		WBL (Eldorado Springs Dr)		165	5	0.08	18.8	C
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	8.5	-

* Length to next intersection

2.4 Crash History

Crash Data from CDOT was analyzed at the existing Trailhead Driveway and the at the proposed Trailhead Driveway. From January 2015 through December 2020, no crashes were reported at either driveway location.

3 NO BUILD CONDITIONS

Future traffic is defined by the planning horizon year of 2043 for the AM, PM, and Weekend peak periods. The 2043 forecasted traffic was calculated based on the DRCOG Regional Model and CDOT's OTIS traffic data.

3.1 No Build 2043 Traffic Volumes

To determine the No Build 2043 traffic volumes, both the Denver Regional Council of Governments (DRCOG) Regional Model and CDOT's Online Transportation Information System (OTIS) traffic were analyzed. The DRCOG Regional Model gave 2020 and 2050 traffic projections for all legs of the CO 93 and CO 170 intersection. These projections were used to calculate a growth factor that could be applied to the 2023 traffic volumes to obtain No Build 2043 traffic volumes.

CDOT's OTIS historic and projected traffic data was obtained at the following count stations:

- Sta. 103930 (along CO 93, north of CO 170)
- Sta. 103929 (along CO 93, south of CO 170)
- Sta. 104949 (along CO 170, west of CO 93)
- Sta. 104950 (along CO 170, east of CO 93)

CDOT's OTIS traffic data was obtained for the 2021 AADT and the 2043 AADT. This traffic data was used to calculate a growth factor that could be applied to the Existing 2023 traffic volumes to project No Build 2043 traffic volumes. The DRCOG Regional Model and the OTIS traffic data growth factors are both shown in **Table 4**.

Table 4. 2043 Growth Rates

Approach	DRCOG Regional Model Growth Factor	OTIS Growth Factor
CO 93 – North Leg	1.42	1.12
CO 93 – South Leg	1.41	1.13
CO 170 – West Leg	1.00	1.16
CO 170 – East Leg	1.21	1.24

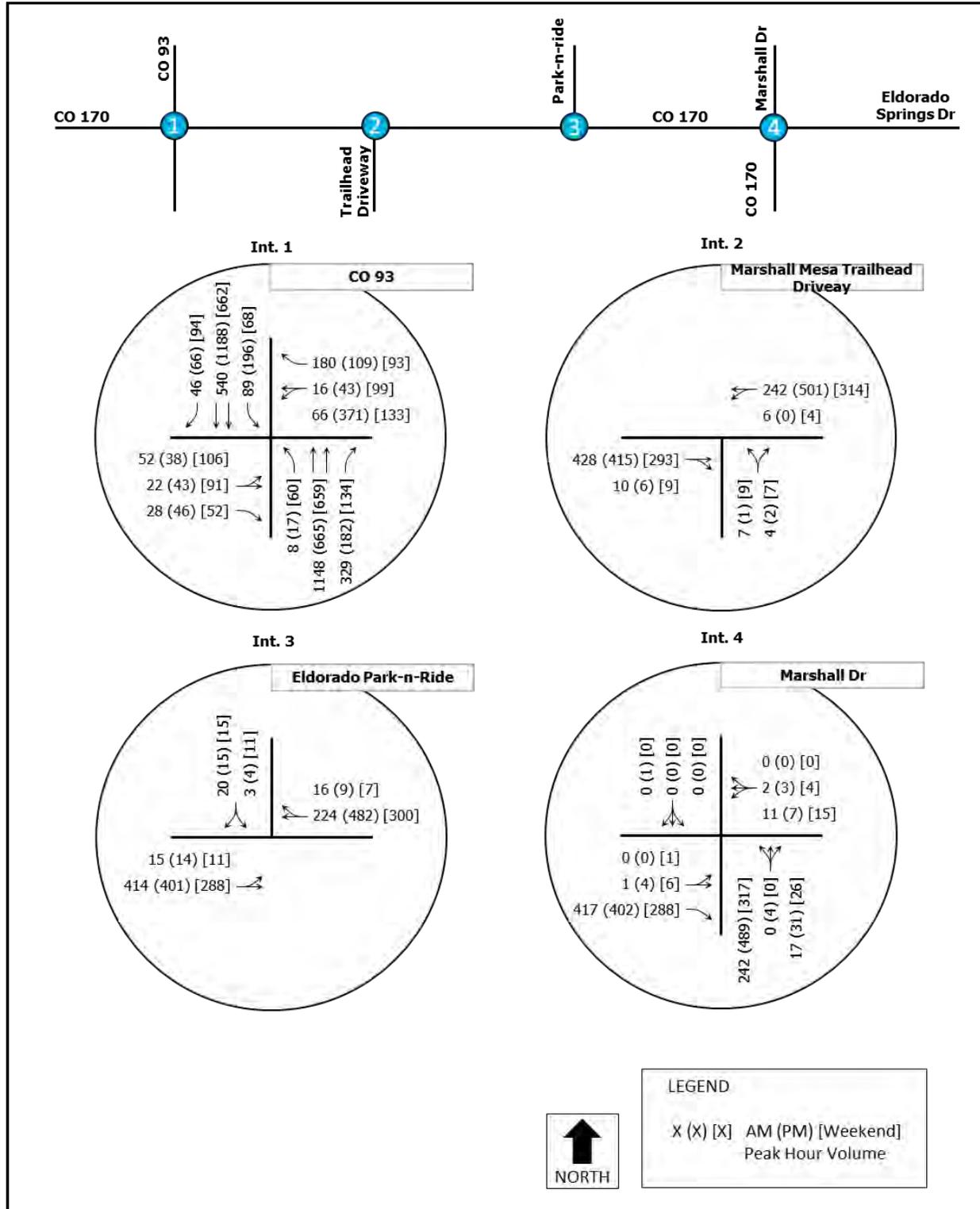
As shown in **Table 4**, the growth factors using the DRCOG Regional Model and OTIS were inconsistent. The higher DRCOG growth rates for CO 93 were judged to be overly robust when considering the highway is already near capacity and recent planning documents (Boulder

County TMP and CDOT's WestConnect PEL) call for CO 93 to remain as a two-lane highway. Conversely, the OTIS growth factors imply almost no vehicle traffic growth and were deemed too constrained. As such, a growth factor of 1.2 was selected for the north and south legs of CO 93 as well as the west leg of CO 170 to compromise between the two available growth factors. For CO 170, east of CO 93, a growth factor of 1.24 was used to represent the highest expected growth. Growth factors were not applied to movements that are not expected to be impacted by regional growth (i.e. driveways or roads that service limited residential). The growth factors were applied in the following way:

- CO 170 and CO 93
 - North Leg: 1.2
 - South Leg: 1.2
 - East Leg: 1.2
 - West Leg: 1.24
- CO 170 and Trailhead Driveway
 - East Leg (EBT Only): 1.24
 - West Leg (WBT Only): 1.24
 - All other movements: 1.0
- CO 170 and Park-n-Ride Driveway
 - East Leg (WBT Only): 1.24
 - West Leg (EBT Only): 1.24
 - All other movements: 1.0
- CO 170 and Marshall Dr
 - West Leg (CO 170): 1.24
 - South Leg (CO 170): 1.24
 - East Leg (Eldorado Springs Dr): 1.0
 - North Leg (Marshall Dr): 1.0

The growth factors were applied to the Existing 2023 volumes to obtain the No Build 2043 traffic volumes. The projected No Build 2043 traffic volumes for the AM, PM, and Weekend peak periods are shown in **Figure 4**.

Figure 4 – No Build 2043 Traffic Volumes



3.2 No Build 2043 Traffic Analysis

The No Build 2043 Traffic volumes were analyzed for the AM, PM, and Weekend peak using Highway Capacity Manual methods and Synchro 11 software. The existing signal timings and existing geometry were utilized in the existing analysis.

The 95th percentile queue, v/c ratio, delay, and LOS for all movements are shown in **Table 5**, **Table 6**, **Table 7** for the AM, PM, and Weekend peak hours, respectively.

At the signalized intersection of CO 93 and CO 170, in the AM peak hour, there were no LOS changes from the Existing 2023 analysis to the No Build 2043 analysis. The eastbound left-turn movement and the westbound right-turn movement operate at LOS E. All other movements operate at LOS D or better. No movements are over capacity and no 95th percentile queues extend past the available storage.

In the PM peak hour, there were no LOS changes from the Existing 2023 analysis to the No Build 2043 analysis; however, at the CO 93 and CO 170 intersection, the westbound through-left turn queue lengthened from 558' to 725' in the No Build 2043 Analysis. The eastbound left-turn movement and the eastbound right-turn movement operate at LOS E. The shared westbound through/left-turn movement has a v/c ratio greater than 1 and operates at a LOS F. All other movements operate at LOS D, no other movements are over capacity, and no other 95th percentile queues extend past the available storage.

In the Weekend peak hour, there were no LOS changes from the Existing 2023 analysis to the No Build 2043 analysis. The eastbound left-turn movement and the westbound left-turn movement at the CO 93 and CO 170 intersection, operate at LOS E. All other movements operate at LOS D or better. No movements are over capacity and no 95th percentile queues extend past the available storage.

All traffic movements at the existing two access driveways on CO 170 and at the CO 170 and Marshall Dr / Eldorado Springs Dr intersection operate at LOS C or better, with the exception of the westbound left-turn movement at the CO 170 and Marshall Dr / Eldorado Springs Dr Intersection. This movement operates at a LOS E in the PM peak hour.

The Synchro Reports are shown in **Appendix C**.

Table 5. No Build 2043 AM Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	No Build 2043 AM			
					95th Queue (ft)	v/c	delay (s)	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	113	0.64	68.2	E
			EBT	-		0	0.0	A
			EBR	55	0	0.27	53.8	D
		Westbound (SH 170)	WBL	450*	118	0.32	44.6	D
			WBT			0	0.0	A
			WBR	100	68	0.81	67.2	E
		Northbound (SH 93)	NBL	205	12	0.02	15.2	B
			NBT	-	588	0.75	27.7	C
			NBR	205	162	0.48	22.8	C
		Southbound (SH 93)	SBL	320	66	0.41	20.5	C
			SBT	-	224	0.33	16.2	B
			SBR	325	0	0.06	13.7	B
Intersection				-	-	-	28.9	C
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125	0	0.01	11.1	B
		WBL (SH 170)		335	0	0.01	8.3	A
		Intersection		-	-	-	0.2	-
CO 170 & Park-n-Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100				
		EBL (SH 170)		480*	0	0.01	7.8	A
		WBL (SH 170)		775*				
		SBL (Park-n-ride)		100	3	0.04	10.5	B
		Intersection		-	-	-	0.5	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	15	0.16	7.6	A
		EBL (SH 170)		775*	53	0.42	10.7	B
		WBL (Eldorado Springs Dr)		165	5	0.06	20.5	C
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	9.5	-

* Length to next intersection

Table 6. No Build 2043 PM Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	No Build 2043 PM			
					95th Queue (ft)	v/c	delay (s)	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	122	0.66	73.2	E
			EBT	-		0	0.0	A
			EBR	55	0	0.44	62.6	E
		Westbound (SH 170)	WBL	450*	#725	1.31	205.6	F
			WBT			0	0.0	A
			WBR	100	40	0.39	45.4	D
		Northbound (SH 93)	NBL	205	20	0.09	21.5	C
			NBT	-	301	0.47	25.3	C
			NBR	205	48	0.29	23.2	C
		Southbound (SH 93)	SBL	320	140	0.56	19.3	B
			SBT	-	624	0.75	28.3	C
			SBR	325	1	0.09	17.1	B
		Intersection				-	-	-
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125	0	0.00	11.0	B
		WBL (SH 170)		335	0	0	0.0	A
		Intersection		-	-	-	0.0	-
CO 170 & Park-n-Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100				
		EBL (SH 170)		480*	0	0.02	8.5	A
		WBL (SH 170)		775*				
		SBL (Park-n-ride)		100	3	0.05	13.5	B
		Intersection		-	-	-	0.4	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	35	0.33	8.3	A
		EBL (SH 170)		775*	50	0.40	10.5	B
		WBL (Eldorado Springs Dr)		165	10	0.11	47.7	E
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	9.3	-

* Length to next intersection

95th Percentile Volume exceeds capacity, queue may be longer

Table 7. No Build 2043 Weekend Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	No Build 2043 Saturday			
					95th Queue (ft)	v/c	delay (s)	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	251	0.79	69.1	E
			EBT	-		0	0.0	A
			EBR	55	0	0.25	49.1	D
		Westbound (SH 170)	WBL	450*	#316	0.82	70.0	E
			WBT			0	0.0	A
			WBR	100	16	0.39	50.0	D
		Northbound (SH 93)	NBL	205	50	0.17	18.5	B
			NBT	-	291	0.45	26.0	C
			NBR	205	43	0.21	23.0	C
		Southbound (SH 93)	SBL	320	56	0.2	18.5	B
			SBT	-	293	0.45	25.9	C
			SBR	325	17	0.14	21.9	C
		Intersection				-	-	-
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125	0	0.01	10.2	B
		WBL (SH 170)		335	0	0.00	8.0	A
		Intersection		-	-	-	0.3	-
CO 170 & Park-n-Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100				
		EBL (SH 170)		480*	0	0.01	8.0	A
		WBL (SH 170)		775*				
		SBL (Park-n-ride)		100	5	0.06	12.4	B
		Intersection		-	-	-	0.7	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	20	0.21	7.8	A
		EBL (SH 170)		775*	30	0.29	9.6	A
		WBL (Eldorado Springs Dr)		165	8	0.10	23.4	C
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	8.7	-

* Length to next intersection

4 BUILD CONDITIONS

The build conditions analysis includes the development of site generated traffic from the parking lot expansion as well as the relocation of the Trailhead Driveway.

4.1 Site Generated Traffic

Trip generation for this project was estimated for the AM, PM, and Weekend peak hours based on the proportion of existing spaces to proposed spaces. The existing Marshall Mesa Trailhead Parking Lot has 45 spaces. The proposed lot has 75 spaces. Thus, the ratio of proposed to existing spaces is approximately 1.67. This ratio was applied to all turning movements into the trailhead as well as all turning movements leaving the trailhead. The additional trips for each turning movement are shown in **Table 8**.

Table 8. Proposed Site Peak Hour Trip Generation

	Trailhead Driveway In		Trailhead Driveway Out	
	EBR	WBL	NBL	NBR
AM Peak Hour				
Existing Movement (veh)	10	6	7	4
Additional Trips (veh)	7	4	5	3
Proposed Movement (veh)	17	10	12	7
PM Peak Hour				
Existing Movement (veh)	6	0	1	2
Additional Trips (veh)	4	0	1	1
Proposed Movement (veh)	10	0	2	3
Weekend Peak Hour				
Existing Movement (veh)	9	4	9	7
Additional Trips (veh)	6	3	6	5
Proposed Movement (veh)	15	7	15	12

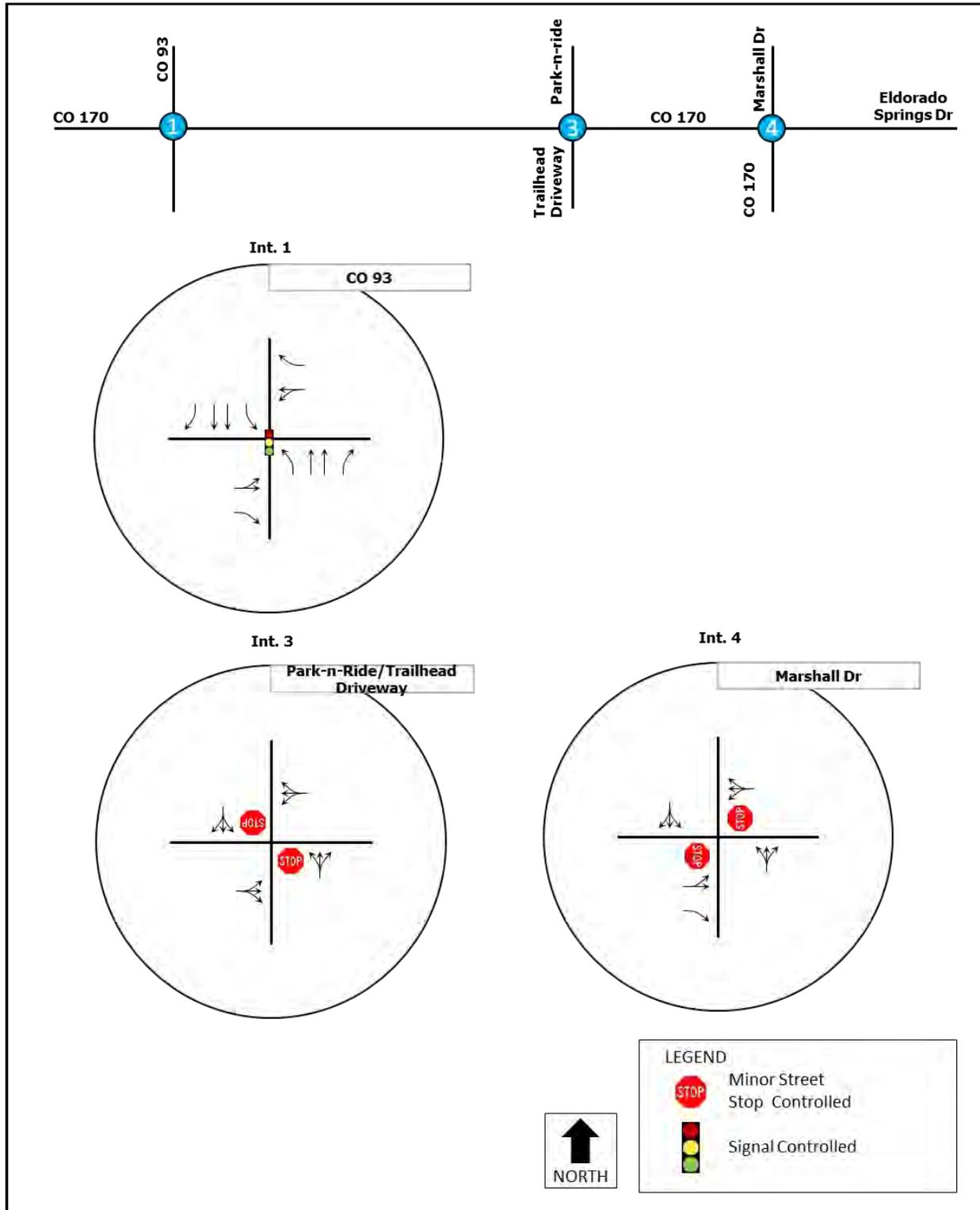
4.2 Trip Distribution and Assignment

Although the existing trailhead driveway is RIRO, vehicles were observed turning left out of and into the trailhead driveway. The proposed driveway is planned as full access. Thus, the turning movements were not reassigned but only relocated to the proposed driveway location.

The additional trips expected to be generated from the parking lot expansion have been applied to the entire network in the same proportion as the existing turning movements.

The proposed Build intersection geometry is shown in **Figure 5**.

Figure 5 – Build Geometry



4.3 Build 2023 Traffic Analysis

For the Build 2023 traffic analysis, the additional site generated trips were added to the Existing 2023 traffic volumes.

The Build 2023 traffic volumes for the AM, PM, and Weekend peak periods are shown in **Figure 6**.

The Build 2023 AM, PM, and Weekend scenarios were analyzed using Highway Capacity Manual methods and Synchro 11 software. The Existing 2023 analysis indicated the WBL/WBT movement at the CO 93 and CO 170 intersection had an extensive queue. To mitigate this queue, the signal timings were modified to provide additional time to the westbound approach in the Build 2023 analysis. This timing change did not negatively impact the overall intersection operation nor CO 93 traffic movements. The geometry used in the Build 2023 Analysis reflects the relocated Trailhead Driveway location.

The 95th percentile queue, v/c ratio, delay, and LOS for all movements are shown in **Table 9**, **Table 10**, and **Table 11** for the AM, PM, and Weekend peak hours, respectively.

At the signalized intersection of CO 93 and CO 170, in the AM peak hour, the proposed changes improved the eastbound left-turn movement and the westbound right-turn movement from LOS E to LOS D. All other movements operate at LOS D or better. No movements are over capacity and no 95th percentile queues extend past the available storage.

In the PM peak hour, at the CO 93 and CO 170 intersection, the proposed changes improved the westbound left-turn movement from LOS F to LOS D. The queue was also reduced from 558' to 392'. The eastbound left-turn movement and the eastbound right-turn movement are still projected to operate at LOS E. All other movements operate at LOS D, no other movements are over capacity, and no other 95th percentile queues extend past the available storage.

In the Weekend peak hour, at the CO 93 and CO 170 intersection, the proposed changes improved the eastbound right-turn movement from LOS E to LOS D. All movements operate at LOS D or better. No movements are over capacity and no 95th percentile queues extend past the available storage.

All traffic movements at the existing two access driveways on CO 170 and at the CO 170 and Marshall Dr / Eldorado Springs Dr intersection operate at LOS C or better, with the exception of the westbound left-turn movement at the CO 170 and Marshall Dr / Eldorado Springs Dr Intersection. This movement operates at a LOS D in the PM peak hour.

The Synchro Reports are shown in **Appendix C**.

Figure 6 – Build 2023 Traffic Volumes

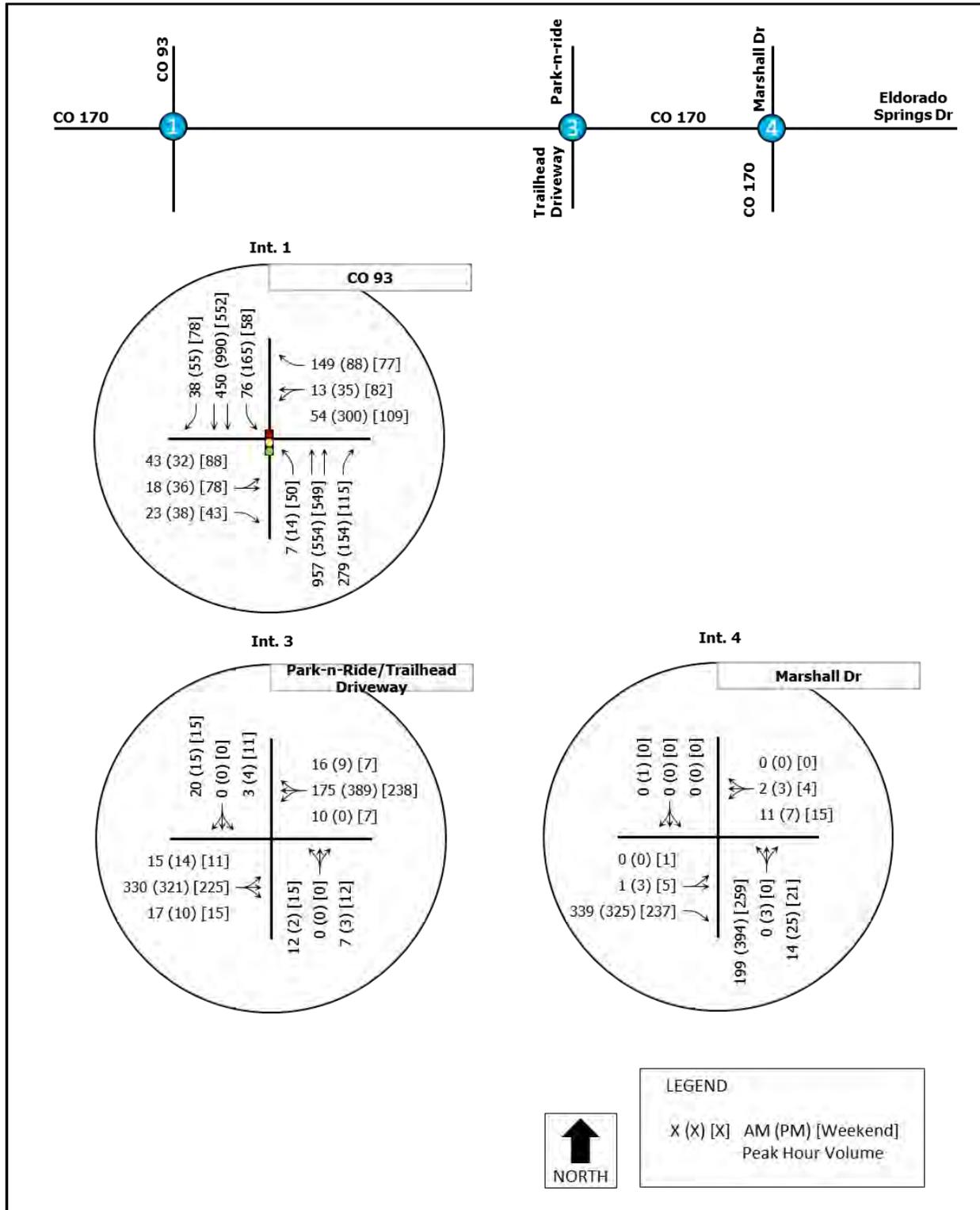


Table 9. Build 2023 AM Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	Build 2023 AM			
					95th Queue (ft)	v/c	delay (s)	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	88	0.5	53.5	D
			EBT			0	0.0	A
			EBR	55		0	0.21	45.8
		Westbound (SH 170)	WBL	450*	91	0.28	39.1	D
			WBT			0	0.0	A
			WBR			100	59	0.69
		Northbound (SH 93)	NBL	205	10	0.02	15.3	B
			NBT	-	421	0.68	25.1	C
			NBR	205	121	0.44	21.9	C
		Southbound (SH 93)	SBL	320	52	0.3	16.4	B
			SBT	-	170	0.29	15.6	B
			SBR	325	0	0.05	13.5	B
		Intersection				-	-	-
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125				
		WBL (SH 170)		335				
		Intersection		-				
CO 170 & Park-n-Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100	3	0.05	13.6	B
		EBL (SH 170)		480*	0	0.01	7.7	A
		WBL (SH 170)		775*	0	0.01	8.1	A
		SBL (Park-n-ride)		100	3	0.04	10.2	B
		Intersection		-	-	-	1.1	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	13	0.13	7.6	A
		EBL (SH 170)		775*	38	0.34	10.0	B
		WBL (Eldorado Springs Dr)		165	3	0.04	16.5	C
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	9.0	-

* Length to next intersection

Table 10. Build 2023 PM Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	Build 2023 PM			
					95th Queue (ft)	v/c	delay (s)	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	113	0.6	67.5	E
			EBT	-		0	0.0	A
			EBR	55		0	0.38	59.1
		Westbound (SH 170)	WBL	450*	392	0.79	51.1	D
			WBT			0	0.0	A
			WBR			100	15	0.24
		Northbound (SH 93)	NBL	205	21	0.08	23.9	C
			NBT	-	291	0.46	28.9	C
			NBR	205	52	0.29	27.0	C
		Southbound (SH 93)	SBL	320	149	0.48	21.2	C
			SBT	-	#611	0.72	31.0	C
			SBR	325	0	0.09	20.6	C
Intersection				-	-	-	33.7	C
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125				
		WBL (SH 170)		335				
		Intersection		-				
CO 170 & Park-n-Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100	0	0.01	13.4	B
		EBL (SH 170)		480*	0	0.01	8.2	A
		WBL (SH 170)		775*	0	0	0.0	A
		SBL (Park-n-ride)		100	3	0.04	12.5	B
		Intersection		-	-	-	0.5	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	28	0.26	8.0	A
		EBL (SH 170)		775*	35	0.33	9.9	A
		WBL (Eldorado Springs Dr)		165	5	0.07	29.5	D
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	8.8	-

* Length to next intersection

95th Percentile Volume exceeds capacity, queue may be longer

Table 11. Build 2023 Weekend Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	Build 2023 Saturday			
					95th Queue (ft)	v/c	delay (s)	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	#238	0.79	66.9	E
			EBT	-		0	0.0	A
			EBR	55		0	0.24	44.4
		Westbound (SH 170)	WBL	450*	206	0.66	49.9	D
			WBT			0	0.0	A
			WBR	100	2	0.31	41.3	D
		Northbound (SH 93)	NBL	205	43	0.13	16.5	B
			NBT	-	233	0.4	23.1	C
			NBR	205	33	0.19	21.0	C
		Southbound (SH 93)	SBL	320	48	0.15	16.5	B
			SBT	-	233	0.4	22.9	C
			SBR	325	7	0.13	19.9	B
Intersection				-	-	-	30.2	C
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125				
		WBL (SH 170)		335				
		Intersection		-				
CO 170 & Park-n- Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100	5	0.06	12.7	B
		EBL (SH 170)		480*	0	0.01	7.9	A
		WBL (SH 170)		775*	0	0.006	7.8	A
		SBL (Park-n-ride)		100	5	0.05	12.0	B
		Intersection		-	-	-	1.4	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	15	0.17	7.7	A
		EBL (SH 170)		775*	23	0.24	9.2	A
		WBL (Eldorado Springs)		165	5	0.07	18.4	C
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	8.4	-

* Length to next intersection

4.4 Build 2043 Traffic Analysis

For the Build 2043 traffic analysis, the additional site generated trips were added to the No Build 2043 traffic volumes.

The Build 2043 traffic volumes for the AM, PM, and Weekend peak periods are shown in **Figure 7**.

The Build 2043 AM, PM, and Weekend scenarios were analyzed using Highway Capacity Manual methods and Synchro 11 software. The Build 2043 analysis utilized the same signal timing modification used in the Build 2023 analysis. Additionally, the geometry used in the Build 2043 Analysis reflects the relocated Trailhead Driveway.

The 95th percentile queue, v/c ratio, delay, and LOS for all movements are shown in **Table 12**, **Table 13**, and **Table 14** for the AM, PM, and Weekend peak hours, respectively.

At the signalized intersection of CO 93 and CO 170, in the AM peak hour, compared to the No Build 2043, the westbound right-turn movement improved from a LOS E to LOS D. The eastbound left-turn movement is still expected to operate at LOS E. All other movements operate at LOS D or better. No movements are over capacity and no 95th percentile queues extend past the available storage.

In the PM peak hour, compared to the No Build 2043, the proposed changes at the CO 93 and CO 170 intersection improved the WBL LOS from LOS F to LOS D. The queue was also reduced from 725' to 536'. The eastbound left-turn movement and the eastbound right-turn movement are still projected to operate at LOS E. All other movements operate at LOS D, no other movements are over capacity, and no other 95th percentile queues extend past the available storage.

In the Weekend peak hour, compared to the No Build 2043, at the CO 93 and CO 170 intersection, the westbound left-turn movement improved from LOS E to LOS D. All other movements operate at LOS D or better. No movements are over capacity and no 95th percentile queues extend past the available storage.

All traffic movements at the existing two access driveways on CO 170 and at the CO 170 and Marshall Dr / Eldorado Springs Dr intersection operate at LOS C or better, with the exception of the westbound left-turn movement at the CO 170 and Marshall Dr / Eldorado Springs Dr Intersection. This movement operates at a LOS E in the PM peak hour.

The Synchro Reports are shown in **Appendix C**.

Figure 7 – Build 2043 Traffic Volumes

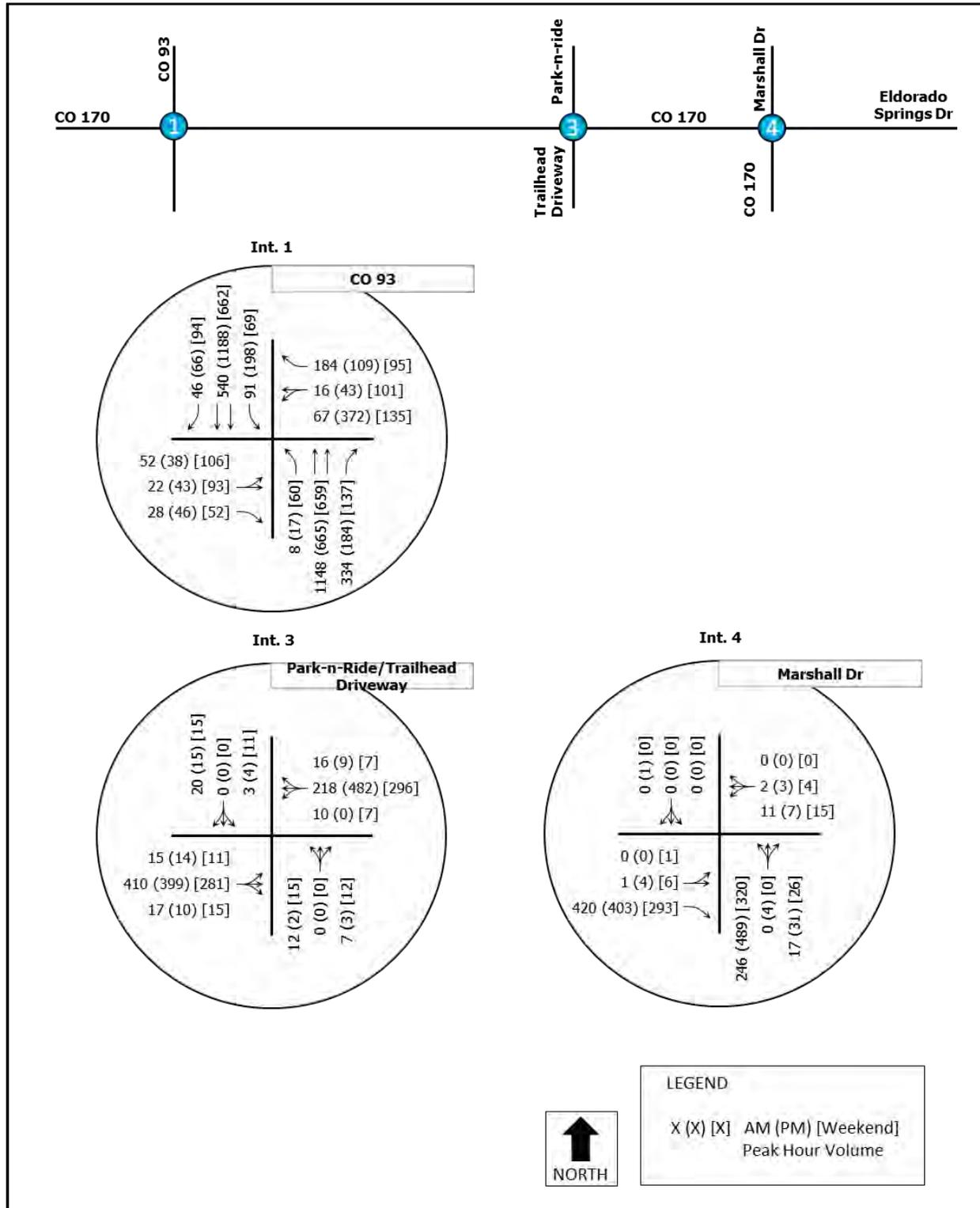


Table 12. Build 2043 AM Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	Build 2043 AM			
					95th Queue (ft)	v/c	delay (s)	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	104	0.6	60.2	E
			EBT			0	0.0	A
			EBR	55		0	0.25	48.5
		Westbound (SH 170)	WBL	450*	108	0.29	38.4	D
			WBT			0	0.0	A
			WBR			100	64	0.73
		Northbound (SH 93)	NBL	205	11	0.02	16.9	B
			NBT	-	#606	0.85	33.4	C
			NBR	205	177	0.55	26.3	C
		Southbound (SH 93)	SBL	320	71	0.43	22.6	C
			SBT	-	214	0.36	18.1	B
			SBR	325	0	0.07	15.2	B
		Intersection				-	-	-
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125				
		WBL (SH 170)		335				
		Intersection		-				
CO 170 & Park-n-Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100	5	0.06	15.5	B
		EBL (SH 170)		480*	0	0.01	7.8	A
		WBL (SH 170)		775*	0	0.01	8.3	A
		SBL (Park-n-ride)		100	3	0.04	10.8	B
		Intersection		-	-	-	1.0	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	15	0.17	7.7	A
		EBL (SH 170)		775*	53	0.42	10.7	B
		WBL (Eldorado Springs Dr)		165	5	0.06	20.9	C
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	9.6	-

* Length to next intersection

95th Percentile Volume exceeds capacity, queue may be longer

Table 13. Build 2043 PM Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	Build 2043 PM			
					95th Queue (ft)	v/c	delay (s)	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	130	0.71	79.4	E
			EBT	-		0	0.0	A
			EBR	55		0	0.46	66.0
		Westbound (SH 170)	WBL	450*	#536	0.86	56.5	E
			WBT		0	0.0	A	
			WBR		100	33	0.25	34.5
		Northbound (SH 93)	NBL	205	24	0.14	30.6	C
			NBT	-	357	0.59	35.6	D
			NBR	205	65	0.37	32.5	C
		Southbound (SH 93)	SBL	320	#207	0.69	31.7	C
			SBT	-	#817	0.92	46.7	D
			SBR	325	1	0.12	24.2	C
Intersection				-	-	-	43.9	D
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125				
		WBL (SH 170)		335				
		Intersection		-				
CO 170 & Park-n- Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100	0	0.02	15.6	B
		EBL (SH 170)		480*	0	0.02	8.5	A
		WBL (SH 170)		775*	0	0	0.0	A
		SBL (Park-n-ride)		100	5	0.05	14.2	B
		Intersection		-	-	-	0.5	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	35	0.33	8.3	A
		EBL (SH 170)		775*	50	0.40	10.5	B
		WBL (Eldorado Springs Dr)		165	10	0.11	47.7	E
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	9.3	-

* Length to next intersection

95th Percentile Volume exceeds capacity, queue may be longer

Table 14. Build 2043 Weekend Peak Hour Level of Service

Intersection	Control Type	Approach	Movement	Exist. Storage	Build 2043 Saturday			
					95th Queue (ft)	v/c	delay (s)	LOS
CO 93 & CO 170	Signalized	Eastbound (SH 170)	EBL	-	#321	0.86	76.6	E
			EBT	-		0	0.0	A
			EBR	55		0	0.27	46.2
		Westbound (SH 170)	WBL	450*	252	0.7	51.6	D
			WBT			0	0.0	A
			WBR	100	17	0.33	41.6	D
		Northbound (SH 93)	NBL	205	53	0.18	19.6	B
			NBT	-	304	0.5	27.9	C
			NBR	205	46	0.24	24.6	C
		Southbound (SH 93)	SBL	320	60	0.21	19.7	B
			SBT	-	307	0.51	27.8	C
			SBR	325	19	0.16	23.3	C
Intersection				-	-	-	34.7	C
CO 170 & Marshall Mesa Trailhead	TWSC	NBL (Trailhead)		125				
		WBL (SH 170)		335				
		Intersection		-				
CO 170 & Park-n- Ride/Proposed Driveway	TWSC	NBL (Trailhead)		100	5	0.07	14.1	B
		EBL (SH 170)		480*	0	0.01	8.0	A
		WBL (SH 170)		775*	0	0.01	7.9	A
		SBL (Park-n-ride)		100	5	0.06	13.2	B
		Intersection		-	-	-	1.3	-
CO 170 & Marshall Dr/ Eldorado Springs Dr	TWSC	NBL (SH 170)		-	20	0.21	7.8	A
		EBL (SH 170)		775*	30	0.29	9.6	A
		WBL (Eldorado Springs)		165	8	0.10	23.7	C
		SBL (Marshall Dr)		450	0	0	0.0	A
		Intersection		-	-	-	8.7	-

* Length to next intersection

95th Percentile Volume exceeds capacity, queue may be longer

5 AUXILIARY TURN LANES

Within the project vicinity, CO 170 is defined as an R-B Rural Highway. The CDOT Access Code states the following regarding Auxiliary Lane Requirement on an R-B Rural Highway:

“(8) Auxiliary turn lanes shall be installed according to the criteria below.

- (a) A left turn deceleration lane with taper and additional storage length is required for an access with a projected peak hour left ingress turning volume greater than 10 vph. The taper length shall be included within the required deceleration length.
- (b) A right turn deceleration lane with taper is required for any access with a projected peak hour right ingress turning volume greater than 25 vph. The taper length shall be included within the required deceleration length.”

The 2043 projected turning movements into the relocated Trailhead Driveway indicate that the right-turns and the left-turns do not exceed the thresholds stated in the CDOT Access Code. **Table 15** summarizes the projected 2043 turning movements compared to the CDOT Access Code thresholds.

Table 15. Lane Storage and Taper Lengths

Location	Peak Period	Peak Hour Volume	Threshold	Auxiliary Lane Req'd
Eastbound Right-Turn	AM	17	>25	No
	PM	10		No
	Weekend	15		No
Westbound Left-Turn	AM	10	>10	No
	PM	0		No
	Weekend	7		No

The eastbound right-turn lane volume is below the threshold for all three peak periods and therefore an eastbound right-turn auxiliary lane is not recommended.

The westbound left-turn lane volume is below the threshold for the PM and Weekend peak periods and at the threshold for the AM Peak period. As shown in **Table 9** through **Table 14**, the WBL is expected to operate at LOS A for all three-peak periods for 2023 and 2043 conditions. The intersection is expected to operate with a maximum delay of 1.0 sec during the Build 2043 AM peak hour.

Additionally, as described **Section 2.4**, there is no history of crashes at the existing trailhead driveway.

The implementation of a westbound left-turn auxiliary is not recommended due to the following reasons:

- The projected site traffic is below the CDOT Access Code threshold during the PM and Weekend peak hours.
- The projected site traffic is at the CDOT Access Code threshold during the AM peak hour. However, the threshold is not exceeded.
- The operational analysis does not indicate an operational issue at the intersection without a westbound left-turn lane.
- The upstream signal creates sufficient gaps for left turning traffic.
- There are no historic crashes from January 2015 through December 2020 involving the westbound left-turn.
- The proposed driveway relocation shifts the trailhead driveway further from the horizontal curve and the intersection of CO 93 and CO 170. The proposed driveway will provide an improved safety and operational condition for vehicles turning left into the trailhead driveway.

6 PEDESTRIAN CONSIDERATIONS

There is an existing mid-block pedestrian crossing located approximately 150' west of the existing CO 170 and Park-n-Ride Driveway. This pedestrian crossing services pedestrians and bicyclists going from the Eldorado Park-n-Ride to the trailhead. This crossing is also approximately 300' east of the intersection of CO 93 and CO 170. Additionally, a relocated crosswalk located at the proposed driveway was evaluated. This new crossing location is deemed the most optimal spot based on the existing roadway geometry because:

- There is a horizontal curve along CO 170 approaching CO 93. Increasing the distance between the proposed crosswalk and the horizontal curve increases stopping sight distance for eastbound vehicles.

With the assumption that the crosswalk location is to be relocated to the proposed driveway, both CDOT's Pedestrian Crossing Installation Guide and City of Boulder's Crossing Treatment Installation Guidelines were reviewed to determine if the existing crossing treatment should be modified. The pedestrian crossing worksheets were filled out for each guide. These worksheets can be found in **Appendix D**.

Following Figure C3 and Table C1 in CDOT's Guide, the recommended treatment is a marked crosswalk with W11-2 advanced pedestrian signs. Figure 1 and Table 1 in City of Boulder's Guidelines also recommended a marked crosswalk with advanced pedestrian signs. Both CDOT's and City of Boulder's Guidelines indicate these treatments are applicable if the minimum pedestrian volume thresholds are met. For the propose crossing location, the volume thresholds are met, as indicated in

Figure 9 – Eastbound Sight Distance (Without Westbound Queue)

Figure 10 – Eastbound Sight Distance (Without Westbound Queue)

Rectangular Rapid Flashing Beacon (RRFB)

CDOT's Guide states that an RRFB may be considered at locations where a HAWK signal (Pedestrian Hybrid Beacon) is not warranted and pedestrian volume meets the thresholds. Both CDOT and City of Boulder recognize the volume thresholds for an RRFB as:

- 20 pedestrians per hour in any one hour
- 18 pedestrians per hour in any two hours
- 15 pedestrians per hour in any three hours
- 10 school aged pedestrians traveling to or from school in any one hour

Error! Not a valid bookmark self-reference. shows the peak hour pedestrian volumes compared to the RRFB threshold. As indicated in **Table 16**, the Weekend PM peak period at CO 170 and Park-n-Ride Driveway exceeds the hourly threshold, thus a RRFB is recommended.

Table 16.

CDOT indicates an SSD of 8x the speed limit required. For CO 170, the required SSD is 240'. This sight distance can be met in the westbound direction as there are no horizontal or vertical obstructions 240' east of the crosswalk. The eastbound direction experiences more limited SSD due to existing the horizontal curve as well as limited SSD when the westbound left-turn queue extends to the crosswalk. Sight distance is shown in **Figure 8** through **Figure 10** Error! Reference source not found.. Due to the SSD limitations in the eastbound direction that is not feasible to remove, it is recommended an enhanced crosswalk be evaluated, such as an RRFB.

Figure 8 – Westbound Sight Distance



Figure 9 – Eastbound Sight Distance (Without Westbound Queue)



Figure 10 – Eastbound Sight Distance (Without Westbound Queue)



Rectangular Rapid Flashing Beacon (RRFB)

CDOT's Guide states that an RRFB may be considered at locations where a HAWK signal (Pedestrian Hybrid Beacon) is not warranted and pedestrian volume meets the thresholds. Both CDOT and City of Boulder recognize the volume thresholds for an RRFB as:

- 20 pedestrians per hour in any one hour
- 18 pedestrians per hour in any two hours
- 15 pedestrians per hour in any three hours
- 10 school aged pedestrians traveling to or from school in any one hour

Error! Not a valid bookmark self-reference. shows the peak hour pedestrian volumes compared to the RRFB threshold. As indicated in Error! Not a valid bookmark self-reference., the Weekend PM peak period at CO 170 and Park-n-Ride Driveway exceeds the hourly threshold, thus a RRFB is recommended.

Table 16. Pedestrian Volume Threshold

Location	Peak Hour Period	Ped Volume Across CO 170	Threshold	Threshold Met?
CO 170 and Trailhead Driveway	AM	4	20	No
	PM	4		No
	Weekend	4		No
CO 170 and Park-n-Ride Driveway	AM	10		No
	PM	5		No
	Weekend	36		Yes

Additional Signing Improvements

The RRFB must be installed in accordance with the MUTCD Interim Approval 21. As noted in the MUTCD, the existing W11-2 (Pedestrian) and W16-7P (Diagonal Arrow) shall be relocated and to the same support as the RRFB.

In addition to the RRFB, it is recommended that Advanced Pedestrian Warning Signs (W11-2, Pedestrian) be installed in advance of the crosswalk in both the eastbound and westbound direction.

7 SUMMARY AND CONCLUSION

7.1 Final Operational Conditions

The purpose of this study is to assess potential traffic impacts of relocating the existing Marshall Mesa Trailhead access on CO 170 in Boulder County. The existing access is located approximately 120 feet from the signalized intersection of CO 93 and CO 170. The proposed access location is approximately 500 feet east of the signalized intersection and aligned with the Eldorado Park-n-Ride access to the north. The study also provides recommendations for relocating the existing pedestrian crosswalk across CO 170 to the proposed driveway location.

Based on the findings of this study, relocating the Trailhead Driveway from the existing location to across from the Eldorado Park-n-Ride Driveway has no adverse operational or safety impacts at the study intersections. In conjunction with signal timing adjustments at CO 93 and CO 170, the Build 2043 scenario is an improved condition compared to No Build 2043.

An analysis of the final operational conditions at the CO 93/CO 170 intersection revealed the following:

- In the Build 2043 AM peak hour, the eastbound left-turn movement is expected to operate at LOS E. However, the eastbound left-turn volume is low, servicing approximately 52 vehicles per hour. All other movements operate at LOS D or better. No movements are over capacity and no 95th percentile queues extend past the available storage.
- In the Build 2043 PM peak hour, the eastbound left-turn movement and the eastbound right-turn movement are projected to operate at LOS E. The westbound left-turn is expected to operate at LOS E with a queue of 536 feet. However, this is an improvement compared to the No Build scenario that operated at a LOS F with a queue of 725 feet.
- In the Build 2043 Weekend peak hour, the eastbound left-turn movement is expected to operate at LOS E. However, the eastbound left-turn volume is low, servicing approximately 106 vehicles per hour. All other movements operate at LOS D or better. No movements are over capacity and no 95th percentile queues extend past the available storage.

In the Build 2043 PM peak hour at CO 170 and Marshall Dr, the westbound left-turn is expected to operate at LOS E, however the westbound approach is only expected to have a volume of 10 vehicles per hour. All other movements at this intersection and at the proposed Trailhead Driveway/Eldorado Park-n-Ride intersection operate at LOS C or better for all time periods. No other movements are over capacity, and no other 95th percentile queues extend past the available storage.

7.2 Proposed Improvements

The following improvements are recommended for the Marshall Mesa Trailhead Driveway relocation:

- Adjust CO 93 and CO 170 signal timings to provide additional time to the westbound left-turn delay. This mitigation will help reduce the westbound left-turn queue while maintaining an acceptable level of service for CO 93 traffic flow.
- The new access driveway should be constructed in accordance with CDOT design standards for access driveways onto category R-B state highways.
- Relocate the existing location of the pedestrian crosswalk to the proposed driveway location
 - Install RRFB
 - Install Advanced Pedestrian Warning Signs

APPENDIX A

TRAFFIC COUNT DATA

All Traffic Data Services

093A01363 SH 93 & ELDORADO SPRINGS DR AM
 Wednesday, February 20, 2019

Peak Hour
 07:15 AM - 08:15 AM
 Peak 15-Minutes
 07:45 AM - 08:00 AM

Traffic Counts - All Vehicles

Time	ELDORADO SPRINGS DR					ELDORADO SPRINGS DR					SH 93					SH 93					Total	Rolling Hour
	Eastbound					Westbound					Northbound					Southbound						
	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR		
6:45 AM	0	6	1	5	0	0	14	2	11	0	0	2	170	48	0	0	11	89	2	0	361	1,924
7:00 AM	0	9	6	3	0	0	24	5	30	0	0	1	158	44	0	0	7	101	6	0	394	2,247
7:15 AM	0	4	2	5	0	0	21	7	42	0	0	0	223	82	0	0	9	119	6	0	520	2,400
7:30 AM	0	15	7	9	0	0	20	4	86	0	0	1	265	101	0	0	24	108	9	0	649	0
7:45 AM	0	10	6	3	0	0	24	5	86	0	0	4	271	108	0	0	40	117	10	0	684	0
8:00 AM	0	14	10	6	0	0	26	7	37	0	0	2	198	96	0	0	32	106	13	0	547	0

Peak Rolling Hour Flow Rates

Vehicle Type	Eastbound					Westbound					Northbound					Southbound					Total
	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	
Articulated Trucks	0	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	5
Lights	0	41	23	23	0	0	87	21	247	0	0	7	945	387	0	0	103	435	34	0	2,353
Mediums	0	2	1	0	0	0	4	1	4	0	0	0	10	0	0	0	2	14	4	0	42
Total	0	43	25	23	0	0	91	23	251	0	0	7	957	387	0	0	105	450	38	0	2,400
Bicycles on Crosswalk			0					0					0					0			0
Heavy Vehicle Percentage			4.4%					2.7%					0.9%					3.5%			2.0%
Heavy Vehicle Percentage	0.0%	4.7%	8.0%	0.0%	0.0%	0.0%	4.4%	8.7%	1.6%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	1.9%	3.3%	10.5%	0.0%	2.0%
Peak Hour Factor (PHF)			0.73					0.79					0.88					0.89			0.88
Peak Hour Factor (PHF)	0.00	0.72	0.63	0.64	0.00	0.00	0.88	0.82	0.73	0.00	0.00	0.44	0.88	0.90	0.00	0.00	0.66	0.95	0.73	0.00	0.88

Traffic Counts by Vehicle Type

Time	Eastbound					Westbound					Northbound					Southbound					Total
	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	
Articulated Trucks																					
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2
8:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
Lights																					
6:45 AM	0	6	1	5	0	0	12	2	11	0	0	2	169	47	0	0	11	89	1	0	356
7:00 AM	0	7	5	3	0	0	22	5	30	0	0	1	156	43	0	0	7	100	6	0	385
7:15 AM	0	4	2	5	0	0	21	7	41	0	0	0	223	82	0	0	8	117	5	0	515
7:30 AM	0	14	7	9	0	0	19	2	83	0	0	1	262	101	0	0	24	107	9	0	638
7:45 AM	0	9	6	3	0	0	22	5	86	0	0	4	265	108	0	0	40	109	9	0	666
8:00 AM	0	14	8	6	0	0	25	7	37	0	0	2	195	96	0	0	31	102	11	0	534
Mediums																					
6:45 AM	0	0	0	0	0	0	2	0	0	0	0	0	1	1	0	0	0	0	1	0	5
7:00 AM	0	2	1	0	0	0	2	0	0	0	0	0	1	1	0	0	0	1	0	0	8
7:15 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	2	1	0	5
7:30 AM	0	1	0	0	0	0	1	1	3	0	0	0	3	0	0	0	0	1	0	0	10
7:45 AM	0	1	0	0	0	0	2	0	0	0	0	0	5	0	0	0	0	7	1	0	16
8:00 AM	0	0	1	0	0	0	1	0	0	0	0	0	2	0	0	0	1	4	2	0	11

Bicycles on Crosswalk

Time	Eastbound			Westbound			Northbound			Southbound		
	CCW	CW	Total	CCW	CW	Total	CCW	CW	Total	CCW	CW	Total
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrians

Time	Eastbound			Westbound			Northbound			Southbound		
	CCW	CW	Total	CCW	CW	Total	CCW	CW	Total	CCW	CW	Total
6:45 AM	0	0	0	0	1	1	1	1	2	0	0	0
7:00 AM	1	0	1	0	1	1	0	0	0	1	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	1	0	1	0	0	0	0	0	0	1	0	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0

All Traffic Data Services

093A01363 SH 93 & ELDORADO SPRINGS DR PM
 Wednesday, February 20, 2019

Peak Hour
 05:00 PM - 06:00 PM
 Peak 15-Minutes
 05:15 PM - 05:30 PM

Traffic Counts - All Vehicles

Time	ELDORADO SPRINGS DR					ELDORADO SPRINGS DR					SH 93					SH 93					Total	Rolling Hour	
	Eastbound					Westbound					Northbound					Southbound							
	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR			
4:45 PM	0	28	11	11	0	0	64	8	25	0	0	5	126	37	0	0	0	33	217	18	0	583	2,437
5:00 PM	0	9	17	8	0	0	66	11	12	0	1	2	133	37	0	0	0	35	232	18	0	581	2,456
5:15 PM	0	7	5	10	0	0	92	8	26	0	0	5	135	47	0	0	0	39	289	10	0	673	2,305
5:30 PM	0	4	5	4	0	0	66	7	26	0	0	1	148	32	0	0	0	48	246	13	0	600	0
5:45 PM	0	12	9	16	0	0	75	9	24	0	0	5	138	36	0	0	0	41	223	14	0	602	0
6:00 PM	0	16	7	7	0	0	40	10	13	0	0	0	107	25	0	0	0	28	163	14	0	430	0

Peak Rolling Hour Flow Rates

Vehicle Type	Eastbound					Westbound					Northbound					Southbound					Total	
	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR		
Articulated Trucks	0	0	1	1	0	0	0	1	2	0	0	0	0	3	0	0	0	0	3	0	0	11
Lights	0	32	35	37	0	0	297	33	88	0	1	13	546	150	0	0	0	163	983	55	0	2,433
Mediums	0	0	0	0	0	0	1	0	0	0	0	0	5	2	0	0	0	0	4	0	0	12
Total	0	32	36	38	0	0	299	35	88	0	1	13	554	152	0	0	0	163	990	55	0	2,456
Bicycles on Crosswalk			0					0					0					0				0
Heavy Vehicle Percentage			1.9%					0.9%					1.4%					0.6%				0.9%
Heavy Vehicle Percentage	0.0%	0.0%	2.8%	2.6%	0.0%	0.0%	0.7%	5.7%	0.0%	0.0%	0.0%	0.0%	1.4%	1.3%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.9%
Peak Hour Factor (PHF)			0.60					0.84					0.96					0.89				0.91
Peak Hour Factor (PHF)	0.00	0.43	0.56	0.59	0.00	0.00	0.81	0.80	0.86	0.00	0.25	0.65	0.94	0.81	0.00	0.00	0.85	0.86	0.82	0.00	0.91	

Traffic Counts by Vehicle Type

Time	Eastbound					Westbound					Northbound					Southbound					Total	
	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR	U-Turn	Left	Thru	Right	RTOR		
Articulated Trucks																						
4:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	1	2	0	0	0	0	1	0	0	0	0	0	0	0	0	4
5:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	3	0	0	0	6
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lights																						
4:45 PM	0	28	10	11	0	0	63	8	24	0	0	5	121	37	0	0	0	33	217	18	0	575
5:00 PM	0	9	17	8	0	0	65	9	12	0	1	2	130	37	0	0	0	35	231	18	0	574
5:15 PM	0	7	5	9	0	0	91	8	26	0	0	5	133	47	0	0	0	39	285	10	0	665
5:30 PM	0	4	5	4	0	0	66	7	26	0	0	1	146	30	0	0	0	48	244	13	0	594
5:45 PM	0	12	8	16	0	0	75	9	24	0	0	5	137	36	0	0	0	41	223	14	0	600
6:00 PM	0	16	7	7	0	0	40	10	13	0	0	0	106	25	0	0	0	28	162	14	0	428
Mediums																						
4:45 PM	0	0	0	0	0	0	1	0	1	0	0	0	5	0	0	0	0	0	0	0	0	7
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	3
5:15 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	2	0	0	0	6
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2

Bicycles on Crosswalk

Time	Eastbound			Westbound			Northbound			Southbound		
	CCW	CW	Total	CCW	CW	Total	CCW	CW	Total	CCW	CW	Total
4:45 PM	0	0	0	0	0	0	0	0	0	1	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrians

Time	Eastbound			Westbound			Northbound			Southbound		
	CCW	CW	Total	CCW	CW	Total	CCW	CW	Total	CCW	CW	Total
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	1	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0



Boulder, CO
 MUL Marshall Mesa Trailhead
 Sat Peak
 US 170 and Hwy 93

File Name : US 170 and Hwy 93 Sat
 Site Code : MUL
 Start Date : 7/8/2023
 Page No : 1

Groups Printed- Autos - Bike & Ped

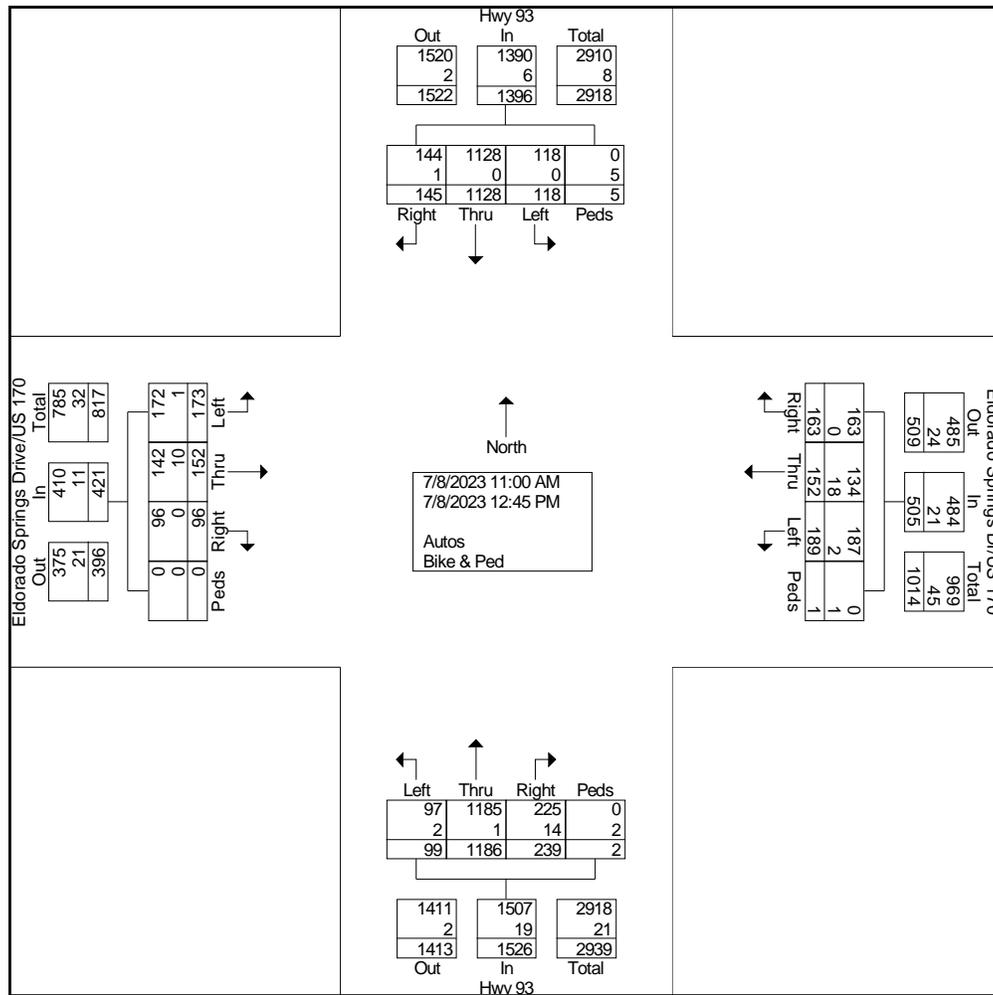
Start Time	Eldorado Springs Drive/US 170 Eastbound					Eldorado Springs Dr/US 170 Westbound					Hwy 93 Northbound					Hwy 93 Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
11:00 AM	18	14	7	0	39	13	17	19	0	49	10	158	29	0	197	19	141	16	1	177	462
11:15 AM	28	24	6	0	58	33	24	19	0	76	15	124	35	0	174	17	113	23	2	155	463
11:30 AM	17	14	15	0	46	22	31	9	0	62	14	147	27	0	188	11	155	16	0	182	478
11:45 AM	20	19	9	0	48	27	20	31	0	78	10	130	24	0	164	17	147	15	2	181	471
Total	83	71	37	0	191	95	92	78	0	265	49	559	115	0	723	64	556	70	5	695	1874
12:00 PM	24	21	13	0	58	26	11	16	0	53	11	148	32	0	191	12	137	24	0	173	475
12:15 PM	21	24	22	0	67	24	16	21	0	61	13	160	22	0	195	6	134	19	0	159	482
12:30 PM	22	14	12	0	48	16	18	24	1	59	13	135	37	2	187	18	155	14	0	187	481
12:45 PM	23	22	12	0	57	28	15	24	0	67	13	184	33	0	230	18	146	18	0	182	536
Total	90	81	59	0	230	94	60	85	1	240	50	627	124	2	803	54	572	75	0	701	1974
Grand Total	173	152	96	0	421	189	152	163	1	505	99	1186	239	2	1526	118	1128	145	5	1396	3848
Apprch %	41.1	36.1	22.8	0		37.4	30.1	32.3	0.2		6.5	77.7	15.7	0.1		8.5	80.8	10.4	0.4		
Total %	4.5	4	2.5	0	10.9	4.9	4	4.2	0	13.1	2.6	30.8	6.2	0.1	39.7	3.1	29.3	3.8	0.1	36.3	
Autos	172	142	96	0	410	187	134	163	0	484	97	1185	225	0	1507	118	1128	144	0	1390	3791
% Autos	99.4	93.4	100	0	97.4	98.9	88.2	100	0	95.8	98	99.9	94.1	0	98.8	100	100	99.3	0	99.6	98.5
Bike & Ped	1	10	0	0	11	2	18	0	1	21	2	1	14	2	19	0	0	1	5	6	57
% Bike & Ped	0.6	6.6	0	0	2.6	1.1	11.8	0	100	4.2	2	0.1	5.9	100	1.2	0	0	0.7	100	0.4	1.5



Ridgeview Data
Collection

Boulder, CO
MUL Marshall Mesa Trailhead
Sat Peak
US 170 and Hwy 93

File Name : US 170 and Hwy 93 Sat
Site Code : MUL
Start Date : 7/8/2023
Page No : 2

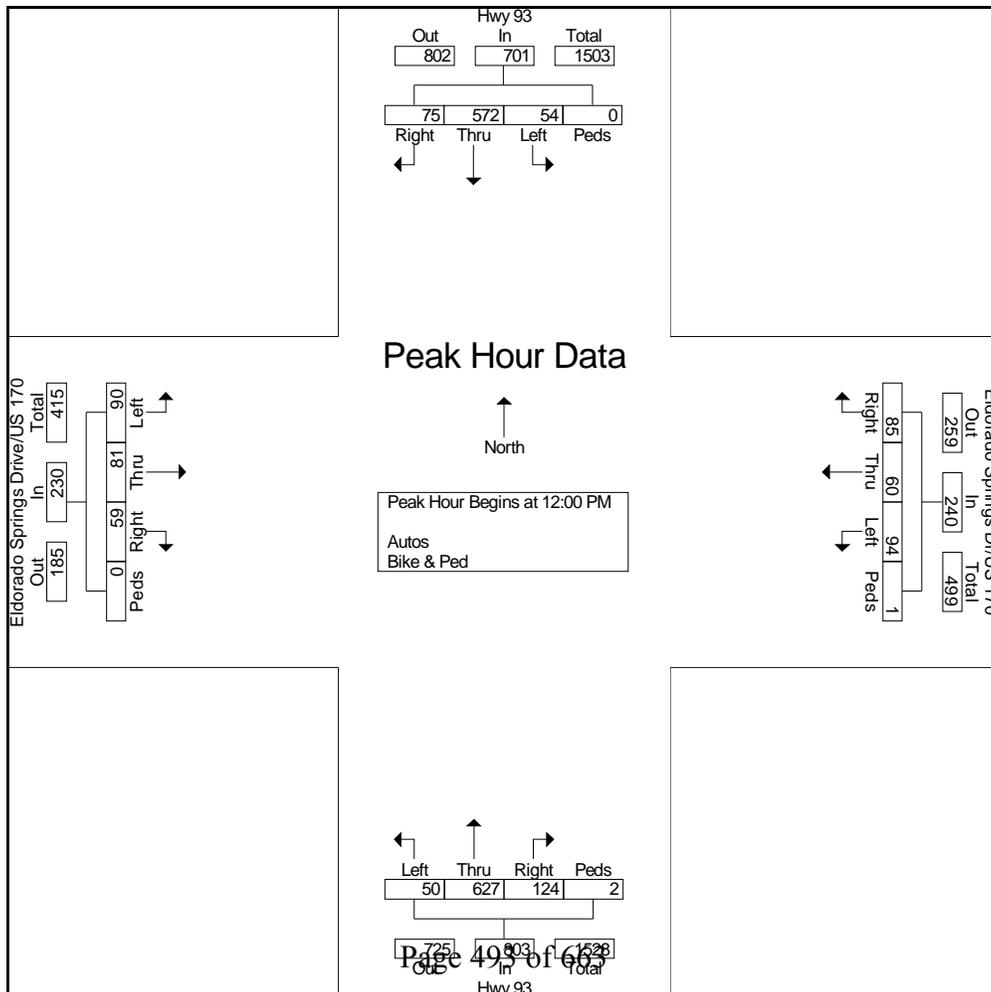




Boulder, CO
 MUL Marshall Mesa Trailhead
 Sat Peak
 US 170 and Hwy 93

File Name : US 170 and Hwy 93 Sat
 Site Code : MUL
 Start Date : 7/8/2023
 Page No : 3

Start Time	Eldorado Springs Drive/US 170 Eastbound					Eldorado Springs Dr/US 170 Westbound					Hwy 93 Northbound					Hwy 93 Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:00 PM																					
12:00 PM	24	21	13	0	58	26	11	16	0	53	11	148	32	0	191	12	137	24	0	173	475
12:15 PM	21	24	22	0	67	24	16	21	0	61	13	160	22	0	195	6	134	19	0	159	482
12:30 PM	22	14	12	0	48	16	18	24	1	59	13	135	37	2	187	18	155	14	0	187	481
12:45 PM	23	22	12	0	57	28	15	24	0	67	13	184	33	0	230	18	146	18	0	182	536
Total Volume	90	81	59	0	230	94	60	85	1	240	50	627	124	2	803	54	572	75	0	701	1974
% App. Total	39.1	35.2	25.7	0		39.2	25	35.4	0.4		6.2	78.1	15.4	0.2		7.7	81.6	10.7	0		
PHF	.938	.844	.670	.000	.858	.839	.833	.885	.250	.896	.962	.852	.838	.250	.873	.750	.923	.781	.000	.937	.921





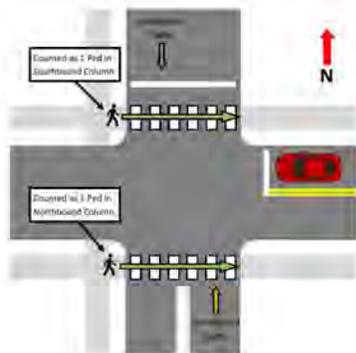
Ridgeview Data
Collection

Boulder, CO
MUL Marshall Mesa Trailhead
Sat Peak
US 170 and Hwy 93

File Name : US 170 and Hwy 93 Sat
Site Code : MUL
Start Date : 7/8/2023
Page No : 4

Image 1

The number of pedestrians shown on this report is representative of the crossing on the approaching leg, i.e. pedestrians crossing the north side of the intersection are counted as pedestrians in the southbound crosswalk, as that is the approaching leg that they are crossing (see figure below). Diagonal crossings are counted on the two legs that will get the pedestrian to the same end point. Diagonals can be counted separately if discussed prior to count.





Boulder, CO
 MUL Marshall Mesa Trailhead
 AM Peak
 Trailhead Driveway

File Name : Trailhead Driveway AM
 Site Code : MUL
 Start Date : 7/11/2023
 Page No : 1

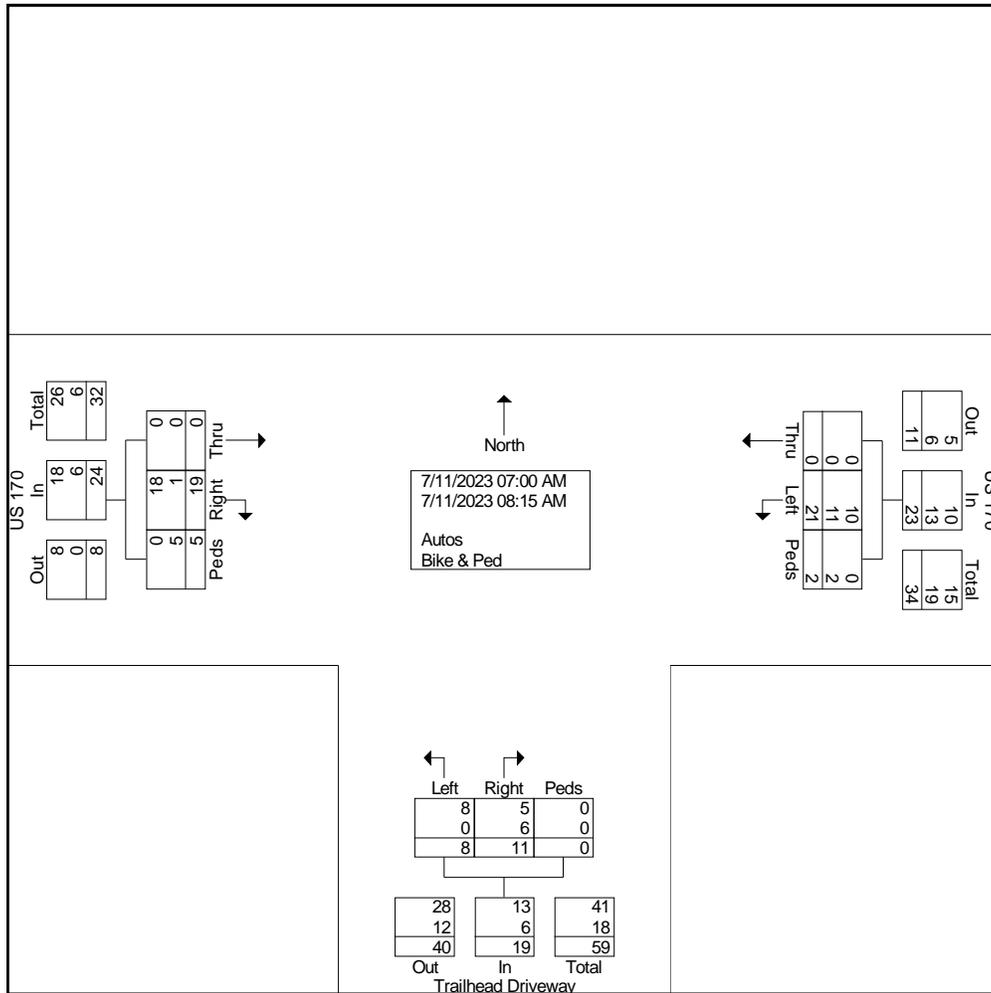
Groups Printed- Autos - Bike & Ped

Start Time	US 170 Eastbound				US 170 Westbound				Trailhead Driveway Northbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
07:00 AM	0	6	2	8	6	0	1	7	0	2	0	2	17
07:15 AM	0	2	0	2	4	0	0	4	1	0	0	1	7
07:30 AM	0	4	0	4	4	0	0	4	1	0	0	1	9
07:45 AM	0	3	0	3	2	0	0	2	1	2	0	3	8
Total	0	15	2	17	16	0	1	17	3	4	0	7	41
08:00 AM	0	2	2	4	2	0	0	2	3	6	0	9	15
08:15 AM	0	2	1	3	3	0	1	4	2	1	0	3	10
Grand Total	0	19	5	24	21	0	2	23	8	11	0	19	66
Apprch %	0	79.2	20.8		91.3	0	8.7		42.1	57.9	0		
Total %	0	28.8	7.6	36.4	31.8	0	3	34.8	12.1	16.7	0	28.8	
Autos	0	18	0	18	10	0	0	10	8	5	0	13	41
% Autos	0	94.7	0	75	47.6	0	0	43.5	100	45.5	0	68.4	62.1
Bike & Ped	0	1	5	6	11	0	2	13	0	6	0	6	25
% Bike & Ped	0	5.3	100	25	52.4	0	100	56.5	0	54.5	0	31.6	37.9



Boulder, CO
 MUL Marshall Mesa Trailhead
 AM Peak
 Trailhead Driveway

File Name : Trailhead Driveway AM
 Site Code : MUL
 Start Date : 7/11/2023
 Page No : 2

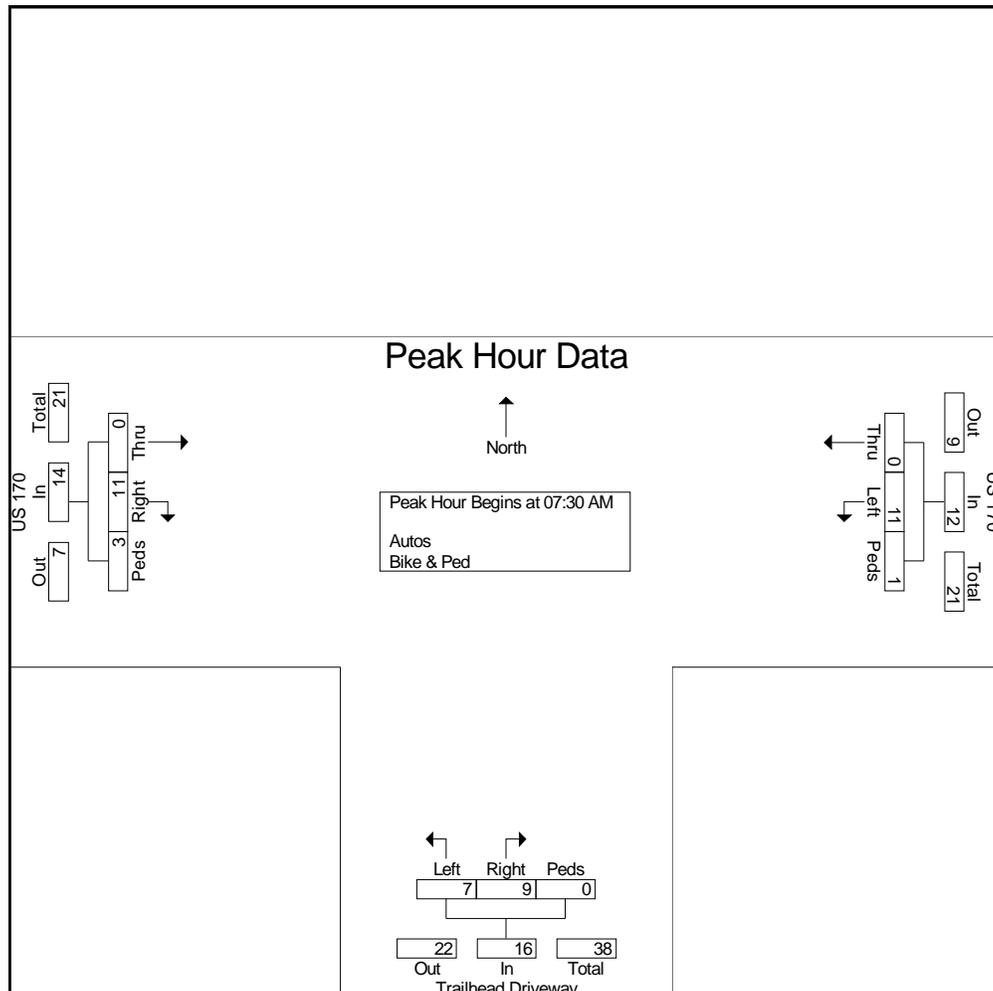




Boulder, CO
 MUL Marshall Mesa Trailhead
 AM Peak
 Trailhead Driveway

File Name : Trailhead Driveway AM
 Site Code : MUL
 Start Date : 7/11/2023
 Page No : 3

Start Time	US 170 Eastbound				US 170 Westbound				Trailhead Driveway Northbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:15 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	0	4	0	4	4	0	0	4	1	0	0	1	9
07:45 AM	0	3	0	3	2	0	0	2	1	2	0	3	8
08:00 AM	0	2	2	4	2	0	0	2	3	6	0	9	15
08:15 AM	0	2	1	3	3	0	1	4	2	1	0	3	10
Total Volume	0	11	3	14	11	0	1	12	7	9	0	16	42
% App. Total	0	78.6	21.4		91.7	0	8.3		43.8	56.2	0		
PHF	.000	.688	.375	.875	.688	.000	.250	.750	.583	.375	.000	.444	.700



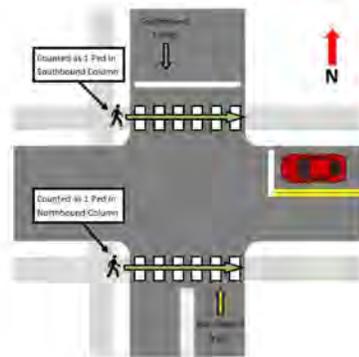


Boulder, CO
 MUL Marshall Mesa Trailhead
 AM Peak
 Trailhead Driveway

File Name : Trailhead Driveway AM
 Site Code : MUL
 Start Date : 7/11/2023
 Page No : 4

Image 1

The number of pedestrians shown on this report is representative of the crossing on the approaching leg, i.e. pedestrians crossing the north side of the intersection are counted as pedestrians in the southbound crosswalk, as that is the approaching leg that they are crossing (see figure below). Diagonal crossings are counted on the two legs that will get the pedestrian to the same end point. Diagonals can be counted separately if discussed prior to count.





Boulder, CO
 MUL Marshall Mesa Trailhead
 PM Peak
 Trailhead Driveway

File Name : Trailhead Driveway PM
 Site Code : MUL
 Start Date : 7/11/2023
 Page No : 1

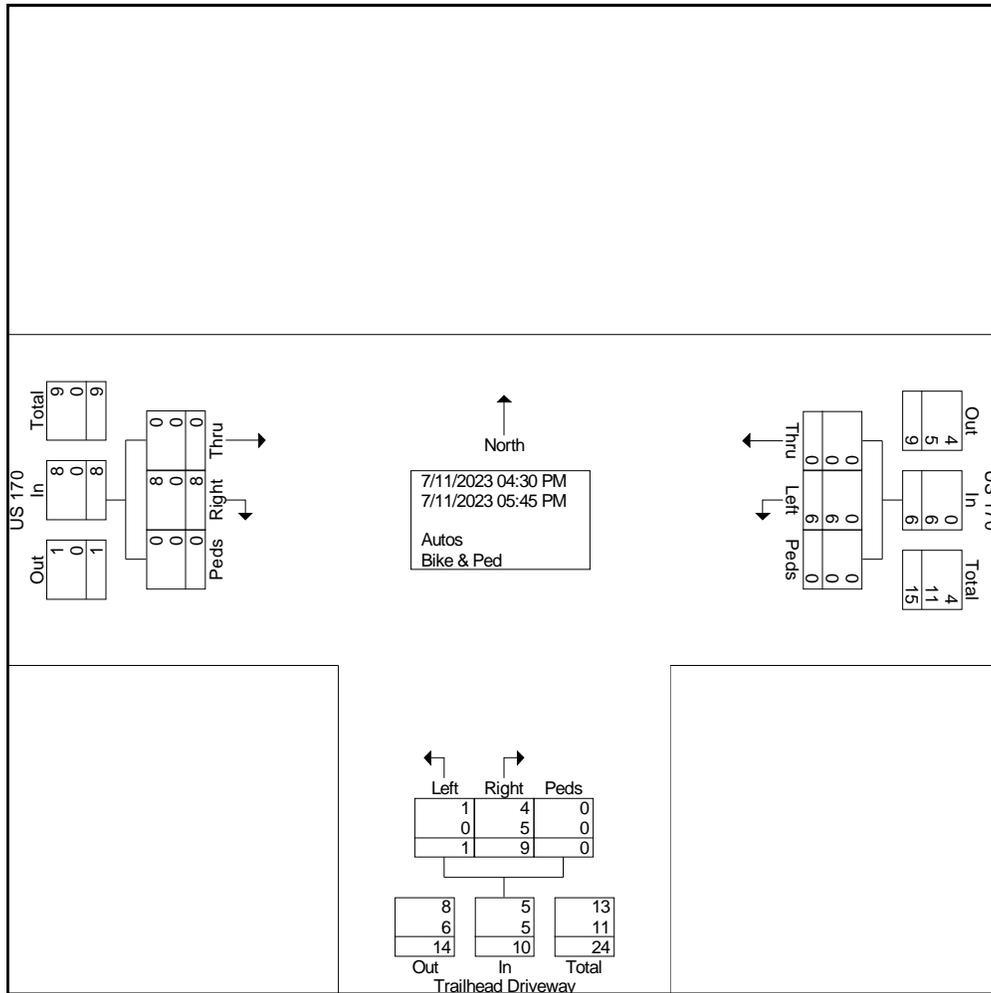
Groups Printed- Autos - Bike & Ped

Start Time	US 170 Eastbound				US 170 Westbound				Trailhead Driveway Northbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
04:30 PM	0	0	0	0	2	0	0	2	0	0	0	0	2
04:45 PM	0	2	0	2	0	0	0	0	0	2	0	2	4
Total	0	2	0	2	2	0	0	2	0	2	0	2	6
05:00 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
05:15 PM	0	0	0	0	1	0	0	1	0	1	0	1	2
05:30 PM	0	0	0	0	1	0	0	1	0	3	0	3	4
05:45 PM	0	6	0	6	1	0	0	1	1	3	0	4	11
Total	0	6	0	6	4	0	0	4	1	7	0	8	18
Grand Total	0	8	0	8	6	0	0	6	1	9	0	10	24
Apprch %	0	100	0		100	0	0		10	90	0		
Total %	0	33.3	0	33.3	25	0	0	25	4.2	37.5	0	41.7	
Autos	0	8	0	8	0	0	0	0	1	4	0	5	13
% Autos	0	100	0	100	0	0	0	0	100	44.4	0	50	54.2
Bike & Ped	0	0	0	0	6	0	0	6	0	5	0	5	11
% Bike & Ped	0	0	0	0	100	0	0	100	0	55.6	0	50	45.8



Boulder, CO
 MUL Marshall Mesa Trailhead
 PM Peak
 Trailhead Driveway

File Name : Trailhead Driveway PM
 Site Code : MUL
 Start Date : 7/11/2023
 Page No : 2

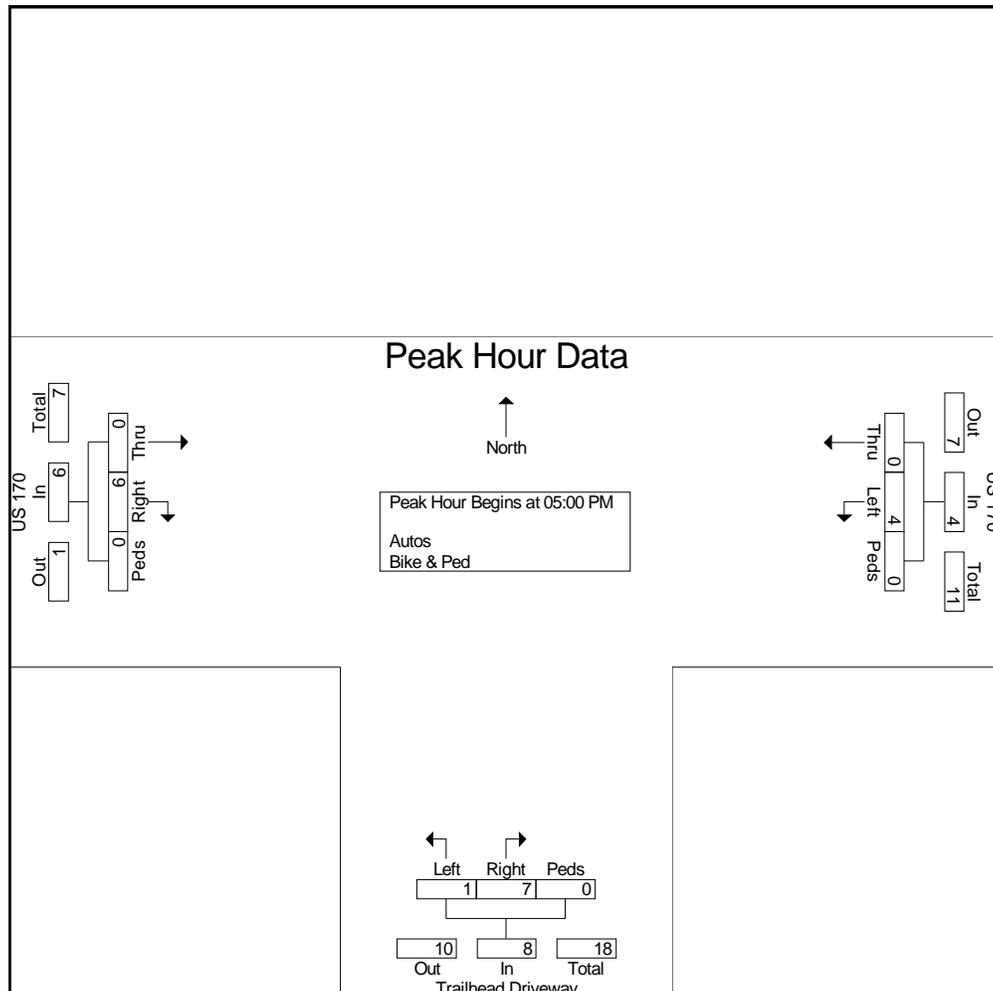




Boulder, CO
 MUL Marshall Mesa Trailhead
 PM Peak
 Trailhead Driveway

File Name : Trailhead Driveway PM
 Site Code : MUL
 Start Date : 7/11/2023
 Page No : 3

Start Time	US 170 Eastbound				US 170 Westbound				Trailhead Driveway Northbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
Peak Hour Analysis From 04:30 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
05:15 PM	0	0	0	0	1	0	0	1	0	1	0	1	2
05:30 PM	0	0	0	0	1	0	0	1	0	3	0	3	4
05:45 PM	0	6	0	6	1	0	0	1	1	3	0	4	11
Total Volume	0	6	0	6	4	0	0	4	1	7	0	8	18
% App. Total	0	100	0		100	0	0		12.5	87.5	0		
PHF	.000	.250	.000	.250	1.00	.000	.000	1.00	.250	.583	.000	.500	.409



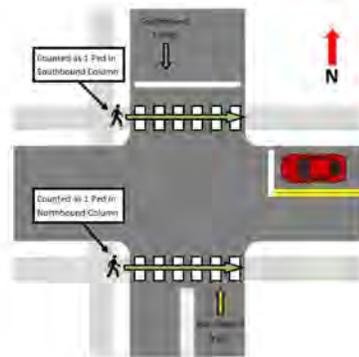


Boulder, CO
MUL Marshall Mesa Trailhead
PM Peak
Trailhead Driveway

File Name : Trailhead Driveway PM
Site Code : MUL
Start Date : 7/11/2023
Page No : 4

Image 1

The number of pedestrians shown on this report is representative of the crossing on the approaching leg, i.e. pedestrians crossing the north side of the intersection are counted as pedestrians in the southbound crosswalk, as that is the approaching leg that they are crossing (see figure below). Diagonal crossings are counted on the two legs that will get the pedestrian to the same end point. Diagonals can be counted separately if discussed prior to count.





Boulder, CO
 MUL Marshall Mesa Trailhead
 Sat Peak
 Trailhead Driveway

File Name : Trailhead Driveway SAT REV
 Site Code : MUL
 Start Date : 7/8/2023
 Page No : 1

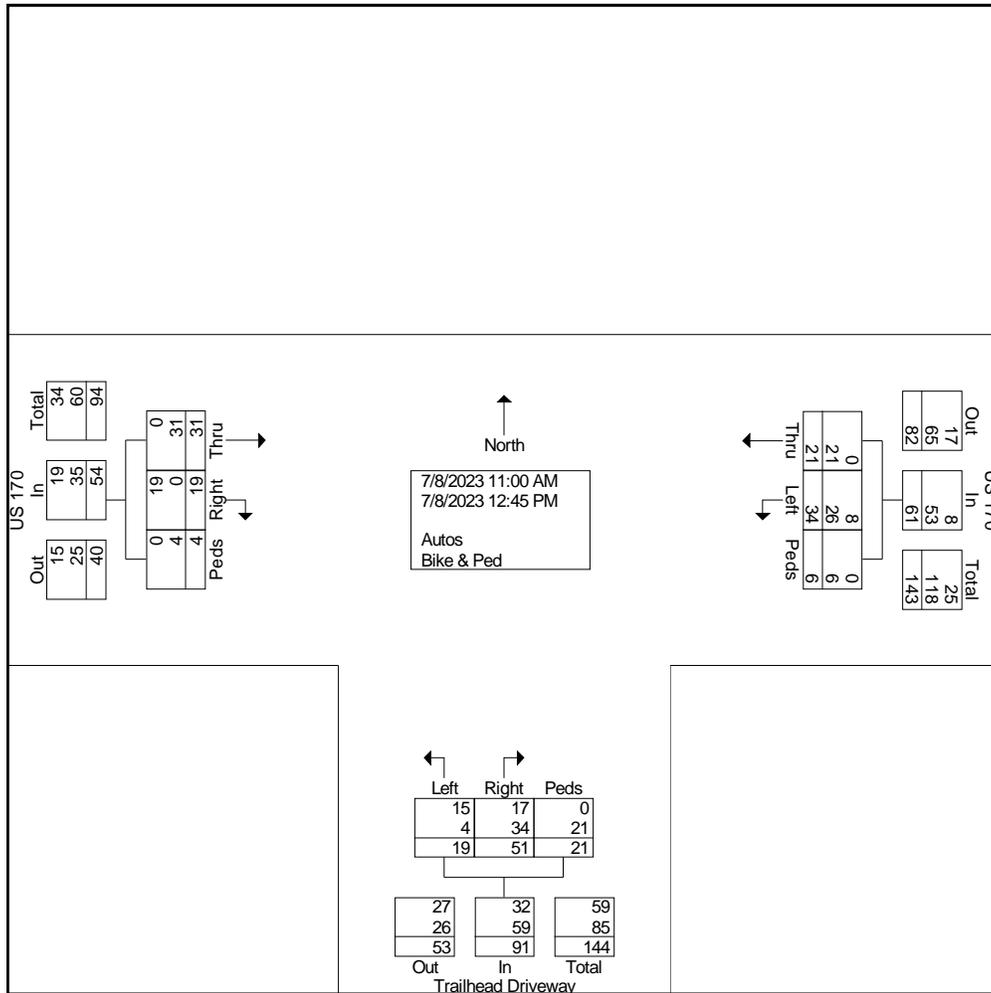
Groups Printed- Autos - Bike & Ped

Start Time	US 170 Eastbound				US 170 Westbound				Trailhead Driveway Northbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
11:00 AM	2	3	0	5	5	3	0	8	3	11	3	17	30
11:15 AM	5	2	0	7	5	0	0	5	1	3	3	7	19
11:30 AM	2	3	3	8	4	2	0	6	1	4	7	12	26
11:45 AM	3	3	0	6	8	4	1	13	3	4	1	8	27
Total	12	11	3	26	22	9	1	32	8	22	14	44	102
12:00 PM	1	1	0	2	3	1	0	4	6	2	0	8	14
12:15 PM	6	1	1	8	2	4	0	6	1	9	4	14	28
12:30 PM	6	2	0	8	2	6	0	8	2	13	0	15	31
12:45 PM	6	4	0	10	5	1	5	11	2	5	3	10	31
Total	19	8	1	28	12	12	5	29	11	29	7	47	104
Grand Total	31	19	4	54	34	21	6	61	19	51	21	91	206
Apprch %	57.4	35.2	7.4		55.7	34.4	9.8		20.9	56	23.1		
Total %	15	9.2	1.9	26.2	16.5	10.2	2.9	29.6	9.2	24.8	10.2	44.2	
Autos	0	19	0	19	8	0	0	8	15	17	0	32	59
% Autos	0	100	0	35.2	23.5	0	0	13.1	78.9	33.3	0	35.2	28.6
Bike & Ped	31	0	4	35	26	21	6	53	4	34	21	59	147
% Bike & Ped	100	0	100	64.8	76.5	100	100	86.9	21.1	66.7	100	64.8	71.4



Boulder, CO
 MUL Marshall Mesa Trailhead
 Sat Peak
 Trailhead Driveway

File Name : Trailhead Driveway SAT REV
 Site Code : MUL
 Start Date : 7/8/2023
 Page No : 2

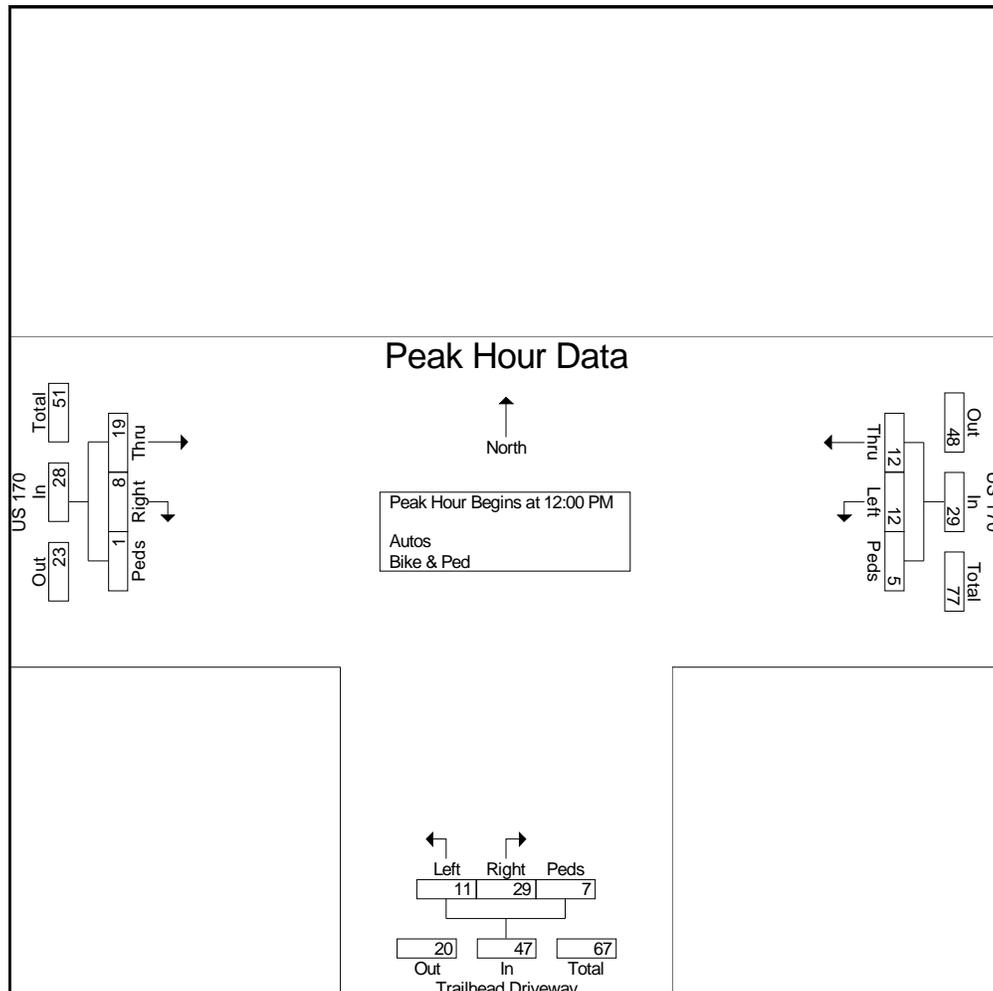




Boulder, CO
 MUL Marshall Mesa Trailhead
 Sat Peak
 Trailhead Driveway

File Name : Trailhead Driveway SAT REV
 Site Code : MUL
 Start Date : 7/8/2023
 Page No : 3

Start Time	US 170 Eastbound				US 170 Westbound				Trailhead Driveway Northbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:00 PM													
12:00 PM	1	1	0	2	3	1	0	4	6	2	0	8	14
12:15 PM	6	1	1	8	2	4	0	6	1	9	4	14	28
12:30 PM	6	2	0	8	2	6	0	8	2	13	0	15	31
12:45 PM	6	4	0	10	5	1	5	11	2	5	3	10	31
Total Volume	19	8	1	28	12	12	5	29	11	29	7	47	104
% App. Total	67.9	28.6	3.6		41.4	41.4	17.2		23.4	61.7	14.9		
PHF	.792	.500	.250	.700	.600	.500	.250	.659	.458	.558	.438	.783	.839



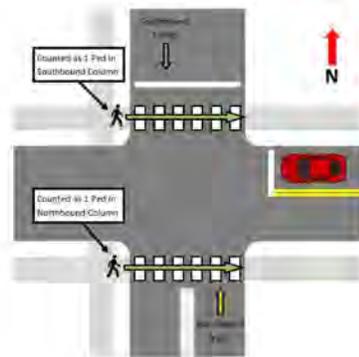


Boulder, CO
MUL Marshall Mesa Trailhead
Sat Peak
Trailhead Driveway

File Name : Trailhead Driveway SAT REV
Site Code : MUL
Start Date : 7/8/2023
Page No : 4

Image 1

The number of pedestrians shown on this report is representative of the crossing on the approaching leg, i.e. pedestrians crossing the north side of the intersection are counted as pedestrians in the southbound crosswalk, as that is the approaching leg that they are crossing (see figure below). Diagonal crossings are counted on the two legs that will get the pedestrian to the same end point. Diagonals can be counted separately if discussed prior to count.





Boulder, CO
 MUL Marshall Mesa Trailhead
 AM Peak
 North Overflow Driveway

File Name : Overflow Driveway AM
 Site Code : MUL
 Start Date : 7/12/2023
 Page No : 1

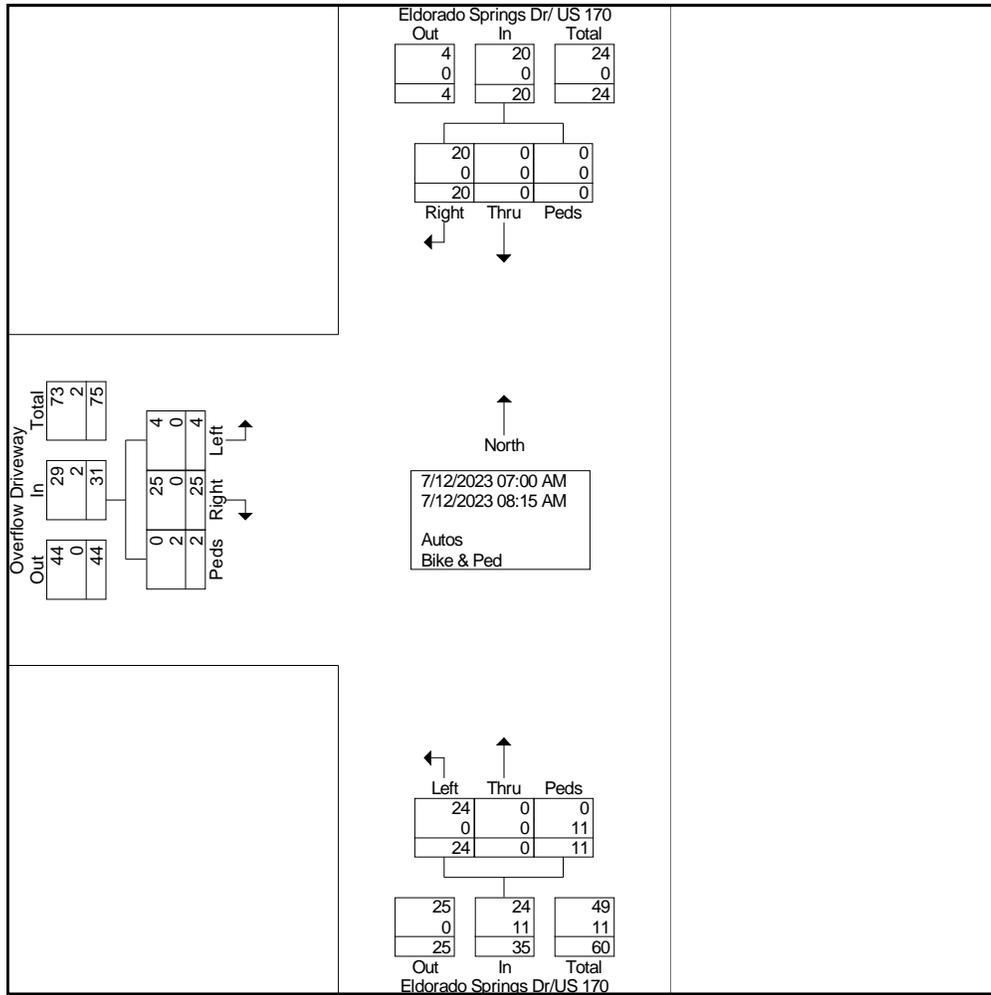
Groups Printed- Autos - Bike & Ped

Start Time	Overflow Driveway Eastbound				Eldorado Springs Dr/US 170 Northbound				Eldorado Springs Dr/ US 170 Southbound				Int. Total
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	
07:00 AM	1	2	0	3	6	0	0	6	0	4	0	4	13
07:15 AM	0	3	0	3	3	0	1	4	0	0	0	0	7
07:30 AM	1	5	1	7	0	0	6	6	0	2	0	2	15
07:45 AM	1	4	1	6	4	0	2	6	0	6	0	6	18
Total	3	14	2	19	13	0	9	22	0	12	0	12	53
08:00 AM	1	4	0	5	8	0	2	10	0	4	0	4	19
08:15 AM	0	7	0	7	3	0	0	3	0	4	0	4	14
Grand Total	4	25	2	31	24	0	11	35	0	20	0	20	86
Apprch %	12.9	80.6	6.5		68.6	0	31.4		0	100	0		
Total %	4.7	29.1	2.3	36	27.9	0	12.8	40.7	0	23.3	0	23.3	
Autos	4	25	0	29	24	0	0	24	0	20	0	20	73
% Autos	100	100	0	93.5	100	0	0	68.6	0	100	0	100	84.9
Bike & Ped	0	0	2	2	0	0	11	11	0	0	0	0	13
% Bike & Ped	0	0	100	6.5	0	0	100	31.4	0	0	0	0	15.1



Boulder, CO
 MUL Marshall Mesa Trailhead
 AM Peak
 North Overflow Driveway

File Name : Overflow Driveway AM
 Site Code : MUL
 Start Date : 7/12/2023
 Page No : 2

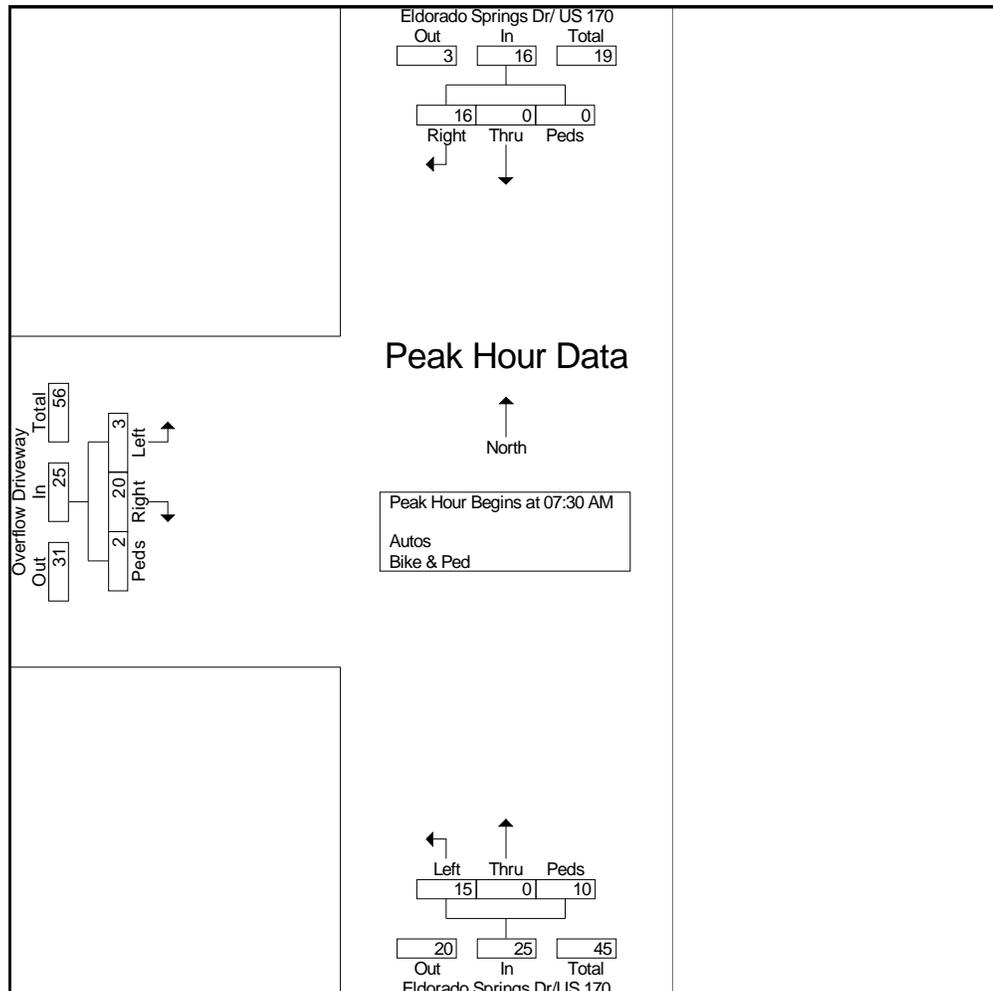




Boulder, CO
 MUL Marshall Mesa Trailhead
 AM Peak
 North Overflow Driveway

File Name : Overflow Driveway AM
 Site Code : MUL
 Start Date : 7/12/2023
 Page No : 3

Start Time	Overflow Driveway Eastbound				Eldorado Springs Dr/US 170 Northbound				Eldorado Springs Dr/ US 170 Southbound				Int. Total
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:15 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	1	5	1	7	0	0	6	6	0	2	0	2	15
07:45 AM	1	4	1	6	4	0	2	6	0	6	0	6	18
08:00 AM	1	4	0	5	8	0	2	10	0	4	0	4	19
08:15 AM	0	7	0	7	3	0	0	3	0	4	0	4	14
Total Volume	3	20	2	25	15	0	10	25	0	16	0	16	66
% App. Total	12	80	8		60	0	40		0	100	0		
PHF	.750	.714	.500	.893	.469	.000	.417	.625	.000	.667	.000	.667	.868



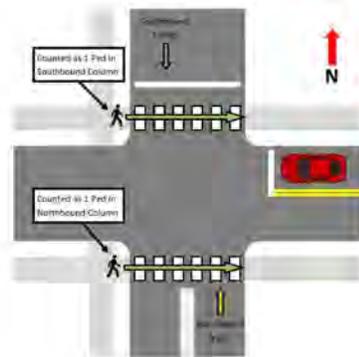


Boulder, CO
MUL Marshall Mesa Trailhead
AM Peak
North Overflow Driveway

File Name : Overflow Driveway AM
Site Code : MUL
Start Date : 7/12/2023
Page No : 4

Image 1

The number of pedestrians shown on this report is representative of the crossing on the approaching leg, i.e. pedestrians crossing the north side of the intersection are counted as pedestrians in the southbound crosswalk, as that is the approaching leg that they are crossing (see figure below). Diagonal crossings are counted on the two legs that will get the pedestrian to the same end point. Diagonals can be counted separately if discussed prior to count.





Boulder, CO
 MUL Marshall Mesa Trailhead
 PM Peak
 North Overflow Driveway

File Name : Overflow Driveway PM REV
 Site Code : MUL
 Start Date : 7/12/2023
 Page No : 1

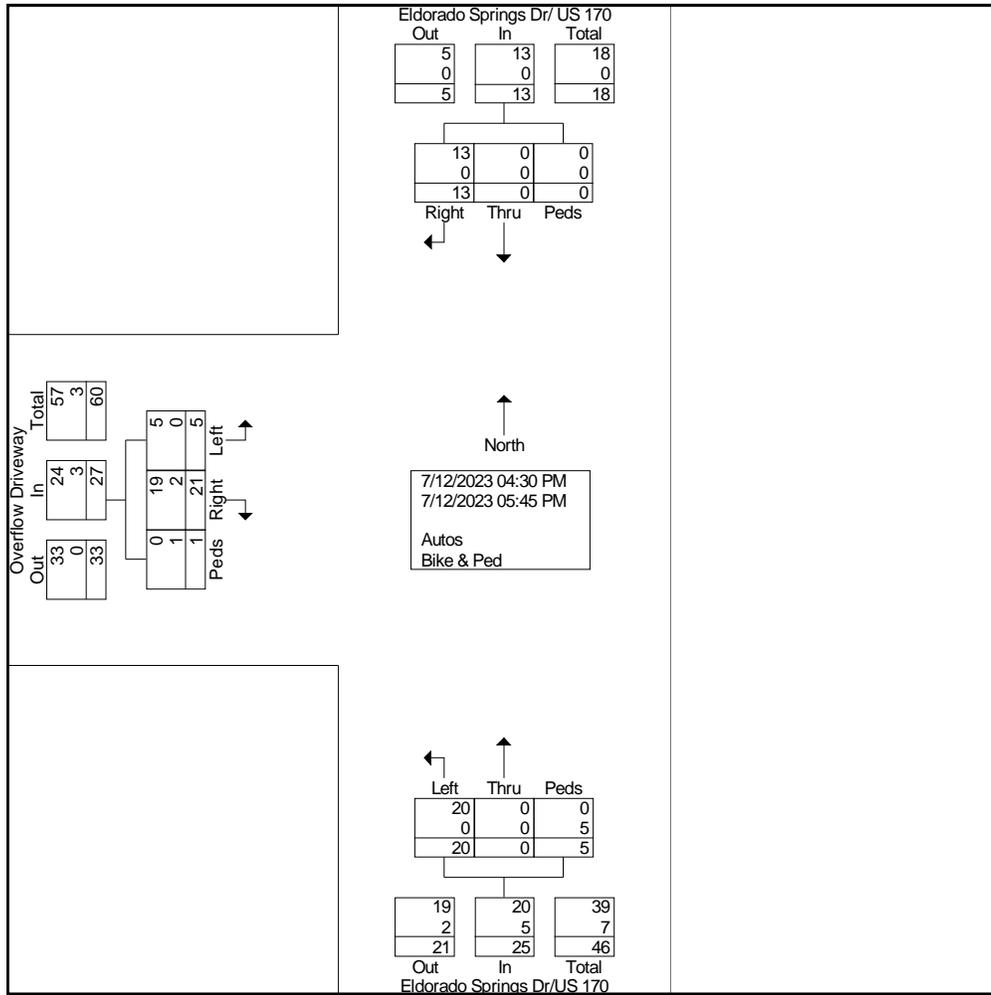
Groups Printed- Autos - Bike & Ped

Start Time	Overflow Driveway Eastbound				Eldorado Springs Dr/US 170 Northbound				Eldorado Springs Dr/ US 170 Southbound				Int. Total
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	
04:30 PM	1	2	0	3	2	0	0	2	0	3	0	3	8
04:45 PM	0	2	0	2	4	0	0	4	0	1	0	1	7
Total	1	4	0	5	6	0	0	6	0	4	0	4	15
05:00 PM	2	4	1	7	5	0	2	7	0	2	0	2	16
05:15 PM	0	7	0	7	4	0	2	6	0	3	0	3	16
05:30 PM	2	3	0	5	2	0	1	3	0	2	0	2	10
05:45 PM	0	3	0	3	3	0	0	3	0	2	0	2	8
Total	4	17	1	22	14	0	5	19	0	9	0	9	50
Grand Total	5	21	1	27	20	0	5	25	0	13	0	13	65
Apprch %	18.5	77.8	3.7		80	0	20		0	100	0		
Total %	7.7	32.3	1.5	41.5	30.8	0	7.7	38.5	0	20	0	20	
Autos	5	19	0	24	20	0	0	20	0	13	0	13	57
% Autos	100	90.5	0	88.9	100	0	0	80	0	100	0	100	87.7
Bike & Ped	0	2	1	3	0	0	5	5	0	0	0	0	8
% Bike & Ped	0	9.5	100	11.1	0	0	100	20	0	0	0	0	12.3



Boulder, CO
 MUL Marshall Mesa Trailhead
 PM Peak
 North Overflow Driveway

File Name : Overflow Driveway PM REV
 Site Code : MUL
 Start Date : 7/12/2023
 Page No : 2

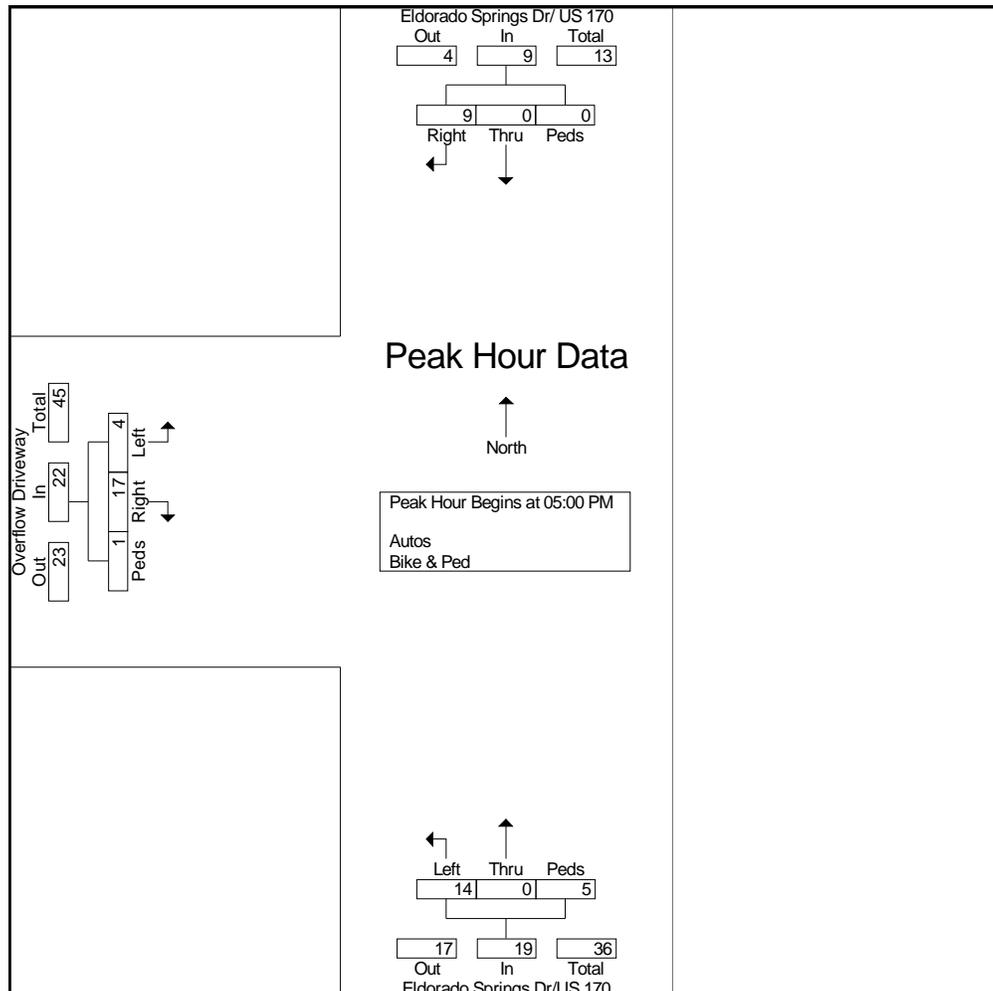




Boulder, CO
 MUL Marshall Mesa Trailhead
 PM Peak
 North Overflow Driveway

File Name : Overflow Driveway PM REV
 Site Code : MUL
 Start Date : 7/12/2023
 Page No : 3

Start Time	Overflow Driveway Eastbound				Eldorado Springs Dr/US 170 Northbound				Eldorado Springs Dr/ US 170 Southbound				Int. Total
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:30 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	2	4	1	7	5	0	2	7	0	2	0	2	16
05:15 PM	0	7	0	7	4	0	2	6	0	3	0	3	16
05:30 PM	2	3	0	5	2	0	1	3	0	2	0	2	10
05:45 PM	0	3	0	3	3	0	0	3	0	2	0	2	8
Total Volume	4	17	1	22	14	0	5	19	0	9	0	9	50
% App. Total	18.2	77.3	4.5		73.7	0	26.3		0	100	0		
PHF	.500	.607	.250	.786	.700	.000	.625	.679	.000	.750	.000	.750	.781



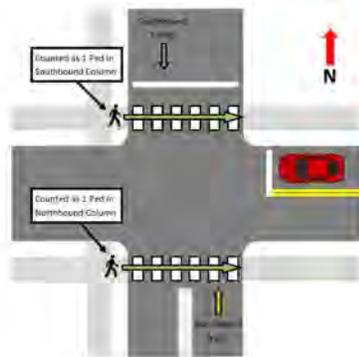


Boulder, CO
MUL Marshall Mesa Trailhead
PM Peak
North Overflow Driveway

File Name : Overflow Driveway PM REV
Site Code : MUL
Start Date : 7/12/2023
Page No : 4

Image 1

The number of pedestrians shown on this report is representative of the crossing on the approaching leg, i.e. pedestrians crossing the north side of the intersection are counted as pedestrians in the southbound crosswalk, as that is the approaching leg that they are crossing (see figure below). Diagonal crossings are counted on the two legs that will get the pedestrian to the same end point. Diagonals can be counted separately if discussed prior to count.





Boulder, CO
 MUL Marshall Mesa Trailhead
 Sat Peak
 North Overflow Driveway

File Name : Overflow Driveway SAT
 Site Code : MUL
 Start Date : 7/8/2023
 Page No : 1

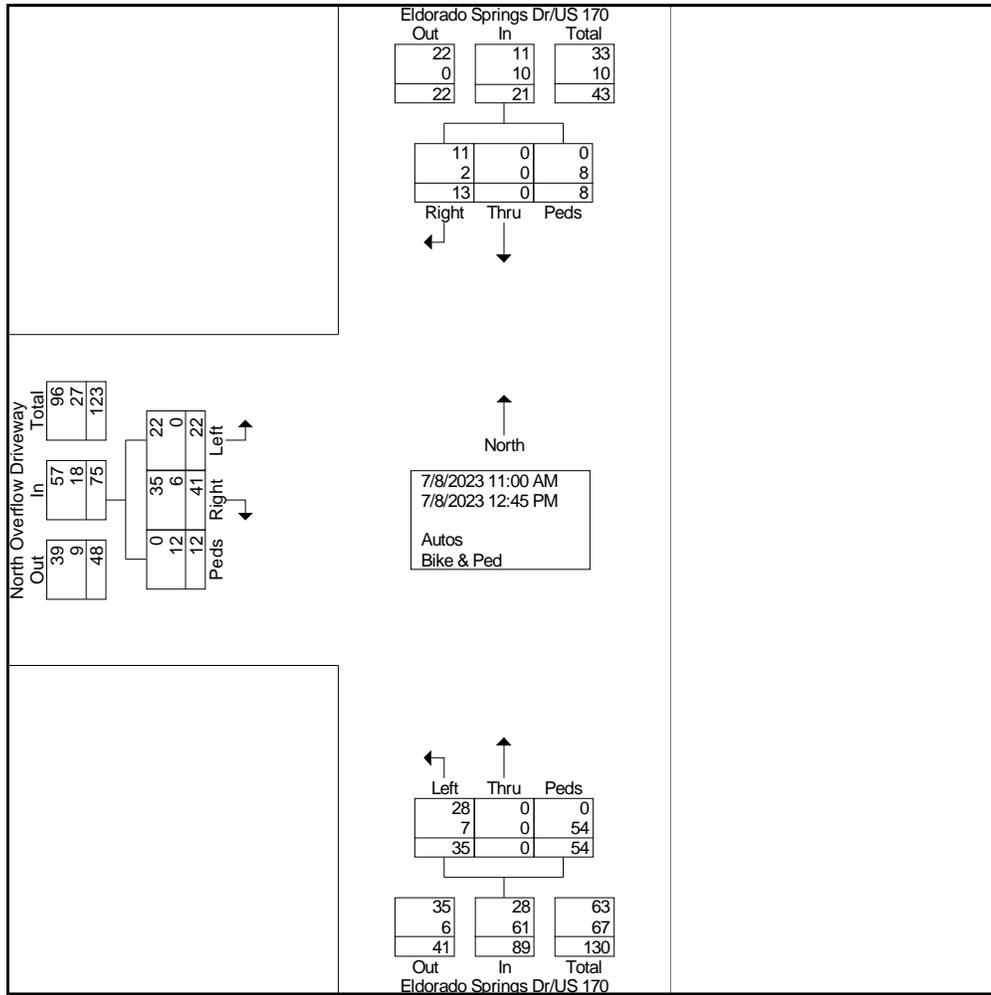
Groups Printed- Autos - Bike & Ped

Start Time	North Overflow Driveway Eastbound				Eldorado Springs Dr/US 170 Northbound				Eldorado Springs Dr/US 170 Southbound				Int. Total
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	
11:00 AM	2	2	0	4	10	0	10	20	0	2	2	4	28
11:15 AM	2	10	7	19	2	0	10	12	0	0	0	0	31
11:30 AM	2	2	0	4	3	0	11	14	0	1	3	4	22
11:45 AM	6	6	1	13	4	0	6	10	0	4	0	4	27
Total	12	20	8	40	19	0	37	56	0	7	5	12	108
12:00 PM	1	1	2	4	3	0	5	8	0	2	1	3	15
12:15 PM	5	5	0	10	3	0	4	7	0	0	0	0	17
12:30 PM	0	8	2	10	5	0	6	11	0	1	2	3	24
12:45 PM	4	7	0	11	5	0	2	7	0	3	0	3	21
Total	10	21	4	35	16	0	17	33	0	6	3	9	77
Grand Total	22	41	12	75	35	0	54	89	0	13	8	21	185
Apprch %	29.3	54.7	16		39.3	0	60.7		0	61.9	38.1		
Total %	11.9	22.2	6.5	40.5	18.9	0	29.2	48.1	0	7	4.3	11.4	
Autos	22	35	0	57	28	0	0	28	0	11	0	11	96
% Autos	100	85.4	0	76	80	0	0	31.5	0	84.6	0	52.4	51.9
Bike & Ped	0	6	12	18	7	0	54	61	0	2	8	10	89
% Bike & Ped	0	14.6	100	24	20	0	100	68.5	0	15.4	100	47.6	48.1



Boulder, CO
 MUL Marshall Mesa Trailhead
 Sat Peak
 North Overflow Driveway

File Name : Overflow Driveway SAT
 Site Code : MUL
 Start Date : 7/8/2023
 Page No : 2

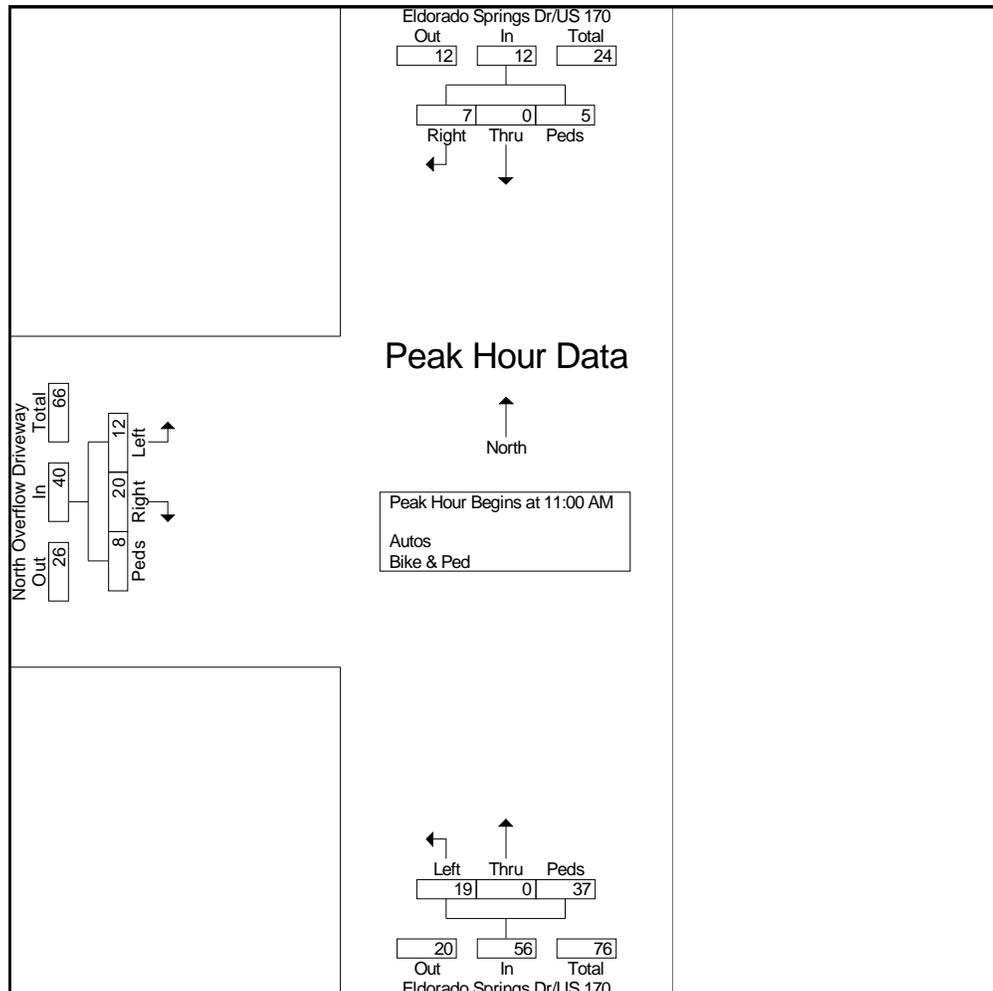




Boulder, CO
 MUL Marshall Mesa Trailhead
 Sat Peak
 North Overflow Driveway

File Name : Overflow Driveway SAT
 Site Code : MUL
 Start Date : 7/8/2023
 Page No : 3

Start Time	North Overflow Driveway Eastbound				Eldorado Springs Dr/US 170 Northbound				Eldorado Springs Dr/US 170 Southbound				Int. Total
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	2	2	0	4	10	0	10	20	0	2	2	4	28
11:15 AM	2	10	7	19	2	0	10	12	0	0	0	0	31
11:30 AM	2	2	0	4	3	0	11	14	0	1	3	4	22
11:45 AM	6	6	1	13	4	0	6	10	0	4	0	4	27
Total Volume	12	20	8	40	19	0	37	56	0	7	5	12	108
% App. Total	30	50	20		33.9	0	66.1		0	58.3	41.7		
PHF	.500	.500	.286	.526	.475	.000	.841	.700	.000	.438	.417	.750	.871



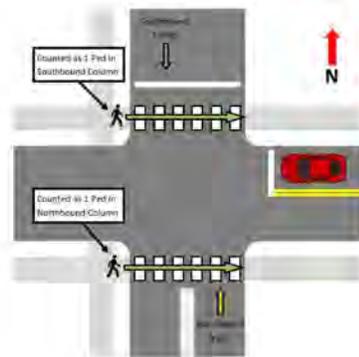


Boulder, CO
MUL Marshall Mesa Trailhead
Sat Peak
North Overflow Driveway

File Name : Overflow Driveway SAT
Site Code : MUL
Start Date : 7/8/2023
Page No : 4

Image 1

The number of pedestrians shown on this report is representative of the crossing on the approaching leg, i.e. pedestrians crossing the north side of the intersection are counted as pedestrians in the southbound crosswalk, as that is the approaching leg that they are crossing (see figure below). Diagonal crossings are counted on the two legs that will get the pedestrian to the same end point. Diagonals can be counted separately if discussed prior to count.





Ridgeview Data
Collection

Boulder, CO
MUL Marshall Mesa Trailhead
AM Peak
US 170 and Marshall Rd

File Name : US 170 and Marshall Rd AM
Site Code : MUL
Start Date : 7/11/2023
Page No : 1

Groups Printed- Autos - Bike & Ped

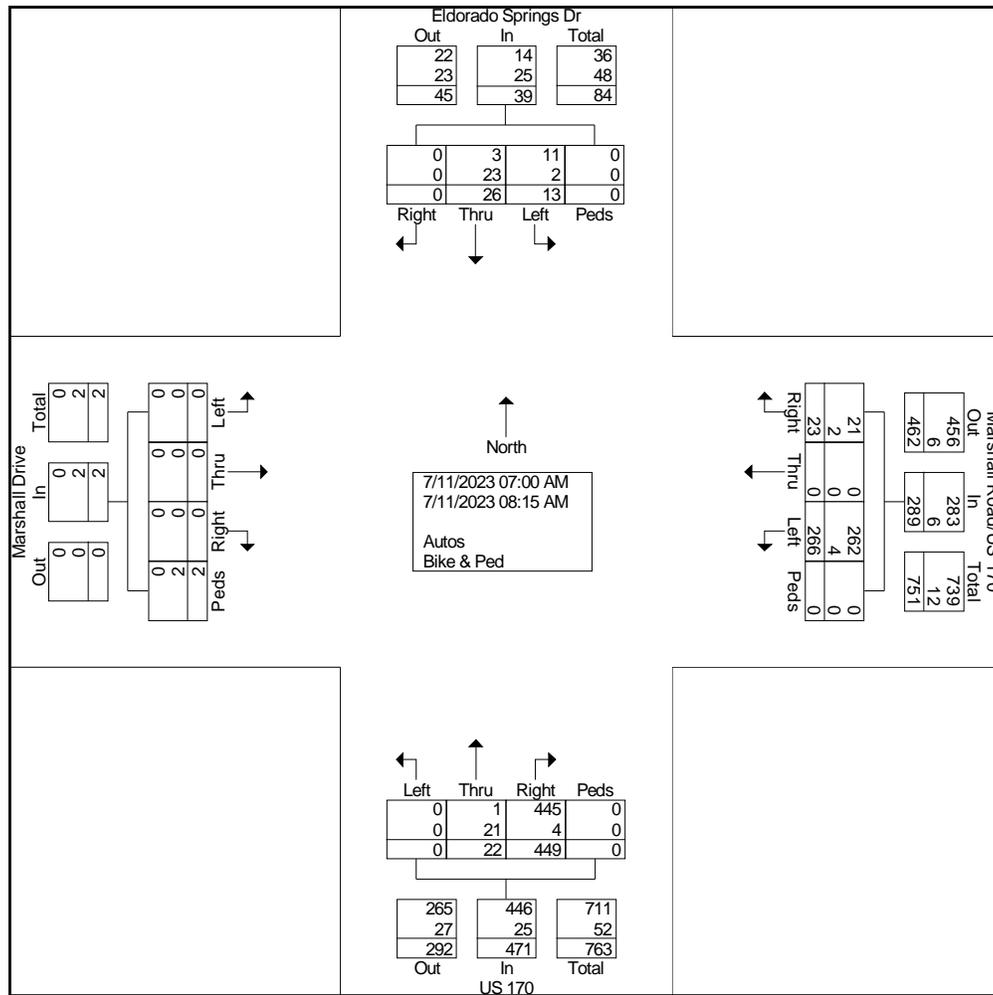
Start Time	Marshall Drive Eastbound					Marshall Road/US 170 Westbound					US 170 Northbound					Eldorado Springs Dr Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	0	0	0	0	0	33	0	3	0	36	0	5	50	0	55	0	3	0	0	3	94
07:15 AM	0	0	0	0	0	38	0	4	0	42	0	2	62	0	64	0	5	0	0	5	111
07:30 AM	0	0	0	0	0	42	0	6	0	48	0	4	78	0	82	2	7	0	0	9	139
07:45 AM	0	0	0	0	0	51	0	2	0	53	0	3	74	0	77	7	3	0	0	10	140
Total	0	0	0	0	0	164	0	15	0	179	0	14	264	0	278	9	18	0	0	27	484
08:00 AM	0	0	0	1	1	54	0	5	0	59	0	7	101	0	108	3	1	0	0	4	172
08:15 AM	0	0	0	1	1	48	0	3	0	51	0	1	84	0	85	1	7	0	0	8	145
Grand Total	0	0	0	2	2	266	0	23	0	289	0	22	449	0	471	13	26	0	0	39	801
Apprch %	0	0	0	100		92	0	8	0		0	4.7	95.3	0		33.3	66.7	0	0		
Total %	0	0	0	0.2	0.2	33.2	0	2.9	0	36.1	0	2.7	56.1	0	58.8	1.6	3.2	0	0	4.9	
Autos	0	0	0	0	0	262	0	21	0	283	0	1	445	0	446	11	3	0	0	14	743
% Autos	0	0	0	0	0	98.5	0	91.3	0	97.9	0	4.5	99.1	0	94.7	84.6	11.5	0	0	35.9	92.8
Bike & Ped	0	0	0	2	2	4	0	2	0	6	0	21	4	0	25	2	23	0	0	25	58
% Bike & Ped	0	0	0	100	100	1.5	0	8.7	0	2.1	0	95.5	0.9	0	5.3	15.4	88.5	0	0	64.1	7.2



Ridgeview Data
Collection

Boulder, CO
MUL Marshall Mesa Trailhead
AM Peak
US 170 and Marshall Rd

File Name : US 170 and Marshall Rd AM
Site Code : MUL
Start Date : 7/11/2023
Page No : 2

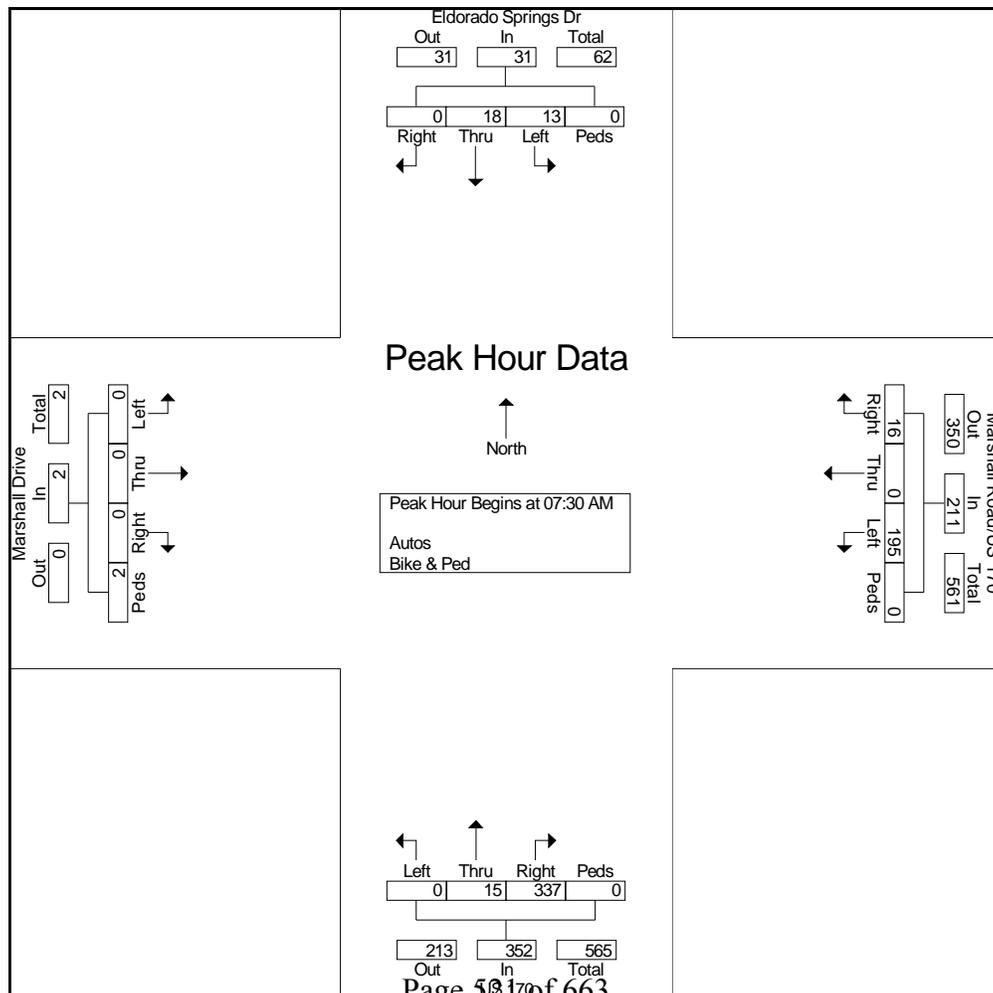




Boulder, CO
 MUL Marshall Mesa Trailhead
 AM Peak
 US 170 and Marshall Rd

File Name : US 170 and Marshall Rd AM
 Site Code : MUL
 Start Date : 7/11/2023
 Page No : 3

Start Time	Marshall Drive Eastbound					Marshall Road/US 170 Westbound					US 170 Northbound					Eldorado Springs Dr Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	0	0	42	0	6	0	48	0	4	78	0	82	2	7	0	0	9	139
07:45 AM	0	0	0	0	0	51	0	2	0	53	0	3	74	0	77	7	3	0	0	10	140
08:00 AM	0	0	0	1	1	54	0	5	0	59	0	7	101	0	108	3	1	0	0	4	172
08:15 AM	0	0	0	1	1	48	0	3	0	51	0	1	84	0	85	1	7	0	0	8	145
Total Volume	0	0	0	2	2	195	0	16	0	211	0	15	337	0	352	13	18	0	0	31	596
% App. Total	0	0	0	100		92.4	0	7.6	0		0	4.3	95.7	0		41.9	58.1	0	0		
PHF	.000	.000	.000	.500	.500	.903	.000	.667	.000	.894	.000	.536	.834	.000	.815	.464	.643	.000	.000	.775	.866





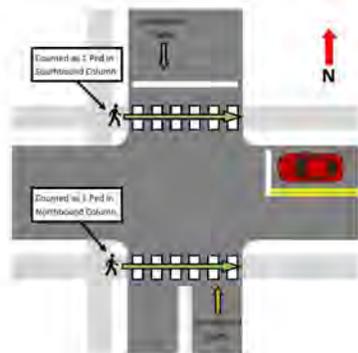
Ridgeview Data
Collection

Boulder, CO
MUL Marshall Mesa Trailhead
AM Peak
US 170 and Marshall Rd

File Name : US 170 and Marshall Rd AM
Site Code : MUL
Start Date : 7/11/2023
Page No : 4

Image 1

The number of pedestrians shown on this report is representative of the crossing on the approaching leg, i.e. pedestrians crossing the north side of the intersection are counted as pedestrians in the southbound crosswalk, as that is the approaching leg that they are crossing (see figure below). Diagonal crossings are counted on the two legs that will get the pedestrian to the same end point. Diagonals can be counted separately if discussed prior to count.





Ridgeview Data
Collection

Boulder, CO
MUL Marshall Mesa Trailhead
PM Peak
US 170 and Marshall Rd

File Name : US 170 and Marshall Rd PM
Site Code : MUL
Start Date : 7/11/2023
Page No : 1

Groups Printed- Autos - Bike & Ped

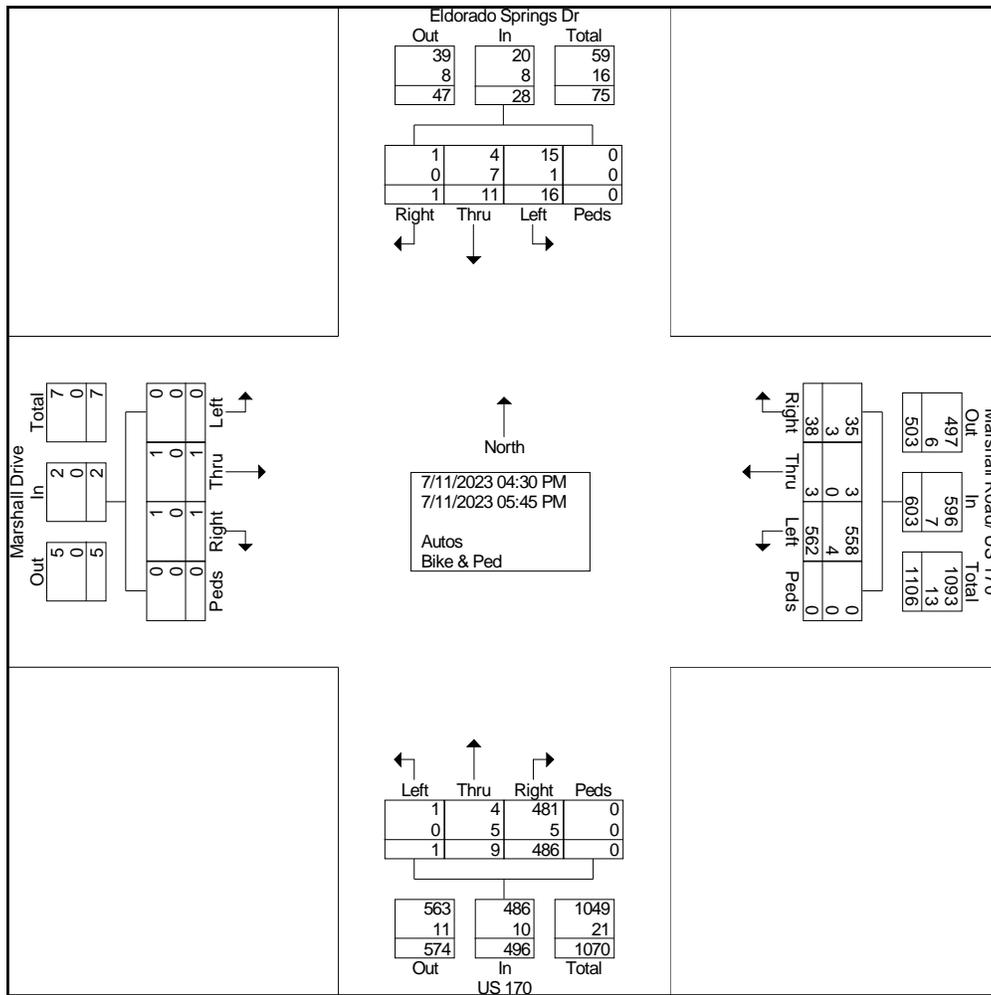
Start Time	Marshall Drive Eastbound					Marshall Road/ US 170 Westbound					US 170 Northbound					Eldorado Springs Dr Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:30 PM	0	0	0	0	0	85	0	3	0	88	0	1	88	0	89	5	1	1	0	7	184
04:45 PM	0	0	0	0	0	80	2	7	0	89	0	2	79	0	81	2	3	0	0	5	175
Total	0	0	0	0	0	165	2	10	0	177	0	3	167	0	170	7	4	1	0	12	359
05:00 PM	0	0	0	0	0	108	1	9	0	118	0	3	93	0	96	2	0	0	0	2	216
05:15 PM	0	0	1	0	1	110	0	4	0	114	0	0	73	0	73	1	2	0	0	3	191
05:30 PM	0	0	0	0	0	98	0	7	0	105	0	1	83	0	84	2	3	0	0	5	194
05:45 PM	0	1	0	0	1	81	0	8	0	89	1	2	70	0	73	4	2	0	0	6	169
Total	0	1	1	0	2	397	1	28	0	426	1	6	319	0	326	9	7	0	0	16	770
Grand Total	0	1	1	0	2	562	3	38	0	603	1	9	486	0	496	16	11	1	0	28	1129
Apprch %	0	50	50	0		93.2	0.5	6.3	0		0.2	1.8	98	0		57.1	39.3	3.6	0		
Total %	0	0.1	0.1	0	0.2	49.8	0.3	3.4	0	53.4	0.1	0.8	43	0	43.9	1.4	1	0.1	0	2.5	
Autos	0	1	1	0	2	558	3	35	0	596	1	4	481	0	486	15	4	1	0	20	1104
% Autos	0	100	100	0	100	99.3	100	92.1	0	98.8	100	44.4	99	0	98	93.8	36.4	100	0	71.4	97.8
Bike & Ped	0	0	0	0	0	4	0	3	0	7	0	5	5	0	10	1	7	0	0	8	25
% Bike & Ped	0	0	0	0	0	0.7	0	7.9	0	1.2	0	55.6	1	0	2	6.2	63.6	0	0	28.6	2.2



Ridgeview Data
Collection

Boulder, CO
MUL Marshall Mesa Trailhead
PM Peak
US 170 and Marshall Rd

File Name : US 170 and Marshall Rd PM
Site Code : MUL
Start Date : 7/11/2023
Page No : 2

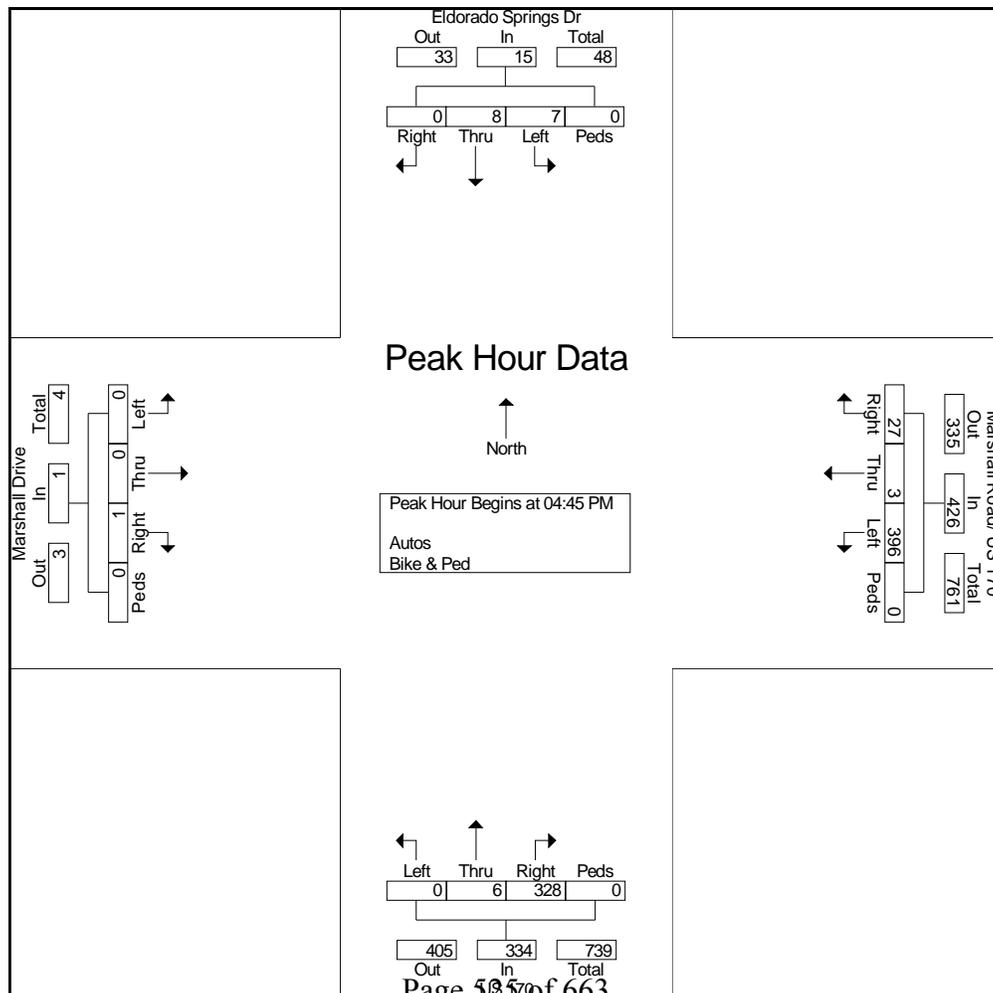




Boulder, CO
 MUL Marshall Mesa Trailhead
 PM Peak
 US 170 and Marshall Rd

File Name : US 170 and Marshall Rd PM
 Site Code : MUL
 Start Date : 7/11/2023
 Page No : 3

Start Time	Marshall Drive Eastbound					Marshall Road/ US 170 Westbound					US 170 Northbound					Eldorado Springs Dr Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:30 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	0	0	0	0	80	2	7	0	89	0	2	79	0	81	2	3	0	0	5	175
05:00 PM	0	0	0	0	0	108	1	9	0	118	0	3	93	0	96	2	0	0	0	2	216
05:15 PM	0	0	1	0	1	110	0	4	0	114	0	0	73	0	73	1	2	0	0	3	191
05:30 PM	0	0	0	0	0	98	0	7	0	105	0	1	83	0	84	2	3	0	0	5	194
Total Volume	0	0	1	0	1	396	3	27	0	426	0	6	328	0	334	7	8	0	0	15	776
% App. Total	0	0	100	0		93	0.7	6.3	0		0	1.8	98.2	0		46.7	53.3	0	0		
PHF	.000	.000	.250	.000	.250	.900	.375	.750	.000	.903	.000	.500	.882	.000	.870	.875	.667	.000	.000	.750	.898





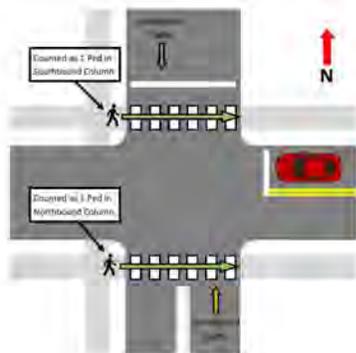
Ridgeview Data
Collection

Boulder, CO
MUL Marshall Mesa Trailhead
PM Peak
US 170 and Marshall Rd

File Name : US 170 and Marshall Rd PM
Site Code : MUL
Start Date : 7/11/2023
Page No : 4

Image 1

The number of pedestrians shown on this report is representative of the crossing on the approaching leg, i.e. pedestrians crossing the north side of the intersection are counted as pedestrians in the southbound crosswalk, as that is the approaching leg that they are crossing (see figure below). Diagonal crossings are counted on the two legs that will get the pedestrian to the same end point. Diagonals can be counted separately if discussed prior to count.





Ridgeview Data
Collection

Boulder, CO
MUL Marshall Mesa Trailhead
Sat Peak
US 170 and Marshall Rd

File Name : US 170 and Marshall Rd Sat
Site Code : MUL
Start Date : 7/8/2023
Page No : 1

Groups Printed- Autos - Bike & Ped

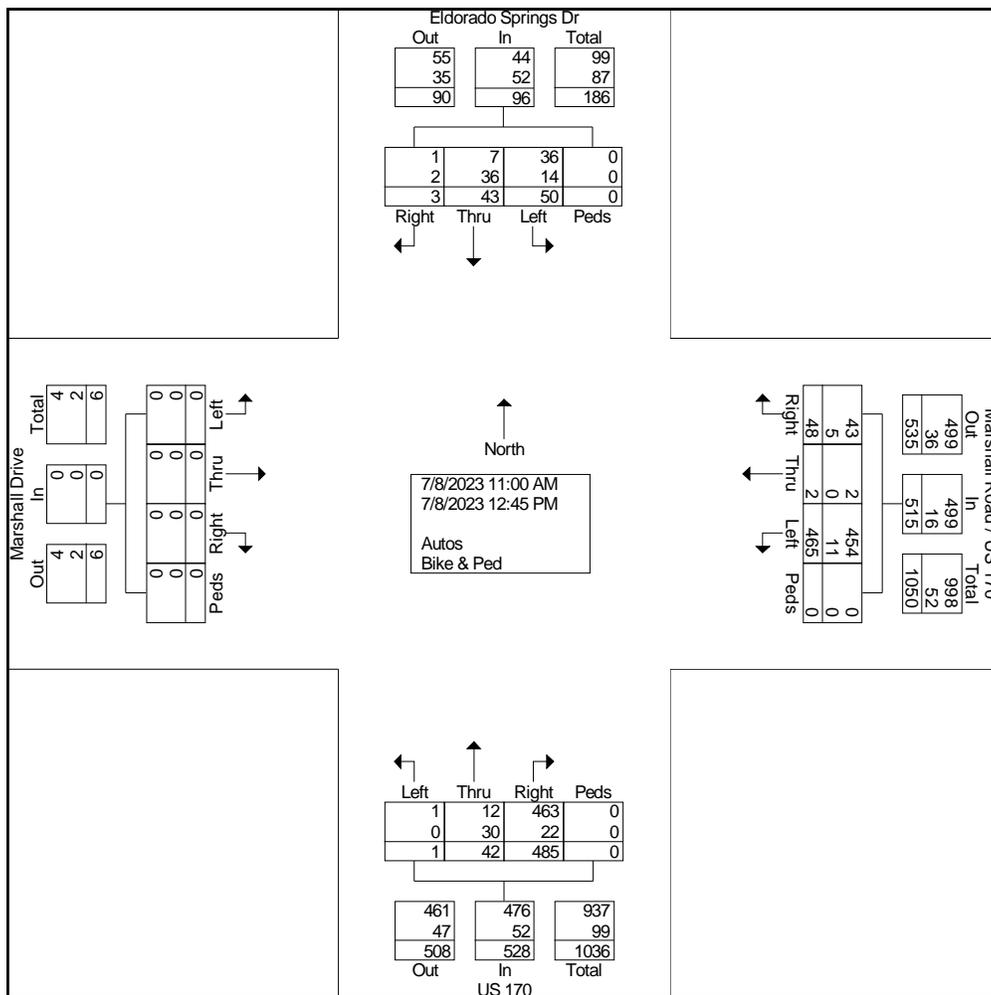
Start Time	Marshall Drive Eastbound					Marshall Road / US 170 Westbound					US 170 Northbound					Eldorado Springs Dr Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
11:00 AM	0	0	0	0	0	45	0	4	0	49	0	4	55	0	59	8	5	1	0	14	122
11:15 AM	0	0	0	0	0	72	0	7	0	79	0	4	69	0	73	5	1	0	0	6	158
11:30 AM	0	0	0	0	0	66	0	6	0	72	0	5	43	0	48	8	10	0	0	18	138
11:45 AM	0	0	0	0	0	71	0	4	0	75	1	2	59	0	62	5	6	0	0	11	148
Total	0	0	0	0	0	254	0	21	0	275	1	15	226	0	242	26	22	1	0	49	566
12:00 PM	0	0	0	0	0	50	0	6	0	56	0	3	67	0	70	6	4	0	0	10	136
12:15 PM	0	0	0	0	0	56	1	8	0	65	0	12	52	0	64	6	2	2	0	10	139
12:30 PM	0	0	0	0	0	40	1	5	0	46	0	3	73	0	76	5	7	0	0	12	134
12:45 PM	0	0	0	0	0	65	0	8	0	73	0	9	67	0	76	7	8	0	0	15	164
Total	0	0	0	0	0	211	2	27	0	240	0	27	259	0	286	24	21	2	0	47	573
Grand Total	0	0	0	0	0	465	2	48	0	515	1	42	485	0	528	50	43	3	0	96	1139
Apprch %	0	0	0	0		90.3	0.4	9.3	0		0.2	8	91.9	0		52.1	44.8	3.1	0		
Total %	0	0	0	0	0	40.8	0.2	4.2	0	45.2	0.1	3.7	42.6	0	46.4	4.4	3.8	0.3	0	8.4	
Autos	0	0	0	0	0	454	2	43	0	499	1	12	463	0	476	36	7	1	0	44	1019
% Autos	0	0	0	0	0	97.6	100	89.6	0	96.9	100	28.6	95.5	0	90.2	72	16.3	33.3	0	45.8	89.5
Bike & Ped	0	0	0	0	0	11	0	5	0	16	0	30	22	0	52	14	36	2	0	52	120
% Bike & Ped	0	0	0	0	0	2.4	0	10.4	0	3.1	0	71.4	4.5	0	9.8	28	83.7	66.7	0	54.2	10.5



Ridgeview Data
Collection

Boulder, CO
MUL Marshall Mesa Trailhead
Sat Peak
US 170 and Marshall Rd

File Name : US 170 and Marshall Rd Sat
Site Code : MUL
Start Date : 7/8/2023
Page No : 2

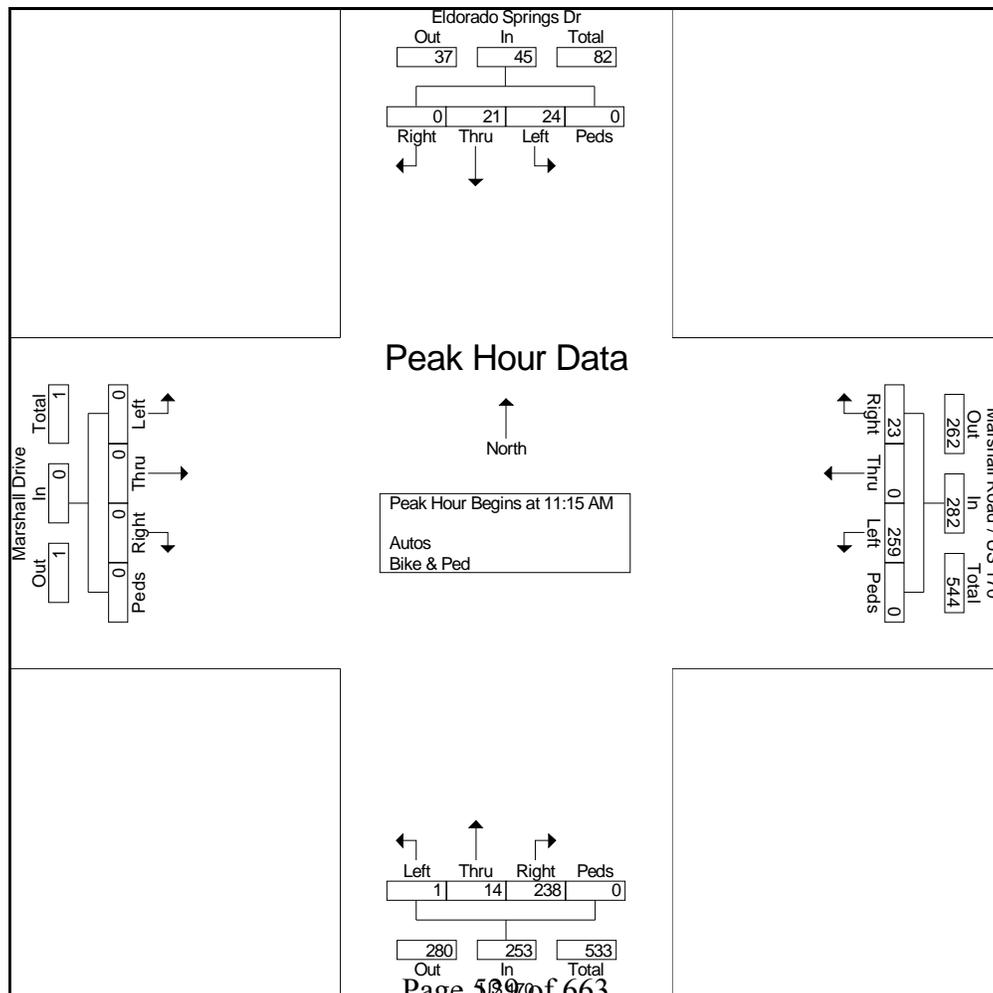




Boulder, CO
 MUL Marshall Mesa Trailhead
 Sat Peak
 US 170 and Marshall Rd

File Name : US 170 and Marshall Rd Sat
 Site Code : MUL
 Start Date : 7/8/2023
 Page No : 3

Start Time	Marshall Drive Eastbound					Marshall Road / US 170 Westbound					US 170 Northbound					Eldorado Springs Dr Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 11:15 AM																					
11:15 AM	0	0	0	0	0	72	0	7	0	79	0	4	69	0	73	5	1	0	0	6	158
11:30 AM	0	0	0	0	0	66	0	6	0	72	0	5	43	0	48	8	10	0	0	18	138
11:45 AM	0	0	0	0	0	71	0	4	0	75	1	2	59	0	62	5	6	0	0	11	148
12:00 PM	0	0	0	0	0	50	0	6	0	56	0	3	67	0	70	6	4	0	0	10	136
Total Volume	0	0	0	0	0	259	0	23	0	282	1	14	238	0	253	24	21	0	0	45	580
% App. Total	0	0	0	0	0	91.8	0	8.2	0		0.4	5.5	94.1	0		53.3	46.7	0	0		
PHF	.000	.000	.000	.000	.000	.899	.000	.821	.000	.892	.250	.700	.862	.000	.866	.750	.525	.000	.000	.625	.918





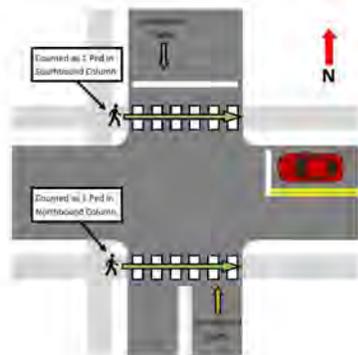
Ridgeview Data
Collection

Boulder, CO
MUL Marshall Mesa Trailhead
Sat Peak
US 170 and Marshall Rd

File Name : US 170 and Marshall Rd Sat
Site Code : MUL
Start Date : 7/8/2023
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Image 1

The number of pedestrians shown on this report is representative of the crossing on the approaching leg, i.e. pedestrians crossing the north side of the intersection are counted as pedestrians in the southbound crosswalk, as that is the approaching leg that they are crossing (see figure below). Diagonal crossings are counted on the two legs that will get the pedestrian to the same end point. Diagonals can be counted separately if discussed prior to count.



APPENDIX B

VOLUME WORKSHEETS

AM Peak Period												
Int. 1												
CO 93 (S Foothills Hwy) at CO 170 (Eldorado Springs Dr)												
	CO 170 (Eldorado Springs Dr)			CO 170 (Eldorado Springs Dr)			CO 93 (S Foothills Hwy)			CO 93 (S Foothills Hwy)		
	Eastbound			Westbound			Northbound			Southbound		
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2019 AM Volume Unbalanced	43	25	23	91	23	251	7	957	387	105	450	38
2019 Heavy Vehicle %	4.4	4.4	4.4	2.7	2.7	2.7	0.9	0.9	0.9	3.5	3.5	3.5
2019 PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
2019 Ped Volume	0	0	1	1	0	0	1	0	0	0	0	1
2019 Bike Volume	0	0	0	0	0	0	0	0	0	0	0	0
Volume Adjustment	0	-7	0	-38	-10	-106	0	0	-113	-31	0	0
2023 AM Volume Balanced	43	18	23	53	13	145	7	957	274	74	450	38
2023 AM Build Volume	43	18	23	54	13	149	7	957	279	76	450	38
2043 Growth Factor	1.2	1.2	1.2	1.24	1.24	1.24	1.2	1.2	1.2	1.2	1.2	1.2
Parking Lot Expansion		0		1	0	4			5	2		
2043 AM No Build Volume	52	22	28	66	16	180	8	1148	329	89	540	46
2043 AM Build Volume	52	22	28	67	16	184	8	1148	334	91	540	46
2043 Heavy Vehicle %	4.4	4.4	4.4	2.7	2.7	2.7	0.9	0.9	0.9	3.5	3.5	3.5
2043 PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
2043 Ped Volume	0	0	1	1	0	0	1	0	0	0	0	1
2043 Bike Volume	0	0	0	0	0	0	0	0	0	0	0	0
PM Peak Period												
Int. 1												
CO 93 (S Foothills Hwy) at CO 170 (Eldorado Springs Dr)												
	CO 170 (Eldorado Springs Dr)			CO 170 (Eldorado Springs Dr)			CO 93 (S Foothills Hwy)			CO 93 (S Foothills Hwy)		
	Eastbound			Westbound			Northbound			Southbound		
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2019 PM Volume Unbalanced	32	36	38	299	35	88	14	554	152	163	990	55
2019 Heavy Vehicle %	1.9	1.9	1.9	0.9	0.9	0.9	1.4	1.4	1.4	0.6	0.6	0.6
2019 PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
2019 Ped Volume	0	0	0	0	0	0	1	0	0	0	0	1
2019 Bike Volume	0	0	0	0	0	0	0	0	0	0	0	0
Volume Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2023 PM Volume Balanced	32	36	38	299	35	88	14	554	152	163	990	55
2023 PM Build Volume	32	36	38	300	35	88	14	554	154	165	990	55
2043 Growth Factor	1.2	1.2	1.2	1.24	1.24	1.24	1.2	1.2	1.2	1.2	1.2	1.2
Parking Lot Expansion		0		1	0	0			2	2		
2043 PM No Build Volume	38	43	46	371	43	109	17	665	182	196	1188	66
2043 PM Build Volume	38	43	46	372	43	109	17	665	184	198	1188	66
2043 Heavy Vehicle %	1.9	1.9	1.9	0.9	0.9	0.9	1.4	1.4	1.4	0.6	0.6	0.6
2043 PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
2043 Ped Volume	0	0	0	0	0	0	1	0	0	0	0	1
2043 Bike Volume	0	0	0	0	0	0	0	0	0	0	0	0
Weekend Peak Period												
Int. 1												
CO 93 (S Foothills Hwy) at CO 170 (Eldorado Springs Dr)												
	CO 170 (Eldorado Springs Dr)			CO 170 (Eldorado Springs Dr)			CO 93 (S Foothills Hwy)			CO 93 (S Foothills Hwy)		
	Eastbound			Westbound			Northbound			Southbound		
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2023 Weekend Volume Unbalanced	88	76	43	107	80	75	50	549	112	57	552	78
2023 Heavy Vehicle %	1.5	1.5	1.5	2	2	2	4	4	4	5	5	5
2023 PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
2023 Ped Volume	4					4						
2023 Bike Volume	1	2		1	6				6			
Volume Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2023 Weekend Volume Balanced	88	76	43	107	80	75	50	549	112	57	552	78
2023 Weekend Build Volume	88	78	43	109	82	77	50	549	115	58	552	78
2043 Growth Factor	1.2	1.2	1.2	1.24	1.24	1.24	1.2	1.2	1.2	1.2	1.2	1.2
Parking Lot Expansion		2		2	2	2			3	1		
2043 Weekend No Build Volume	106	91	52	133	99	93	60	659	134	68	662	94
2043 Weekend Build Volume	106	93	52	135	101	95	60	659	137	69	662	94
2043 Heavy Vehicle %	1.5	1.5	1.5	2	2	2	4	4	4	5	5	5
2043 PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
2043 Ped Volume	4	0	0	0	0	4	0	0	0	0	0	0
2043 Bike Volume	1	2	0	1	6	0	0	0	6	0	0	0

AM Peak Period												
Int. 2												
CO 170 (Eldorado Springs Dr) at Marshall Mesa Trailhead Driveway												
	CO 170 (Eldorado Springs Dr)			CO 170 (Eldorado Springs Dr)			Trailhead Driveway			N/A		
	Eastbound			Westbound			Northbound			Southbound		
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2023 AM Volume Unbalanced	0	345	10	6	195	0	7	0	4			
2023 Heavy Vehicle %	2	2	2	2	2	2	2	2	2			
2023 PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88			
2023 Ped Volume							3		1			
2023 Bike Volume			1	5					5			
Volume Adjustment	0	0	0	0	0	0	0	0	0			
2023 AM Volume Balanced	0	345	10	6	195	0	7	0	4			
2023 AM Build Volume	0	362	0	0	207	0	0	0	0			
2043 Growth Factor	1.0	1.24	1.0	1.0	1.24	1.0	1.0	1.0	1.0			
Parking Lot Expansion			7	4			5		3			
2043 AM No Build Volume	0	428	10	6	242	0	7	0	4			
2043 AM Build Volume	0	445	0	0	254	0	0	0	0			
2043 Heavy Vehicle %	2	2	2	2	2	2	2	2	2			
2043 PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
2043 Ped Volume	0	0	0	0	0	0	3	0	1			
2043 Bike Volume	0	0	1	5	0	0	0	0	5			
PM Peak Period												
Int. 2												
CO 170 (Eldorado Springs Dr) at Marshall Mesa Trailhead Driveway												
	CO 170 (Eldorado Springs Dr)			CO 170 (Eldorado Springs Dr)			Trailhead Driveway			N/A		
	Eastbound			Westbound			Northbound			Southbound		
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2023 PM Volume Unbalanced	0	335	6	0	404	0	1	0	2			
2023 Heavy Vehicle %	2	2	2	2	2	2	2	2	2			
2023 PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91			
2023 Ped Volume							3		1			
2023 Bike Volume			1	5					5			
Volume Adjustment	0	0	0	0	0	0	0	0	0			
2023 PM Volume Balanced	0	335	6	0	404	0	1	0	2			
2023 PM Build Volume	0	345	0	0	406	0	0	0	0			
2043 Growth Factor	1.0	1.24	1.0	1.0	1.24	1.0	1.0	1.0	1.0			
Parking Lot Expansion			4	0			1		1			
2043 PM No Build Volume	0	415	6	0	501	0	1	0	2			
2043 PM Build Volume	0	425	0	0	503	0	0	0	0			
2043 Heavy Vehicle %	2	2	2	2	2	2	2	2	2			
2043 PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
2043 Ped Volume	0	0	0	0	0	0	3	0	1			
2043 Bike Volume	0	0	1	5	0	0	0	0	5			
Weekend Peak Period												
Int. 2												
CO 170 (Eldorado Springs Dr) at Marshall Mesa Trailhead Driveway												
	CO 170 (Eldorado Springs Dr)			CO 170 (Eldorado Springs Dr)			Trailhead Driveway			N/A		
	Eastbound			Westbound			Northbound			Southbound		
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2023 Weekend Volume Unbalanced	0	236	9	4	253	0	9	0	7			
2023 Heavy Vehicle %	2	2	2	2	2	2	2	2	2			
2023 PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99			
2023 Ped Volume			11	11			3		1			
2023 Bike Volume		11		16	7		2		6			
Volume Adjustment	0	0	0	0	0	0	0	0	0			
2023 Weekend Volume Balanced	0	236	9	4	253	0	9	0	7			
2023 Weekend Build Volume	0	251	0	0	268	0	0	0	0			
2043 Growth Factor	1.0	1.24	1.0	1.0	1.24	1.0	1.0	1.0	1.0			
Parking Lot Expansion			6	3			6		5			
2043 Weekend No Build Volume	0	293	9	4	314	0	9	0	7			
2043 Weekend Build Volume	0	308	0	0	329	0	0	0	0			
2043 Heavy Vehicle %	2	2	2	2	2	2	2	2	2			
2043 PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
2043 Ped Volume	0	0	11	11	0	0	3	0	1			
2043 Bike Volume	0	11	0	16	7	0	2	0	6			

AM Peak Period												
Int. 3												
CO 170 (Eldorado Springs Dr) at Eldorado Park-n-Ride												
	Park-n-Ride Driveway			Proposed Driveway (Trailhead)			CO 170 (Eldorado Springs Dr)			CO 170 (Eldorado Springs Dr)		
	Southbound			Northbound			Eastbound			Westbound		
	SBL	SBT	SBR	NBL	NBT	NBR	EBL	EBT	EBR	WBL	WBT	WBR
2023 AM Volume Unbalanced	3	0	20				15	334	0	0	181	16
2023 Heavy Vehicle %	2	2	2				2	2	2	2	2	2
2023 PHF	0.88	0.88	0.88				0.88	0.88	0.88	0.88	0.88	0.88
2023 Ped Volume			10				2					2
2023 Bike Volume												
Volume Adjustment	0	0	0				0	0	0	0	0	0
2023 AM Volume Balanced	3	0	20				15	334	0	0	181	16
2023 AM Build Volume	3	0	20	12	0	7	15	330	17	10	175	16
2043 Growth Factor	1.0	1.0	1.0				1.0	1.24	1.0	1.0	1.24	1.0
Parking Lot Expansion								3			4	
2043 AM No Build Volume	3	0	20				15	414	0	0	224	16
2043 AM Build Volume	3	0	20	12	0	7	15	410	17	10	218	16
2043 Heavy Vehicle %	2	2	2	2	2	2	2	2	2	2	2	2
2043 PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
2043 Ped Volume	0	0	10				2	0	0	0	0	2
2043 Bike Volume	0	0	0				0	0	0	0	0	0
PM Peak Period												
Int. 3												
CO 170 (Eldorado Springs Dr) at Eldorado Park-n-Ride												
	Park-n-Ride Driveway			Proposed Driveway (Trailhead)			CO 170 (Eldorado Springs Dr)			CO 170 (Eldorado Springs Dr)		
	Southbound			Northbound			Eastbound			Westbound		
	SBL	SBT	SBR	NBL	NBT	NBR	EBL	EBT	EBR	WBL	WBT	WBR
2023 PM Volume Unbalanced	4	0	15				14	323	0	0	389	9
2023 Heavy Vehicle %	2	2	2				2	2	2	2	2	2
2023 PHF	0.91	0.91	0.91				0.91	0.91	0.91	0.91	0.91	0.91
2023 Ped Volume			5				1					1
2023 Bike Volume			2									
Volume Adjustment	0	0	0				0	0	0	0	0	0
2023 PM Volume Balanced	4	0	15				14	323	0	0	389	9
2023 PM Build Volume	4	0	15	2	0	3	14	321	10	0	389	9
2043 Growth Factor	1.0	1.0	1.0				1.0	1.24	1.0	1.0	1.24	1.0
Parking Lot Expansion								1			0	
2043 PM No Build Volume	4	0	15				14	401	0	0	482	9
2043 PM Build Volume	4	0	15	2	0	3	14	399	10	0	482	9
2043 Heavy Vehicle %	2	2	2	2	2	2	2	2	2	2	2	2
2043 PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
2043 Ped Volume	0	0	5				1	0	0	0	0	1
2043 Bike Volume	0	0	2				0	0	0	0	0	0
Weekend Peak Period												
Int. 3												
CO 170 (Eldorado Springs Dr) at Eldorado Park-n-Ride												
	Park-n-Ride Driveway			Proposed Driveway (Trailhead)			CO 170 (Eldorado Springs Dr)			CO 170 (Eldorado Springs Dr)		
	Southbound			Northbound			Eastbound			Westbound		
	SBL	SBT	SBR	NBL	NBT	NBR	EBL	EBT	EBR	WBL	WBT	WBR
2023 Weekend Volume Unbalanced	11	0	15				11	232	0	0	242	7
2023 Heavy Vehicle %	2	2	2				2	2	2	2	2	2
2023 PHF	0.99	0.99	0.99				0.99	0.99	0.99	0.99	0.99	0.99
2023 Ped Volume	4		32				10					10
2023 Bike Volume			4				1					
Volume Adjustment	0	0	0				0	0	0	0	0	0
2023 Weekend Volume Balanced	11	0	15				11	232	0	0	242	7
2023 Weekend Build Volume	11	0	15	15	0	12	11	225	15	7	238	7
2043 Growth Factor	1.0	1.0	1.0				1.0	1.24	1.0	1.0	1.24	1.0
Parking Lot Expansion								5			3	
2043 Weekend No Build Volume	11	0	15				11	288	0	0	300	7
2043 Weekend Build Volume	11	0	15	15	0	12	11	281	15	7	296	7
2043 Heavy Vehicle %	2	2	2	2	2	2	2	2	2	2	2	2
2043 PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
2043 Ped Volume	4	0	32				10	0	0	0	0	10
2043 Bike Volume	0	0	4				1	0	0	0	0	0

AM Peak Period												
Int. 4												
CO 170 (Eldorado Springs Dr) at Marshall Dr												
	Marshall Dr			CO 170 (Marshall Dr)			CO 170 (Eldorado Springs Dr)			Eldorado Springs Dr		
	Southbound			Northbound			Eastbound			Westbound		
	SBL	SBT	SBR	NBL	NBT	NBR	EBL	EBT	EBR	WBL	WBT	WBR
2023 AM Volume Unbalanced	0	0	0	195	0	14	0	1	336	11	2	0
2023 Heavy Vehicle %	2	2	2	2	2	2	2	2	2	2	2	2
2023 PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
2023 Ped Volume							2					2
2023 Bike Volume				4		2		14	1	2	16	
Volume Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2023 AM Volume Balanced	0	0	0	195	0	14	0	1	336	11	2	0
2023 AM Build Volume	0	0	0	199	0	14	0	1	339	11	2	0
2043 Growth Factor	1.0	1.0	1.0	1.24	1.24	1.24	1.24	1.24	1.24	1.0	1.0	1.0
Parking Lot Expansion			0	4			0	0	3		0	
2043 AM No Build Volume	0	0	0	242	0	17	0	1	417	11	2	0
2043 AM Build Volume	0	0	0	246	0	17	0.0	1	420	11	2	0
2043 Heavy Vehicle %	2	2	2	2	2	2	2	2	2	2	2	2
2043 PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
2043 Ped Volume	0	0	0	0	0	0	2	0	0	0	0	2
2043 Bike Volume	0	0	0	4	0	2	0	14	1	2	16	0
PM Peak Period												
Int. 4												
CO 170 (Eldorado Springs Dr) at Marshall Dr												
	Marshall Dr			CO 170 (Marshall Dr)			CO 170 (Eldorado Springs Dr)			Eldorado Springs Dr		
	Southbound			Northbound			Eastbound			Westbound		
	SBL	SBT	SBR	NBL	NBT	NBR	EBL	EBT	EBR	WBL	WBT	WBR
2023 PM Volume Unbalanced	0	0	1	394	3	25	0	3	324	7	3	0
2023 Heavy Vehicle %	2	2	2	2	2	2	2	2	2	2	2	2
2023 PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
2023 Ped Volume												
2023 Bike Volume				2		2		3	4		5	
Volume Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2023 PM Volume Balanced	0	0	1	394	3	25	0	3	324	7	3	0
2023 PM Build Volume	0	0	1	394	3	25	0	3	325	7	3	0
2043 Growth Factor	1.0	1.0	1.0	1.24	1.24	1.24	1.24	1.24	1.24	1.0	1.0	1.0
Parking Lot Expansion			0	0			0	0	1		0	
2043 PM No Build Volume	0	0	1	489	4	31	0	4	402	7	3	0
2043 PM Build Volume	0	0	1	489	4	31	0.0	4	403	7	3	0
2043 Heavy Vehicle %	2	2	2	2	2	2	2	2	2	2	2	2
2043 PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
2043 Ped Volume	0	0	0	0	0	0	0	0	0	0	0	0
2043 Bike Volume	0	0	0	2	0	2	0	3	4	0	5	0
Weekend Peak Period												
Int. 4												
CO 170 (Eldorado Springs Dr) at Marshall Dr												
	Marshall Dr			CO 170 (Marshall Dr)			CO 170 (Eldorado Springs Dr)			Eldorado Springs Dr		
	Southbound			Northbound			Eastbound			Westbound		
	SBL	SBT	SBR	NBL	NBT	NBR	EBL	EBT	EBR	WBL	WBT	WBR
2023 Weekend Volume Unbalanced	0	0	0	256	0	21	1	5	232	15	4	0
2023 Heavy Vehicle %	2	2	2	2	2	2	2	2	2	2	2	2
2023 PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
2023 Ped Volume												
2023 Bike Volume				3		2		9	6	9	17	
Volume Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2023 Weekend Volume Balanced	0	0	0	256	0	21	1	5	232	15	4	0
2023 Weekend Build Volume	0	0	0	259	0	21	1	5	237	15	4	0
2043 Growth Factor	1.0	1.0	1.0	1.24	1.24	1.24	1.24	1.24	1.24	1.0	1.0	1.0
Parking Lot Expansion			0	3			0	0	5		0	
2043 Weekend No Build Volume	0	0	0	317	0	26	1	6	288	15	4	0
2043 Weekend Build Volume	0	0	0	320	0	26	1.0	6	293	15	4	0
2043 Heavy Vehicle %	2	2	2	2	2	2	2	2	2	2	2	2
2043 PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
2043 Ped Volume	0	0	0	0	0	0	0	0	0	0	0	0
2043 Bike Volume	0	0	0	3	0	2	0	9	6	9	17	0

APPENDIX C

SYNCHRO REPORTS

Queues
1: SH 93 & SH 170

EXISTING 2023 AM
08/09/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	69	26	75	165	8	1088	311	84	511	43
v/c Ratio	0.33	0.09	0.35	0.49	0.01	0.61	0.34	0.28	0.26	0.05
Control Delay	52.1	0.6	51.6	12.6	11.0	24.8	7.9	13.1	14.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.1	0.6	51.6	12.6	11.0	24.8	7.9	13.1	14.6	0.1
Queue Length 50th (ft)	47	0	51	0	2	312	38	24	91	0
Queue Length 95th (ft)	95	0	100	59	10	444	107	53	178	0
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	382	439	385	469	606	1784	907	319	1988	924
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.06	0.19	0.35	0.01	0.61	0.34	0.26	0.26	0.05

Intersection Summary

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

EXISTING 2023 AM

08/09/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	18	23	53	13	145	7	957	274	74	450	38
Future Volume (veh/h)	43	18	23	53	13	145	7	957	274	74	450	38
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1856	1856	1856	1885	1885	1885	1841	1841	1841
Adj Flow Rate, veh/h	49	20	26	60	15	165	8	1088	311	84	511	43
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	4	4	4	3	3	3	1	1	1	4	4	4
Cap, veh/h	90	37	111	194	48	213	481	1710	762	279	1851	825
Arrive On Green	0.07	0.07	0.07	0.14	0.14	0.14	0.02	0.48	0.48	0.07	0.53	0.53
Sat Flow, veh/h	1262	515	1554	1427	357	1569	1795	3582	1596	1753	3497	1558
Grp Volume(v), veh/h	69	0	26	75	0	165	8	1088	311	84	511	43
Grp Sat Flow(s),veh/h/ln	1778	0	1554	1784	0	1569	1795	1791	1596	1753	1749	1558
Q Serve(g_s), s	4.1	0.0	1.7	4.1	0.0	11.1	0.2	24.8	13.8	2.4	8.8	1.5
Cycle Q Clear(g_c), s	4.1	0.0	1.7	4.1	0.0	11.1	0.2	24.8	13.8	2.4	8.8	1.5
Prop In Lane	0.71		1.00	0.80		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	127	0	111	242	0	213	481	1710	762	279	1851	825
V/C Ratio(X)	0.54	0.00	0.23	0.31	0.00	0.78	0.02	0.64	0.41	0.30	0.28	0.05
Avail Cap(c_a), veh/h	375	0	328	377	0	331	617	1710	762	322	1851	825
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	48.9	0.0	47.8	42.5	0.0	45.5	14.1	21.4	18.5	15.2	14.1	12.4
Incr Delay (d2), s/veh	12.5	0.0	3.9	2.6	0.0	19.3	0.0	1.8	1.6	0.6	0.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.0	0.8	2.0	0.0	5.4	0.1	10.0	5.1	0.9	3.3	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.3	0.0	51.6	45.1	0.0	64.7	14.1	23.2	20.1	15.8	14.5	12.5
LnGrp LOS	E	A	D	D	A	E	B	C	C	B	B	B
Approach Vol, veh/h		95			240			1407			638	
Approach Delay, s/veh		58.7			58.6			22.5			14.5	
Approach LOS		E			E			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.4	60.0		14.8	6.7	65.7		21.8				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	52.0		23.0	10.0	52.0		23.0				
Max Q Clear Time (g_c+I1), s	4.4	26.8		6.1	2.2	10.8		13.1				
Green Ext Time (p_c), s	0.1	22.2		0.8	0.0	14.4		1.6				
Intersection Summary												
HCM 6th Ctrl Delay			25.4									
HCM 6th LOS			C									
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
2: Marshall Mesa Trailhead & SH 170

EXISTING 2023 AM
08/09/2023

Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↑		↔
Traffic Vol, veh/h	345	10	6	195	7	4
Future Vol, veh/h	345	10	6	195	7	4
Conflicting Peds, #/hr	0	0	0	0	3	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	392	11	7	222	8	5
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	403	0	637	399
Stage 1	-	-	-	-	398	-
Stage 2	-	-	-	-	239	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1156	-	441	651
Stage 1	-	-	-	-	678	-
Stage 2	-	-	-	-	801	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1156	-	437	650
Mov Cap-2 Maneuver	-	-	-	-	437	-
Stage 1	-	-	-	-	678	-
Stage 2	-	-	-	-	793	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0.2	10.6			
HCM LOS			B			
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	650	-	-	1156	-	
HCM Lane V/C Ratio	0.007	-	-	0.006	-	
HCM Control Delay (s)	10.6	-	-	8.1	-	
HCM Lane LOS	B	-	-	A	-	
HCM 95th %tile Q(veh)	0	-	-	0	-	

HCM 6th TWSC
3: SH 170 & Eldorado Park-n-Ride

EXISTING 2023 AM
08/09/2023

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	15	334	181	16	3	20
Future Vol, veh/h	15	334	181	16	3	20
Conflicting Peds, #/hr	2	0	0	2	0	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	380	206	18	3	23
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	226	0	-	0	631	227
Stage 1	-	-	-	-	217	-
Stage 2	-	-	-	-	414	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1342	-	-	-	445	812
Stage 1	-	-	-	-	819	-
Stage 2	-	-	-	-	667	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1339	-	-	-	436	803
Mov Cap-2 Maneuver	-	-	-	-	436	-
Stage 1	-	-	-	-	804	-
Stage 2	-	-	-	-	666	-
Approach	EB	WB		SB		
HCM Control Delay, s	0.3	0		10.2		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1339	-	-	-	724	
HCM Lane V/C Ratio	0.013	-	-	-	0.036	
HCM Control Delay (s)	7.7	0	-	-	10.2	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0	-	-	-	0.1	

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

EXISTING 2023 AM
08/09/2023

Intersection												
Int Delay, s/veh	9.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	1	336	11	2	0	195	0	14	0	0	0
Future Vol, veh/h	0	1	336	11	2	0	195	0	14	0	0	0
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	391	13	2	0	227	0	16	0	0	0

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	466	471	1	464	463	10	1	0	0	16	0	0
Stage 1	1	1	-	462	462	-	-	-	-	-	-	-
Stage 2	465	470	-	2	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	507	491	1084	508	496	1071	1622	-	-	1602	-	-
Stage 1	1022	895	-	580	565	-	-	-	-	-	-	-
Stage 2	578	560	-	1021	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	450	422	1084	289	426	1069	1622	-	-	1602	-	-
Mov Cap-2 Maneuver	450	422	-	289	426	-	-	-	-	-	-	-
Stage 1	878	895	-	498	485	-	-	-	-	-	-	-
Stage 2	493	481	-	652	895	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	10.2		17.5		7.1		0	
HCM LOS	B		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1622	-	-	1087	304	1602	-	-
HCM Lane V/C Ratio	0.14	-	-	0.36	0.05	-	-	-
HCM Control Delay (s)	7.6	0	-	10.2	17.5	0	-	-
HCM Lane LOS	A	A	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0.5	-	-	1.7	0.2	0	-	-

Queues
1: SH 93 & SH 170

EXISTING 2023 PM
08/20/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	75	42	367	97	15	609	167	179	1088	60
v/c Ratio	0.38	0.14	1.07	0.23	0.05	0.40	0.21	0.40	0.60	0.07
Control Delay	57.4	1.0	117.2	3.8	13.9	26.0	4.2	16.5	25.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.4	1.0	117.2	3.8	13.9	26.0	4.2	16.5	25.3	0.2
Queue Length 50th (ft)	58	0	~341	0	5	181	0	68	299	0
Queue Length 95th (ft)	107	0	#558	19	17	243	44	116	480	0
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	346	412	342	415	310	1537	782	452	1822	860
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.10	1.07	0.23	0.05	0.40	0.21	0.40	0.60	0.07

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

EXISTING 2023 PM

08/20/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	36	38	299	35	88	14	554	152	163	990	55
Future Volume (veh/h)	32	36	38	299	35	88	14	554	152	163	990	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	35	40	42	329	38	97	15	609	167	179	1088	60
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	1	1	1	1	1	1	1	1	1
Cap, veh/h	57	65	105	315	36	311	236	1578	703	414	1733	772
Arrive On Green	0.07	0.07	0.07	0.19	0.19	0.19	0.03	0.44	0.44	0.07	0.48	0.48
Sat Flow, veh/h	853	975	1585	1617	187	1598	1795	3582	1596	1795	3582	1596
Grp Volume(v), veh/h	75	0	42	367	0	97	15	609	167	179	1088	60
Grp Sat Flow(s),veh/h/ln	1828	0	1585	1804	0	1598	1795	1791	1596	1795	1791	1596
Q Serve(g_s), s	4.7	0.0	3.0	23.0	0.0	6.1	0.5	13.5	7.7	6.2	26.6	2.4
Cycle Q Clear(g_c), s	4.7	0.0	3.0	23.0	0.0	6.1	0.5	13.5	7.7	6.2	26.6	2.4
Prop In Lane	0.47		1.00	0.90		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	121	0	105	351	0	311	236	1578	703	414	1733	772
V/C Ratio(X)	0.62	0.00	0.40	1.04	0.00	0.31	0.06	0.39	0.24	0.43	0.63	0.08
Avail Cap(c_a), veh/h	356	0	309	351	0	311	341	1578	703	441	1733	772
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.7	0.0	52.9	47.5	0.0	40.7	18.9	22.3	20.6	16.0	22.6	16.3
Incr Delay (d2), s/veh	17.2	0.0	8.7	60.0	0.0	2.0	0.1	0.7	0.8	0.7	1.7	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.0	1.4	16.1	0.0	2.6	0.2	5.6	2.9	2.4	10.9	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.9	0.0	61.6	107.5	0.0	42.8	19.0	23.0	21.4	16.7	24.3	16.5
LnGrp LOS	E	A	E	F	A	D	B	C	C	B	C	B
Approach Vol, veh/h		117			464			791			1327	
Approach Delay, s/veh		67.6			94.0			22.6			22.9	
Approach LOS		E			F			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.2	60.0		14.8	8.1	65.1		30.0				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	52.0		23.0	10.0	52.0		23.0				
Max Q Clear Time (g_c+I1), s	8.2	15.5		6.7	2.5	28.6		25.0				
Green Ext Time (p_c), s	0.1	18.8		1.0	0.0	19.4		0.0				
Intersection Summary												
HCM 6th Ctrl Delay				37.0								
HCM 6th LOS				D								
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
2: Marshall Mesa Trailhead & SH 170

EXISTING 2023 PM
08/20/2023

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑		↑
Traffic Vol, veh/h	335	6	0	404	1	2
Future Vol, veh/h	335	6	0	404	1	2
Conflicting Peds, #/hr	0	0	0	0	3	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	368	7	0	444	1	2
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	819	373
Stage 1	-	-	-	-	372	-
Stage 2	-	-	-	-	447	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	0	-	345	673
Stage 1	-	-	0	-	697	-
Stage 2	-	-	0	-	644	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	344	672
Mov Cap-2 Maneuver	-	-	-	-	344	-
Stage 1	-	-	-	-	697	-
Stage 2	-	-	-	-	642	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0	10.4			
HCM LOS						B
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	672	-	-	-		
HCM Lane V/C Ratio	0.003	-	-	-		
HCM Control Delay (s)	10.4	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0	-	-	-		

HCM 6th TWSC
3: SH 170 & Eldorado Park-n-Ride

EXISTING 2023 PM
08/20/2023

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	↷
Traffic Vol, veh/h	14	323	389	9	4	15
Future Vol, veh/h	14	323	389	9	4	15
Conflicting Peds, #/hr	1	0	0	1	0	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	355	427	10	4	16
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	438	0	-	0	818	438
Stage 1	-	-	-	-	433	-
Stage 2	-	-	-	-	385	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1122	-	-	-	346	619
Stage 1	-	-	-	-	654	-
Stage 2	-	-	-	-	688	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1121	-	-	-	339	615
Mov Cap-2 Maneuver	-	-	-	-	339	-
Stage 1	-	-	-	-	642	-
Stage 2	-	-	-	-	687	-
Approach	EB	WB	SB			
HCM Control Delay, s	0.3	0	12.1			
HCM LOS			B			
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1121	-	-	-	525	
HCM Lane V/C Ratio	0.014	-	-	-	0.04	
HCM Control Delay (s)	8.3	0	-	-	12.1	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0	-	-	-	0.1	

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

EXISTING 2023 PM
08/20/2023

Intersection												
Int Delay, s/veh	8.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	3	324	7	3	0	394	3	25	0	0	1
Future Vol, veh/h	0	3	324	7	3	0	394	3	25	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	356	8	3	0	433	3	27	0	0	1

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	885	897	1	885	884	17	1	0	0	30	0	0
Stage 1	1	1	-	883	883	-	-	-	-	-	-	-
Stage 2	884	896	-	2	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	266	279	1084	266	284	1062	1622	-	-	1583	-	-
Stage 1	1022	895	-	340	364	-	-	-	-	-	-	-
Stage 2	340	359	-	1021	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	208	203	1084	139	207	1062	1622	-	-	1583	-	-
Mov Cap-2 Maneuver	208	203	-	139	207	-	-	-	-	-	-	-
Stage 1	744	895	-	248	265	-	-	-	-	-	-	-
Stage 2	244	261	-	683	895	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.9		30.2		7.5		0	
HCM LOS	A		D					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1622	-	-	1094	154	1583	-
HCM Lane V/C Ratio	0.267	-	-	0.328	0.071	-	-
HCM Control Delay (s)	8	0	-	9.9	30.2	0	-
HCM Lane LOS	A	A	-	A	D	A	-
HCM 95th %tile Q(veh)	1.1	-	-	1.4	0.2	0	-

Queues
1: SH 93 & SH 170

EXISTING 2023 WEEKEND

08/20/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	166	43	189	76	51	555	113	58	558	79
v/c Ratio	0.60	0.12	0.66	0.21	0.12	0.38	0.16	0.14	0.38	0.11
Control Delay	60.1	0.7	61.9	1.3	16.2	27.1	3.6	16.3	27.0	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.1	0.7	61.9	1.3	16.2	27.1	3.6	16.3	27.0	0.9
Queue Length 50th (ft)	130	0	148	0	20	168	0	22	170	0
Queue Length 95th (ft)	211	0	238	0	44	237	30	49	237	6
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	341	409	340	404	451	1476	717	446	1467	730
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.11	0.56	0.19	0.11	0.38	0.16	0.13	0.38	0.11

Intersection Summary

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

EXISTING 2023 WEEKEND

08/20/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	76	43	107	80	75	50	549	112	57	552	78
Future Volume (veh/h)	88	76	43	107	80	75	50	549	112	57	552	78
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1841	1841	1841	1826	1826	1826
Adj Flow Rate, veh/h	89	77	43	108	81	76	51	555	113	58	558	79
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	2	2	2	2	2	2	4	4	4	5	5	5
Cap, veh/h	121	105	192	143	107	214	428	1565	681	421	1562	697
Arrive On Green	0.12	0.12	0.12	0.14	0.14	0.14	0.06	0.45	0.45	0.06	0.45	0.45
Sat Flow, veh/h	977	845	1548	1039	779	1550	1753	3497	1521	1739	3469	1547
Grp Volume(v), veh/h	166	0	43	189	0	76	51	555	113	58	558	79
Grp Sat Flow(s),veh/h/ln	1822	0	1548	1818	0	1550	1753	1749	1521	1739	1735	1547
Q Serve(g_s), s	10.2	0.0	2.9	11.6	0.0	5.2	1.7	12.1	5.2	2.0	12.2	3.4
Cycle Q Clear(g_c), s	10.2	0.0	2.9	11.6	0.0	5.2	1.7	12.1	5.2	2.0	12.2	3.4
Prop In Lane	0.54		1.00	0.57		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	226	0	192	251	0	214	428	1565	681	421	1562	697
V/C Ratio(X)	0.74	0.00	0.22	0.75	0.00	0.36	0.12	0.35	0.17	0.14	0.36	0.11
Avail Cap(c_a), veh/h	361	0	307	360	0	307	481	1565	681	469	1562	697
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.0	0.0	45.9	48.2	0.0	45.4	15.4	21.1	19.1	15.4	20.9	18.5
Incr Delay (d2), s/veh	15.4	0.0	2.1	15.4	0.0	3.6	0.1	0.6	0.5	0.1	0.6	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.6	0.0	1.2	6.3	0.0	2.2	0.7	4.8	1.8	0.8	4.8	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	64.5	0.0	48.0	63.6	0.0	49.0	15.5	21.7	19.7	15.5	21.6	18.8
LnGrp LOS	E	A	D	E	A	D	B	C	B	B	C	B
Approach Vol, veh/h		209			265			719			695	
Approach Delay, s/veh		61.1			59.4			20.9			20.7	
Approach LOS		E			E			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.8	60.0		21.4	11.5	60.3		23.0				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	52.0		23.0	10.0	52.0		23.0				
Max Q Clear Time (g_c+I1), s	4.0	14.1		12.2	3.7	14.2		13.6				
Green Ext Time (p_c), s	0.0	16.6		1.6	0.0	15.9		1.9				
Intersection Summary												
HCM 6th Ctrl Delay			30.7									
HCM 6th LOS			C									
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
2: Marshall Mesa Trailhead & SH 170

EXISTING 2023 WEEKEND

08/20/2023

Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↑		↔
Traffic Vol, veh/h	236	9	4	253	9	7
Future Vol, veh/h	236	9	4	253	9	7
Conflicting Peds, #/hr	0	11	11	0	3	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	238	9	4	256	9	7
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	258	0	521	255
Stage 1	-	-	-	-	254	-
Stage 2	-	-	-	-	267	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1307	-	516	784
Stage 1	-	-	-	-	788	-
Stage 2	-	-	-	-	778	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1293	-	507	775
Mov Cap-2 Maneuver	-	-	-	-	507	-
Stage 1	-	-	-	-	780	-
Stage 2	-	-	-	-	773	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0.1	9.7			
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	775	-	-	1293	-	
HCM Lane V/C Ratio	0.009	-	-	0.003	-	
HCM Control Delay (s)	9.7	-	-	7.8	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0	-	-	0	-	

HCM 6th TWSC
3: SH 170 & Eldorado Park-n-Ride

EXISTING 2023 WEEKEND

08/20/2023

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	11	232	242	7	11	15
Future Vol, veh/h	11	232	242	7	11	15
Conflicting Peds, #/hr	10	0	0	10	4	32
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	234	244	7	11	15
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	261	0	-	0	518	290
Stage 1	-	-	-	-	258	-
Stage 2	-	-	-	-	260	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1303	-	-	-	518	749
Stage 1	-	-	-	-	785	-
Stage 2	-	-	-	-	783	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1291	-	-	-	502	719
Mov Cap-2 Maneuver	-	-	-	-	502	-
Stage 1	-	-	-	-	769	-
Stage 2	-	-	-	-	775	-
Approach	EB	WB	SB			
HCM Control Delay, s	0.4	0	11.2			
HCM LOS			B			
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1291	-	-	-	608	
HCM Lane V/C Ratio	0.009	-	-	-	0.043	
HCM Control Delay (s)	7.8	0	-	-	11.2	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0	-	-	-	0.1	

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

EXISTING 2023 WEEKEND

08/20/2023

Intersection												
Int Delay, s/veh	8.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	5	232	15	4	0	256	0	21	0	0	0
Future Vol, veh/h	1	5	232	15	4	0	256	0	21	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	6	261	17	4	0	288	0	24	0	0	0

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	591	601	1	592	589	12	1	0	0	24	0	0
Stage 1	1	1	-	588	588	-	-	-	-	-	-	-
Stage 2	590	600	-	4	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	419	414	1084	418	421	1069	1622	-	-	1591	-	-
Stage 1	1022	895	-	495	496	-	-	-	-	-	-	-
Stage 2	494	490	-	1018	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	357	339	1084	270	345	1069	1622	-	-	1591	-	-
Mov Cap-2 Maneuver	357	339	-	270	345	-	-	-	-	-	-	-
Stage 1	838	895	-	406	407	-	-	-	-	-	-	-
Stage 2	401	402	-	768	895	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.3		18.8		7.1		0	
HCM LOS	A		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1622	-	-	1112	283	1591	-	-
HCM Lane V/C Ratio	0.177	-	-	0.24	0.075	-	-	-
HCM Control Delay (s)	7.7	0	-	9.3	18.8	0	-	-
HCM Lane LOS	A	A	-	A	C	A	-	-
HCM 95th %tile Q(veh)	0.6	-	-	0.9	0.2	0	-	-

Queues
1: SH 93 & SH 170

2043 FUTURE NO BUILD AM

08/09/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	81	30	89	196	9	1248	358	97	587	50
v/c Ratio	0.38	0.10	0.39	0.53	0.02	0.75	0.41	0.41	0.30	0.05
Control Delay	53.8	0.6	52.4	12.0	12.1	30.4	10.6	16.6	15.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.8	0.6	52.4	12.0	12.1	30.4	10.6	16.6	15.9	0.1
Queue Length 50th (ft)	56	0	62	0	3	397	61	29	112	0
Queue Length 95th (ft)	113	0	118	68	12	588	162	66	224	0
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	365	425	366	479	561	1671	863	258	1979	921
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.07	0.24	0.41	0.02	0.75	0.41	0.38	0.30	0.05

Intersection Summary

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

2043 FUTURE NO BUILD AM

08/09/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	52	22	28	66	16	180	8	1148	329	89	540	46
Future Volume (veh/h)	52	22	28	66	16	180	8	1148	329	89	540	46
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1856	1856	1856	1885	1885	1885	1841	1841	1841
Adj Flow Rate, veh/h	57	24	30	72	17	196	9	1248	358	97	587	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	3	3	3	1	1	1	4	4	4
Cap, veh/h	89	38	111	222	52	241	429	1666	742	239	1804	804
Arrive On Green	0.07	0.07	0.07	0.15	0.15	0.15	0.02	0.47	0.47	0.07	0.52	0.52
Sat Flow, veh/h	1251	527	1553	1443	341	1569	1795	3582	1596	1753	3497	1558
Grp Volume(v), veh/h	81	0	30	89	0	196	9	1248	358	97	587	50
Grp Sat Flow(s),veh/h/ln	1778	0	1553	1783	0	1569	1795	1791	1596	1753	1749	1558
Q Serve(g_s), s	5.0	0.0	2.0	5.0	0.0	13.5	0.3	32.0	17.3	2.9	10.9	1.8
Cycle Q Clear(g_c), s	5.0	0.0	2.0	5.0	0.0	13.5	0.3	32.0	17.3	2.9	10.9	1.8
Prop In Lane	0.70		1.00	0.81		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	127	0	111	274	0	241	429	1666	742	239	1804	804
V/C Ratio(X)	0.64	0.00	0.27	0.32	0.00	0.81	0.02	0.75	0.48	0.41	0.33	0.06
Avail Cap(c_a), veh/h	366	0	320	367	0	323	558	1666	742	277	1804	804
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.5	0.0	49.1	42.1	0.0	45.7	15.2	24.5	20.6	19.4	15.7	13.5
Incr Delay (d2), s/veh	17.7	0.0	4.7	2.5	0.0	21.4	0.0	3.1	2.2	1.1	0.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	0.0	0.9	2.4	0.0	6.7	0.1	13.2	6.5	1.1	4.2	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.2	0.0	53.8	44.6	0.0	67.2	15.2	27.7	22.8	20.5	16.2	13.7
LnGrp LOS	E	A	D	D	A	E	B	C	C	C	B	B
Approach Vol, veh/h		111			285			1615			734	
Approach Delay, s/veh		64.3			60.1			26.5			16.6	
Approach LOS		E			E			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.6	60.0		15.0	7.0	65.7		24.2				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	52.0		23.0	10.0	52.0		23.0				
Max Q Clear Time (g_c+I1), s	4.9	34.0		7.0	2.3	12.9		15.5				
Green Ext Time (p_c), s	0.1	17.0		0.9	0.0	16.4		1.6				
Intersection Summary												
HCM 6th Ctrl Delay				28.9								
HCM 6th LOS				C								
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
2: Marshall Mesa Trailhead & SH 170

2043 FUTURE NO BUILD AM
08/09/2023

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑		↑
Traffic Vol, veh/h	428	10	6	242	7	4
Future Vol, veh/h	428	10	6	242	7	4
Conflicting Peds, #/hr	0	0	0	0	3	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	465	11	7	263	8	4
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	476	0	751	472
Stage 1	-	-	-	-	471	-
Stage 2	-	-	-	-	280	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1086	-	378	592
Stage 1	-	-	-	-	628	-
Stage 2	-	-	-	-	767	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1086	-	374	591
Mov Cap-2 Maneuver	-	-	-	-	374	-
Stage 1	-	-	-	-	628	-
Stage 2	-	-	-	-	759	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0.2	11.1			
HCM LOS						B
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	591	-	-	1086	-	
HCM Lane V/C Ratio	0.007	-	-	0.006	-	
HCM Control Delay (s)	11.1	-	-	8.3	-	
HCM Lane LOS	B	-	-	A	-	
HCM 95th %tile Q(veh)	0	-	-	0	-	

HCM 6th TWSC
3: SH 170 & Eldorado Park-n-Ride

2043 FUTURE NO BUILD AM
08/09/2023

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	↷
Traffic Vol, veh/h	15	414	224	16	3	20
Future Vol, veh/h	15	414	224	16	3	20
Conflicting Peds, #/hr	2	0	0	2	0	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	450	243	17	3	22
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	262	0	-	0	736	264
Stage 1	-	-	-	-	254	-
Stage 2	-	-	-	-	482	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1302	-	-	-	386	775
Stage 1	-	-	-	-	788	-
Stage 2	-	-	-	-	621	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1300	-	-	-	378	766
Mov Cap-2 Maneuver	-	-	-	-	378	-
Stage 1	-	-	-	-	774	-
Stage 2	-	-	-	-	620	-
Approach	EB	WB	SB			
HCM Control Delay, s	0.3	0	10.5			
HCM LOS			B			
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1300	-	-	-	-	676
HCM Lane V/C Ratio	0.013	-	-	-	-	0.037
HCM Control Delay (s)	7.8	0	-	-	-	10.5
HCM Lane LOS	A	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	-	0.1

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

2043 FUTURE NO BUILD AM

08/09/2023

Intersection												
Int Delay, s/veh	9.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	1	417	11	2	0	242	0	17	0	0	0
Future Vol, veh/h	0	1	417	11	2	0	242	0	17	0	0	0
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	453	12	2	0	263	0	18	0	0	0

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	539	545	1	537	536	11	1	0	0	18	0	0
Stage 1	1	1	-	535	535	-	-	-	-	-	-	-
Stage 2	538	544	-	2	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	453	446	1084	455	451	1070	1622	-	-	1599	-	-
Stage 1	1022	895	-	529	524	-	-	-	-	-	-	-
Stage 2	527	519	-	1021	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	394	373	1084	231	377	1068	1622	-	-	1599	-	-
Mov Cap-2 Maneuver	394	373	-	231	377	-	-	-	-	-	-	-
Stage 1	854	895	-	442	438	-	-	-	-	-	-	-
Stage 2	438	434	-	593	895	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	10.7		20.5		7.1		0	
HCM LOS	B		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1622	-	-	1087	246	1599	-	-
HCM Lane V/C Ratio	0.162	-	-	0.418	0.057	-	-	-
HCM Control Delay (s)	7.6	0	-	10.7	20.5	0	-	-
HCM Lane LOS	A	A	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0.6	-	-	2.1	0.2	0	-	-

Queues
1: SH 93 & SH 170

2043 FUTURE NO BUILD PM

08/20/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	88	50	450	118	18	723	198	213	1291	72
v/c Ratio	0.43	0.17	1.37	0.29	0.09	0.49	0.26	0.56	0.74	0.09
Control Delay	58.6	1.2	225.2	6.9	14.7	29.1	4.2	21.5	30.6	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.6	1.2	225.2	6.9	14.7	29.1	4.2	21.5	30.6	0.2
Queue Length 50th (ft)	68	0	~486	0	6	226	0	85	393	0
Queue Length 95th (ft)	122	0	#725	40	20	301	48	140	624	1
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	332	400	328	403	233	1473	775	379	1750	831
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.13	1.37	0.29	0.08	0.49	0.26	0.56	0.74	0.09

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

2043 FUTURE NO BUILD PM

08/20/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	43	46	371	43	109	17	665	182	196	1188	66
Future Volume (veh/h)	38	43	46	371	43	109	17	665	182	196	1188	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	41	47	50	403	47	118	18	723	198	213	1291	72
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	1	1	1	1	1	1	1	1	1
Cap, veh/h	62	71	115	309	36	305	190	1547	689	380	1727	769
Arrive On Green	0.07	0.07	0.07	0.19	0.19	0.19	0.03	0.43	0.43	0.08	0.48	0.48
Sat Flow, veh/h	852	976	1585	1616	188	1598	1795	3582	1596	1795	3582	1596
Grp Volume(v), veh/h	88	0	50	450	0	118	18	723	198	213	1291	72
Grp Sat Flow(s),veh/h/ln	1828	0	1585	1804	0	1598	1795	1791	1596	1795	1791	1596
Q Serve(g_s), s	5.6	0.0	3.6	23.0	0.0	7.8	0.7	17.3	9.7	7.6	35.1	2.9
Cycle Q Clear(g_c), s	5.6	0.0	3.6	23.0	0.0	7.8	0.7	17.3	9.7	7.6	35.1	2.9
Prop In Lane	0.47		1.00	0.90		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	132	0	115	345	0	305	190	1547	689	380	1727	769
V/C Ratio(X)	0.66	0.00	0.44	1.31	0.00	0.39	0.09	0.47	0.29	0.56	0.75	0.09
Avail Cap(c_a), veh/h	349	0	303	345	0	305	285	1547	689	385	1727	769
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.4	0.0	53.5	48.7	0.0	42.5	21.3	24.3	22.2	17.5	25.2	16.9
Incr Delay (d2), s/veh	18.8	0.0	9.2	156.9	0.0	2.9	0.2	1.0	1.0	1.8	3.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	0.0	1.7	25.3	0.0	3.3	0.3	7.2	3.7	3.1	14.6	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.2	0.0	62.6	205.6	0.0	45.4	21.5	25.3	23.2	19.3	28.3	17.1
LnGrp LOS	E	A	E	F	A	D	C	C	C	B	C	B
Approach Vol, veh/h		138			568			939			1576	
Approach Delay, s/veh		69.4			172.3			24.8			26.5	
Approach LOS		E			F			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.7	60.0		15.7	8.6	66.0		30.0				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	52.0		23.0	10.0	52.0		23.0				
Max Q Clear Time (g_c+I1), s	9.6	19.3		7.6	2.7	37.1		25.0				
Green Ext Time (p_c), s	0.0	20.7		1.2	0.0	13.7		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			53.6									
HCM 6th LOS			D									
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
2: Marshall Mesa Trailhead & SH 170

2043 FUTURE NO BUILD PM
08/20/2023

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↑		↗
Traffic Vol, veh/h	415	6	0	501	1	2
Future Vol, veh/h	415	6	0	501	1	2
Conflicting Peds, #/hr	0	0	0	0	3	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	451	7	0	545	1	2
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	1003	456
Stage 1	-	-	-	-	455	-
Stage 2	-	-	-	-	548	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	0	-	268	604
Stage 1	-	-	0	-	639	-
Stage 2	-	-	0	-	579	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	267	603
Mov Cap-2 Maneuver	-	-	-	-	267	-
Stage 1	-	-	-	-	639	-
Stage 2	-	-	-	-	577	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0	11			
HCM LOS						B
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	603	-	-	-		
HCM Lane V/C Ratio	0.004	-	-	-		
HCM Control Delay (s)	11	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0	-	-	-		

HCM 6th TWSC
3: SH 170 & Eldorado Park-n-Ride

2043 FUTURE NO BUILD PM
08/20/2023

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↖	↗
Traffic Vol, veh/h	14	401	482	9	4	15
Future Vol, veh/h	14	401	482	9	4	15
Conflicting Peds, #/hr	1	0	0	1	0	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	436	524	10	4	16
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	535	0	-	0	996	535
Stage 1	-	-	-	-	530	-
Stage 2	-	-	-	-	466	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1033	-	-	-	271	545
Stage 1	-	-	-	-	590	-
Stage 2	-	-	-	-	632	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1032	-	-	-	265	542
Mov Cap-2 Maneuver	-	-	-	-	265	-
Stage 1	-	-	-	-	578	-
Stage 2	-	-	-	-	631	-
Approach	EB	WB	SB			
HCM Control Delay, s	0.3	0	13.5			
HCM LOS			B			
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1032	-	-	-	444	
HCM Lane V/C Ratio	0.015	-	-	-	0.047	
HCM Control Delay (s)	8.5	0	-	-	13.5	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0	-	-	-	0.1	

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

2043 FUTURE NO BUILD PM

08/20/2023

Intersection												
Int Delay, s/veh	9.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	4	402	7	3	0	489	4	31	0	0	1
Future Vol, veh/h	0	4	402	7	3	0	489	4	31	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	4	437	8	3	0	532	4	34	0	0	1

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1088	1103	1	1088	1086	21	1	0	0	38	0	0
Stage 1	1	1	-	1085	1085	-	-	-	-	-	-	-
Stage 2	1087	1102	-	3	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	193	211	1084	193	216	1056	1622	-	-	1572	-	-
Stage 1	1022	895	-	262	293	-	-	-	-	-	-	-
Stage 2	262	287	-	1020	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	140	140	1084	83	143	1056	1622	-	-	1572	-	-
Mov Cap-2 Maneuver	140	140	-	83	143	-	-	-	-	-	-	-
Stage 1	679	895	-	174	195	-	-	-	-	-	-	-
Stage 2	171	191	-	606	895	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	10.5		47.7		7.7		0	
HCM LOS	B		E					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1622	-	-	1095	95	1572	-
HCM Lane V/C Ratio	0.328	-	-	0.403	0.114	-	-
HCM Control Delay (s)	8.3	0	-	10.5	47.7	0	-
HCM Lane LOS	A	A	-	B	E	A	-
HCM 95th %tile Q(veh)	1.4	-	-	2	0.4	0	-

Queues
1: SH 93 & SH 170

2043 FUTURE NO BUILD WEEKEND

08/20/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	199	53	234	94	61	666	135	69	669	95
v/c Ratio	0.69	0.14	0.77	0.25	0.17	0.46	0.19	0.19	0.47	0.13
Control Delay	64.5	0.8	68.9	3.7	17.3	29.9	5.0	17.5	29.9	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.5	0.8	68.9	3.7	17.3	29.9	5.0	17.5	29.9	2.1
Queue Length 50th (ft)	162	0	193	0	26	224	0	29	225	0
Queue Length 95th (ft)	251	0	#316	16	50	291	43	56	293	17
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	331	401	331	396	383	1435	704	378	1424	712
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.13	0.71	0.24	0.16	0.46	0.19	0.18	0.47	0.13

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

2043 FUTURE NO BUILD WEEKEND

08/20/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	106	91	52	133	99	93	60	659	134	68	662	94
Future Volume (veh/h)	106	91	52	133	99	93	60	659	134	68	662	94
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1841	1841	1841	1826	1826	1826
Adj Flow Rate, veh/h	107	92	53	134	100	94	61	666	135	69	669	95
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	2	2	2	2	2	2	4	4	4	5	5	5
Cap, veh/h	136	117	215	163	122	243	359	1485	646	353	1480	660
Arrive On Green	0.14	0.14	0.14	0.16	0.16	0.16	0.06	0.42	0.42	0.06	0.43	0.43
Sat Flow, veh/h	979	842	1550	1041	777	1552	1753	3497	1521	1739	3469	1547
Grp Volume(v), veh/h	199	0	53	234	0	94	61	666	135	69	669	95
Grp Sat Flow(s),veh/h/ln	1821	0	1550	1818	0	1552	1753	1749	1521	1739	1735	1547
Q Serve(g_s), s	12.9	0.0	3.7	15.2	0.0	6.7	2.3	16.6	6.9	2.6	16.8	4.6
Cycle Q Clear(g_c), s	12.9	0.0	3.7	15.2	0.0	6.7	2.3	16.6	6.9	2.6	16.8	4.6
Prop In Lane	0.54		1.00	0.57		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	253	0	215	285	0	243	359	1485	646	353	1480	660
V/C Ratio(X)	0.79	0.00	0.25	0.82	0.00	0.39	0.17	0.45	0.21	0.20	0.45	0.14
Avail Cap(c_a), veh/h	342	0	291	342	0	292	402	1485	646	393	1480	660
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	51.0	0.0	47.0	50.0	0.0	46.3	18.2	25.0	22.2	18.2	24.9	21.4
Incr Delay (d2), s/veh	18.1	0.0	2.1	20.1	0.0	3.6	0.2	1.0	0.7	0.3	1.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.2	0.0	1.6	8.5	0.0	2.8	0.9	6.8	2.5	1.0	6.8	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	69.1	0.0	49.1	70.0	0.0	50.0	18.5	26.0	23.0	18.5	25.9	21.9
LnGrp LOS	E	A	D	E	A	D	B	C	C	B	C	C
Approach Vol, veh/h		252			328			862			833	
Approach Delay, s/veh		64.9			64.3			25.0			24.9	
Approach LOS		E			E			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.2	60.0		24.0	12.0	60.2		26.2				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	52.0		23.0	10.0	52.0		23.0				
Max Q Clear Time (g_c+I1), s	4.6	18.6		14.9	4.3	18.8		17.2				
Green Ext Time (p_c), s	0.0	18.7		1.6	0.0	18.0		1.7				
Intersection Summary												
HCM 6th Ctrl Delay			35.0									
HCM 6th LOS			D									
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
2: Marshall Mesa Trailhead & SH 170

2043 FUTURE NO BUILD WEEKEND

08/20/2023

Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↑		↗
Traffic Vol, veh/h	293	9	4	314	9	7
Future Vol, veh/h	293	9	4	314	9	7
Conflicting Peds, #/hr	0	11	11	0	3	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	318	10	4	341	10	8
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	339	0	686	335
Stage 1	-	-	-	-	334	-
Stage 2	-	-	-	-	352	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1220	-	413	707
Stage 1	-	-	-	-	725	-
Stage 2	-	-	-	-	712	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1207	-	406	699
Mov Cap-2 Maneuver	-	-	-	-	406	-
Stage 1	-	-	-	-	718	-
Stage 2	-	-	-	-	707	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0.1	10.2			
HCM LOS						B
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	699	-	-	1207	-	
HCM Lane V/C Ratio	0.011	-	-	0.004	-	
HCM Control Delay (s)	10.2	-	-	8	-	
HCM Lane LOS	B	-	-	A	-	
HCM 95th %tile Q(veh)	0	-	-	0	-	

HCM 6th TWSC
3: SH 170 & Eldorado Park-n-Ride

2043 FUTURE NO BUILD WEEKEND

08/20/2023

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	11	288	300	7	11	15
Future Vol, veh/h	11	288	300	7	11	15
Conflicting Peds, #/hr	10	0	0	10	4	32
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	313	326	8	12	16
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	344	0	-	0	681	372
Stage 1	-	-	-	-	340	-
Stage 2	-	-	-	-	341	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1215	-	-	-	416	674
Stage 1	-	-	-	-	721	-
Stage 2	-	-	-	-	720	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1203	-	-	-	403	647
Mov Cap-2 Maneuver	-	-	-	-	403	-
Stage 1	-	-	-	-	705	-
Stage 2	-	-	-	-	713	-
Approach	EB	WB		SB		
HCM Control Delay, s	0.3	0		12.4		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1203	-	-	-	515	
HCM Lane V/C Ratio	0.01	-	-	-	0.055	
HCM Control Delay (s)	8	0	-	-	12.4	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0	-	-	-	0.2	

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

2043 FUTURE NO BUILD WEEKEND

08/20/2023

Intersection												
Int Delay, s/veh	8.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	6	288	15	4	0	317	0	26	0	0	0
Future Vol, veh/h	1	6	288	15	4	0	317	0	26	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	7	313	16	4	0	345	0	28	0	0	0
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	707	719	1	709	705	14	1	0	0	28	0	0
Stage 1	1	1	-	704	704	-	-	-	-	-	-	-
Stage 2	706	718	-	5	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	350	354	1084	349	361	1066	1622	-	-	1585	-	-
Stage 1	1022	895	-	428	440	-	-	-	-	-	-	-
Stage 2	427	433	-	1017	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	288	277	1084	203	283	1066	1622	-	-	1585	-	-
Mov Cap-2 Maneuver	288	277	-	203	283	-	-	-	-	-	-	-
Stage 1	800	895	-	335	345	-	-	-	-	-	-	-
Stage 2	330	339	-	718	895	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	9.6		23.4			7.2			0			
HCM LOS	A		C									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1622	-	-	1110	216	1585	-	-				
HCM Lane V/C Ratio	0.212	-	-	0.289	0.096	-	-	-				
HCM Control Delay (s)	7.8	0	-	9.6	23.4	0	-	-				
HCM Lane LOS	A	A	-	A	C	A	-	-				
HCM 95th %tile Q(veh)	0.8	-	-	1.2	0.3	0	-	-				

Queues
1: SH 93 & SH 170

2023 FUTURE BUILD AM

08/11/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	67	25	73	162	8	1040	303	83	489	41
v/c Ratio	0.31	0.08	0.32	0.47	0.01	0.64	0.36	0.27	0.26	0.05
Control Delay	46.3	0.5	45.4	11.6	11.3	26.2	9.5	13.4	15.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.3	0.5	45.4	11.6	11.3	26.2	9.5	13.4	15.3	0.1
Queue Length 50th (ft)	40	0	44	0	2	287	42	23	84	0
Queue Length 95th (ft)	88	0	91	59	10	421	121	52	170	0
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	278	357	765	768	596	1625	834	325	1861	873
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.07	0.10	0.21	0.01	0.64	0.36	0.26	0.26	0.05

Intersection Summary

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

2023 FUTURE BUILD AM

08/11/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	18	23	54	13	149	7	957	279	76	450	38
Future Volume (veh/h)	43	18	23	54	13	149	7	957	279	76	450	38
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1856	1856	1856	1885	1885	1885	1841	1841	1841
Adj Flow Rate, veh/h	47	20	25	59	14	162	8	1040	303	83	489	41
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	3	3	3	1	1	1	4	4	4
Cap, veh/h	95	40	118	214	51	233	455	1532	682	279	1695	755
Arrive On Green	0.08	0.08	0.08	0.15	0.15	0.15	0.02	0.43	0.43	0.07	0.48	0.48
Sat Flow, veh/h	1247	531	1554	1441	342	1569	1795	3582	1596	1753	3497	1558
Grp Volume(v), veh/h	67	0	25	73	0	162	8	1040	303	83	489	41
Grp Sat Flow(s),veh/h/ln	1778	0	1554	1783	0	1569	1795	1791	1596	1753	1749	1558
Q Serve(g_s), s	3.6	0.0	1.5	3.6	0.0	9.6	0.2	23.0	13.2	2.3	8.2	1.4
Cycle Q Clear(g_c), s	3.6	0.0	1.5	3.6	0.0	9.6	0.2	23.0	13.2	2.3	8.2	1.4
Prop In Lane	0.70		1.00	0.81		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	135	0	118	265	0	233	455	1532	682	279	1695	755
V/C Ratio(X)	0.50	0.00	0.21	0.28	0.00	0.69	0.02	0.68	0.44	0.30	0.29	0.05
Avail Cap(c_a), veh/h	272	0	237	744	0	655	609	1532	682	329	1695	755
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.6	0.0	42.6	37.1	0.0	39.7	15.3	22.7	19.9	15.8	15.2	13.4
Incr Delay (d2), s/veh	9.9	0.0	3.2	2.0	0.0	12.7	0.0	2.4	2.1	0.6	0.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	0.7	1.7	0.0	4.5	0.1	9.3	4.9	0.9	3.1	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.5	0.0	45.8	39.1	0.0	52.3	15.3	25.1	21.9	16.4	15.6	13.5
LnGrp LOS	D	A	D	D	A	D	B	C	C	B	B	B
Approach Vol, veh/h		92			235			1351			613	
Approach Delay, s/veh		51.4			48.2			24.3			15.6	
Approach LOS		D			D			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.2	50.0		14.5	6.6	55.6		21.6				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	42.0		15.0	10.0	42.0		41.0				
Max Q Clear Time (g_c+I1), s	4.3	25.0		5.6	2.2	10.2		11.6				
Green Ext Time (p_c), s	0.1	15.3		0.5	0.0	12.2		2.8				
Intersection Summary												
HCM 6th Ctrl Delay				25.5								
HCM 6th LOS				C								
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
3: Marshall Mesa Trailhead/Eldorado Park-n-Ride & SH 170

2023 FUTURE BUILD AM

08/11/2023

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	330	17	10	175	16	12	0	7	3	0	20
Future Vol, veh/h	15	330	17	10	175	16	12	0	7	3	0	20
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	359	18	11	190	17	13	0	8	3	0	22

Major/Minor	Major1		Major2		Minor1			Minor2				
Conflicting Flow All	209	0	0	377	0	0	642	631	368	627	632	211
Stage 1	-	-	-	-	-	-	400	400	-	223	223	-
Stage 2	-	-	-	-	-	-	242	231	-	404	409	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1362	-	-	1181	-	-	387	398	677	396	398	829
Stage 1	-	-	-	-	-	-	626	602	-	780	719	-
Stage 2	-	-	-	-	-	-	762	713	-	623	596	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1359	-	-	1181	-	-	366	387	677	383	387	820
Mov Cap-2 Maneuver	-	-	-	-	-	-	366	387	-	383	387	-
Stage 1	-	-	-	-	-	-	617	593	-	767	710	-
Stage 2	-	-	-	-	-	-	727	704	-	607	587	-

Approach	EB		WB		NB			SB		
HCM Control Delay, s	0.3		0.4		13.6			10.2		
HCM LOS					B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	441	1359	-	-	1181	-	-	714
HCM Lane V/C Ratio	0.047	0.012	-	-	0.009	-	-	0.035
HCM Control Delay (s)	13.6	7.7	0	-	8.1	0	-	10.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

2023 FUTURE BUILD AM

08/11/2023

Intersection												
Int Delay, s/veh	9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	1	339	11	2	0	199	0	14	0	0	0
Future Vol, veh/h	0	1	339	11	2	0	199	0	14	0	0	0
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	368	12	2	0	216	0	15	0	0	0
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	444	448	1	442	441	10	1	0	0	15	0	0
Stage 1	1	1	-	440	440	-	-	-	-	-	-	-
Stage 2	443	447	-	2	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	524	506	1084	526	510	1071	1622	-	-	1603	-	-
Stage 1	1022	895	-	596	578	-	-	-	-	-	-	-
Stage 2	594	573	-	1021	895	-	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	467	438	1084	311	441	1069	1622	-	-	1603	-	-
Mov Cap-2 Maneuver	467	438	-	311	441	-	-	-	-	-	-	-
Stage 1	884	895	-	516	500	-	-	-	-	-	-	-
Stage 2	511	496	-	673	895	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	10		16.5			7.1			0			
HCM LOS	B		C									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1622	-	-	1087	326	1603	-	-				
HCM Lane V/C Ratio	0.133	-	-	0.34	0.043	-	-	-				
HCM Control Delay (s)	7.6	0	-	10	16.5	0	-	-				
HCM Lane LOS	A	A	-	B	C	A	-	-				
HCM 95th %tile Q(veh)	0.5	-	-	1.5	0.1	0	-	-				

Queues
1: SH 93 & SH 170

2023 FUTURE BUILD PM

08/20/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	74	41	364	96	15	602	167	179	1076	60
v/c Ratio	0.39	0.14	0.76	0.18	0.06	0.48	0.25	0.47	0.69	0.08
Control Delay	60.6	1.0	52.1	2.5	21.0	34.7	5.9	25.0	34.8	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.6	1.0	52.1	2.5	21.0	34.7	5.9	25.0	34.8	0.2
Queue Length 50th (ft)	58	0	274	0	6	208	0	84	360	0
Queue Length 95th (ft)	113	0	392	15	21	291	52	149	#611	0
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	230	320	623	643	264	1267	674	388	1566	757
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.13	0.58	0.15	0.06	0.48	0.25	0.46	0.69	0.08

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

2023 FUTURE BUILD PM

08/20/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	36	38	300	35	88	14	554	154	165	990	55
Future Volume (veh/h)	32	36	38	300	35	88	14	554	154	165	990	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	35	39	41	326	38	96	15	602	167	179	1076	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	1	1	1	1	1	1	1	1	1
Cap, veh/h	59	65	108	410	48	405	193	1310	584	369	1492	665
Arrive On Green	0.07	0.07	0.07	0.25	0.25	0.25	0.03	0.37	0.37	0.08	0.42	0.42
Sat Flow, veh/h	864	963	1585	1616	188	1598	1795	3582	1595	1795	3582	1596
Grp Volume(v), veh/h	74	0	41	364	0	96	15	602	167	179	1076	60
Grp Sat Flow(s),veh/h/ln	1827	0	1585	1804	0	1598	1795	1791	1595	1795	1791	1596
Q Serve(g_s), s	4.5	0.0	2.8	21.7	0.0	5.5	0.6	14.7	8.5	6.9	28.8	2.6
Cycle Q Clear(g_c), s	4.5	0.0	2.8	21.7	0.0	5.5	0.6	14.7	8.5	6.9	28.8	2.6
Prop In Lane	0.47		1.00	0.90		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	124	0	108	458	0	405	193	1310	584	369	1492	665
V/C Ratio(X)	0.60	0.00	0.38	0.79	0.00	0.24	0.08	0.46	0.29	0.48	0.72	0.09
Avail Cap(c_a), veh/h	239	0	207	644	0	571	302	1310	584	387	1492	665
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.0	0.0	51.2	40.0	0.0	34.0	23.7	27.8	25.8	20.2	27.9	20.3
Incr Delay (d2), s/veh	15.5	0.0	7.9	11.1	0.0	1.1	0.2	1.2	1.2	1.0	3.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	0.0	1.4	10.9	0.0	2.3	0.2	6.2	3.3	2.8	12.2	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.5	0.0	59.1	51.1	0.0	35.1	23.9	28.9	27.0	21.2	31.0	20.6
LnGrp LOS	E	A	E	D	A	D	C	C	C	C	C	C
Approach Vol, veh/h		115			460			784			1315	
Approach Delay, s/veh		64.5			47.8			28.4			29.2	
Approach LOS		E			D			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.9	50.0		14.8	8.0	55.8		36.1				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	42.0		15.0	10.0	42.0		41.0				
Max Q Clear Time (g_c+I1), s	8.9	16.7		6.5	2.6	30.8		23.7				
Green Ext Time (p_c), s	0.1	14.8		0.6	0.0	9.9		5.5				
Intersection Summary												
HCM 6th Ctrl Delay				33.7								
HCM 6th LOS				C								
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
3: Marshall Mesa Trailhead/Eldorado Park-n-Ride & SH 170

2023 FUTURE BUILD PM
08/20/2023

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	14	321	10	0	389	9	2	0	3	4	0	15
Future Vol, veh/h	14	321	10	0	389	9	2	0	3	4	0	15
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	349	11	0	423	10	2	0	3	4	0	16
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	434	0	0	360	0	0	826	819	355	815	819	434
Stage 1	-	-	-	-	-	-	385	385	-	429	429	-
Stage 2	-	-	-	-	-	-	441	434	-	386	390	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1126	-	-	1199	-	-	291	310	689	296	310	622
Stage 1	-	-	-	-	-	-	638	611	-	604	584	-
Stage 2	-	-	-	-	-	-	595	581	-	637	608	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1125	-	-	1199	-	-	278	304	689	290	304	618
Mov Cap-2 Maneuver	-	-	-	-	-	-	278	304	-	290	304	-
Stage 1	-	-	-	-	-	-	627	601	-	593	583	-
Stage 2	-	-	-	-	-	-	577	580	-	623	598	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.3			0			13.4			12.5		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	433	1125	-	-	1199	-	-	499				
HCM Lane V/C Ratio	0.013	0.014	-	-	-	-	-	0.041				
HCM Control Delay (s)	13.4	8.2	0	-	0	-	-	12.5				
HCM Lane LOS	B	A	A	-	A	-	-	B				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1				

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

2023 FUTURE BUILD PM
08/20/2023

Intersection												
Int Delay, s/veh	8.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	3	325	7	3	0	394	3	25	0	0	1
Future Vol, veh/h	0	3	325	7	3	0	394	3	25	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	353	8	3	0	428	3	27	0	0	1

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	875	887	1	875	874	17	1	0	0	30	0	0
Stage 1	1	1	-	873	873	-	-	-	-	-	-	-
Stage 2	874	886	-	2	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	270	283	1084	270	288	1062	1622	-	-	1583	-	-
Stage 1	1022	895	-	345	368	-	-	-	-	-	-	-
Stage 2	344	363	-	1021	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	211	207	1084	143	211	1062	1622	-	-	1583	-	-
Mov Cap-2 Maneuver	211	207	-	143	211	-	-	-	-	-	-	-
Stage 1	747	895	-	252	269	-	-	-	-	-	-	-
Stage 2	248	265	-	686	895	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.9		29.5		7.5		0	
HCM LOS	A		D					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1622	-	-	1094	158	1583	-
HCM Lane V/C Ratio	0.264	-	-	0.326	0.069	-	-
HCM Control Delay (s)	8	0	-	9.9	29.5	0	-
HCM Lane LOS	A	A	-	A	D	A	-
HCM 95th %tile Q(veh)	1.1	-	-	1.4	0.2	0	-

Queues
1: SH 93 & SH 170

2023 FUTURE BUILD WEEKEND

08/20/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	168	43	193	78	51	555	116	59	558	79
v/c Ratio	0.69	0.13	0.58	0.20	0.12	0.41	0.18	0.14	0.42	0.12
Control Delay	63.0	0.8	49.1	1.3	15.8	27.6	4.4	16.0	27.5	1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.0	0.8	49.1	1.3	15.8	27.6	4.4	16.0	27.5	1.2
Queue Length 50th (ft)	117	0	129	0	17	153	0	20	155	0
Queue Length 95th (ft)	#238	0	206	2	43	233	33	48	233	7
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	249	336	681	671	436	1338	661	433	1330	674
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.13	0.28	0.12	0.12	0.41	0.18	0.14	0.42	0.12

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

2023 FUTURE BUILD WEEKEND

08/20/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	78	43	109	82	77	50	549	115	58	552	78
Future Volume (veh/h)	88	78	43	109	82	77	50	549	115	58	552	78
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1841	1841	1841	1826	1826	1826
Adj Flow Rate, veh/h	89	79	43	110	83	78	51	555	116	59	558	79
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	2	2	2	2	2	2	4	4	4	5	5	5
Cap, veh/h	113	100	180	167	126	251	399	1403	610	394	1405	627
Arrive On Green	0.12	0.12	0.12	0.16	0.16	0.16	0.06	0.40	0.40	0.06	0.40	0.40
Sat Flow, veh/h	965	857	1547	1036	782	1552	1753	3497	1520	1739	3469	1547
Grp Volume(v), veh/h	168	0	43	193	0	78	51	555	116	59	558	79
Grp Sat Flow(s),veh/h/ln	1822	0	1547	1819	0	1552	1753	1749	1520	1739	1735	1547
Q Serve(g_s), s	9.4	0.0	2.6	10.4	0.0	4.6	1.7	11.8	5.2	2.0	11.9	3.4
Cycle Q Clear(g_c), s	9.4	0.0	2.6	10.4	0.0	4.6	1.7	11.8	5.2	2.0	11.9	3.4
Prop In Lane	0.53		1.00	0.57		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	213	0	180	294	0	251	399	1403	610	394	1405	627
V/C Ratio(X)	0.79	0.00	0.24	0.66	0.00	0.31	0.13	0.40	0.19	0.15	0.40	0.13
Avail Cap(c_a), veh/h	261	0	222	712	0	608	463	1403	610	451	1405	627
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.0	0.0	42.0	41.2	0.0	38.7	16.4	22.3	20.3	16.3	22.1	19.5
Incr Delay (d2), s/veh	22.0	0.0	2.4	8.8	0.0	2.5	0.1	0.8	0.7	0.2	0.8	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	0.0	1.1	5.4	0.0	1.9	0.7	4.7	1.9	0.7	4.7	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.9	0.0	44.4	49.9	0.0	41.3	16.5	23.1	21.0	16.5	22.9	19.9
LnGrp LOS	E	A	D	D	A	D	B	C	C	B	C	B
Approach Vol, veh/h		211			271			722			696	
Approach Delay, s/veh		62.4			47.4			22.3			22.0	
Approach LOS		E			D			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.6	50.0		19.2	11.2	50.4		23.9				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	42.0		15.0	10.0	42.0		41.0				
Max Q Clear Time (g_c+I1), s	4.0	13.8		11.4	3.7	13.9		12.4				
Green Ext Time (p_c), s	0.0	14.1		0.7	0.0	13.6		3.7				
Intersection Summary												
HCM 6th Ctrl Delay			30.2									
HCM 6th LOS			C									
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
3: Marshall Mesa Trailhead/Eldorado Park-n-Ride & SH 170

2023 FUTURE BUILD WEEKEND

08/20/2023

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	11	225	15	7	238	7	15	0	12	11	0	15
Future Vol, veh/h	11	225	15	7	238	7	15	0	12	11	0	15
Conflicting Peds, #/hr	10	0	0	0	0	10	0	0	0	4	0	32
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	245	16	8	259	8	16	0	13	12	0	16
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	277	0	0	261	0	0	596	570	257	577	574	305
Stage 1	-	-	-	-	-	-	277	277	-	289	289	-
Stage 2	-	-	-	-	-	-	319	293	-	288	285	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1286	-	-	1303	-	-	415	431	782	428	429	735
Stage 1	-	-	-	-	-	-	729	681	-	719	673	-
Stage 2	-	-	-	-	-	-	693	670	-	720	676	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1274	-	-	1303	-	-	388	419	779	410	417	706
Mov Cap-2 Maneuver	-	-	-	-	-	-	388	419	-	410	417	-
Stage 1	-	-	-	-	-	-	721	674	-	705	662	-
Stage 2	-	-	-	-	-	-	652	659	-	697	669	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.3			0.2			12.7			12		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	499	1274	-	-	1303	-	-	541				
HCM Lane V/C Ratio	0.059	0.009	-	-	0.006	-	-	0.052				
HCM Control Delay (s)	12.7	7.9	0	-	7.8	0	-	12				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.2				

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

2023 FUTURE BUILD WEEKEND

08/20/2023

Intersection												
Int Delay, s/veh	8.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	5	237	15	4	0	259	0	21	0	0	0
Future Vol, veh/h	1	5	237	15	4	0	259	0	21	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	5	258	16	4	0	282	0	23	0	0	0
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	579	588	1	580	577	12	1	0	0	23	0	0
Stage 1	1	1	-	576	576	-	-	-	-	-	-	-
Stage 2	578	587	-	4	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	426	421	1084	426	427	1069	1622	-	-	1592	-	-
Stage 1	1022	895	-	503	502	-	-	-	-	-	-	-
Stage 2	501	497	-	1018	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	365	346	1084	277	351	1069	1622	-	-	1592	-	-
Mov Cap-2 Maneuver	365	346	-	277	351	-	-	-	-	-	-	-
Stage 1	841	895	-	414	413	-	-	-	-	-	-	-
Stage 2	408	409	-	771	895	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	9.2		18.4			7.1			0			
HCM LOS	A		C									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1622	-	-	1111	290	1592	-	-				
HCM Lane V/C Ratio	0.174	-	-	0.238	0.071	-	-	-				
HCM Control Delay (s)	7.7	0	-	9.2	18.4	0	-	-				
HCM Lane LOS	A	A	-	A	C	A	-	-				
HCM 95th %tile Q(veh)	0.6	-	-	0.9	0.2	0	-	-				

Queues
1: SH 93 & SH 170

2043 FUTURE BUILD AM

08/11/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	81	30	90	200	9	1248	363	99	587	50
v/c Ratio	0.37	0.10	0.37	0.51	0.02	0.83	0.46	0.43	0.32	0.06
Control Delay	48.5	0.6	46.0	10.9	12.2	34.3	13.0	19.4	16.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.5	0.6	46.0	10.9	12.2	34.3	13.0	19.4	16.7	0.1
Queue Length 50th (ft)	50	0	56	0	3	392	73	29	110	0
Queue Length 95th (ft)	104	0	108	64	11	#606	177	71	214	0
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	265	346	727	761	544	1503	786	251	1855	871
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.09	0.12	0.26	0.02	0.83	0.46	0.39	0.32	0.06

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

2043 FUTURE BUILD AM

08/11/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	52	22	28	67	16	184	8	1148	334	91	540	46
Future Volume (veh/h)	52	22	28	67	16	184	8	1148	334	91	540	46
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1856	1856	1856	1885	1885	1885	1841	1841	1841
Adj Flow Rate, veh/h	57	24	30	73	17	200	9	1248	363	99	587	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	3	3	3	1	1	1	4	4	4
Cap, veh/h	95	40	118	253	59	275	389	1472	656	229	1633	728
Arrive On Green	0.08	0.08	0.08	0.18	0.18	0.18	0.02	0.41	0.41	0.07	0.47	0.47
Sat Flow, veh/h	1251	527	1554	1446	337	1570	1795	3582	1596	1753	3497	1558
Grp Volume(v), veh/h	81	0	30	90	0	200	9	1248	363	99	587	50
Grp Sat Flow(s),veh/h/ln	1778	0	1554	1783	0	1570	1795	1791	1596	1753	1749	1558
Q Serve(g_s), s	4.5	0.0	1.9	4.5	0.0	12.3	0.3	32.2	17.7	3.0	11.0	1.8
Cycle Q Clear(g_c), s	4.5	0.0	1.9	4.5	0.0	12.3	0.3	32.2	17.7	3.0	11.0	1.8
Prop In Lane	0.70		1.00	0.81		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	135	0	118	312	0	275	389	1472	656	229	1633	728
V/C Ratio(X)	0.60	0.00	0.25	0.29	0.00	0.73	0.02	0.85	0.55	0.43	0.36	0.07
Avail Cap(c_a), veh/h	261	0	228	716	0	630	533	1472	656	272	1633	728
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.7	0.0	44.5	36.6	0.0	39.8	16.9	27.2	22.9	21.3	17.4	15.0
Incr Delay (d2), s/veh	14.5	0.0	4.0	1.8	0.0	12.5	0.0	6.2	3.3	1.3	0.6	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.0	0.8	2.1	0.0	5.7	0.1	13.9	6.8	1.2	4.2	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.2	0.0	48.5	38.4	0.0	52.3	16.9	33.4	26.3	22.6	18.1	15.2
LnGrp LOS	E	A	D	D	A	D	B	C	C	C	B	B
Approach Vol, veh/h		111			290			1620			736	
Approach Delay, s/veh		57.1			48.0			31.7			18.5	
Approach LOS		E			D			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.5	50.0		14.8	6.8	55.7		24.9				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	42.0		15.0	10.0	42.0		41.0				
Max Q Clear Time (g_c+I1), s	5.0	34.2		6.5	2.3	13.0		14.3				
Green Ext Time (p_c), s	0.1	7.6		0.6	0.0	14.0		3.4				
Intersection Summary												
HCM 6th Ctrl Delay			30.9									
HCM 6th LOS			C									
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
3: Marshall Mesa Trailhead/Eldorado Park-n-Ride & SH 170

2043 FUTURE BUILD AM

08/11/2023

Intersection												
Int Delay, s/veh	1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	410	17	10	218	16	12	0	7	3	0	20
Future Vol, veh/h	15	410	17	10	218	16	12	0	7	3	0	20
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	446	18	11	237	17	13	0	8	3	0	22
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	256	0	0	464	0	0	776	765	455	761	766	258
Stage 1	-	-	-	-	-	-	487	487	-	270	270	-
Stage 2	-	-	-	-	-	-	289	278	-	491	496	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1309	-	-	1097	-	-	315	333	605	322	333	781
Stage 1	-	-	-	-	-	-	562	550	-	736	686	-
Stage 2	-	-	-	-	-	-	719	680	-	559	545	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1307	-	-	1097	-	-	296	323	605	310	323	772
Mov Cap-2 Maneuver	-	-	-	-	-	-	296	323	-	310	323	-
Stage 1	-	-	-	-	-	-	552	541	-	722	676	-
Stage 2	-	-	-	-	-	-	684	670	-	543	536	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.3			0.3			15.5			10.8		
HCM LOS							C			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	365	1307	-	-	1097	-	-	646				
HCM Lane V/C Ratio	0.057	0.012	-	-	0.01	-	-	0.039				
HCM Control Delay (s)	15.5	7.8	0	-	8.3	0	-	10.8				
HCM Lane LOS	C	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1				

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

2043 FUTURE BUILD AM

08/11/2023

Intersection												
Int Delay, s/veh	9.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	1	420	11	2	0	246	0	17	0	0	0
Future Vol, veh/h	0	1	420	11	2	0	246	0	17	0	0	0
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	457	12	2	0	267	0	18	0	0	0

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	547	553	1	545	544	11	1	0	0	18	0	0
Stage 1	1	1	-	543	543	-	-	-	-	-	-	-
Stage 2	546	552	-	2	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	448	441	1084	449	446	1070	1622	-	-	1599	-	-
Stage 1	1022	895	-	524	520	-	-	-	-	-	-	-
Stage 2	522	515	-	1021	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	388	367	1084	226	372	1068	1622	-	-	1599	-	-
Mov Cap-2 Maneuver	388	367	-	226	372	-	-	-	-	-	-	-
Stage 1	851	895	-	436	433	-	-	-	-	-	-	-
Stage 2	432	429	-	590	895	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	10.7		20.9		7.2		0	
HCM LOS	B		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1622	-	-	1087	241	1599	-
HCM Lane V/C Ratio	0.165	-	-	0.421	0.059	-	-
HCM Control Delay (s)	7.7	0	-	10.7	20.9	0	-
HCM Lane LOS	A	A	-	B	C	A	-
HCM 95th %tile Q(veh)	0.6	-	-	2.1	0.2	0	-

Queues
1: SH 93 & SH 170

2043 FUTURE BUILD PM

08/20/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	88	50	451	118	18	723	200	215	1291	72
v/c Ratio	0.47	0.18	0.86	0.21	0.11	0.63	0.31	0.73	0.91	0.10
Control Delay	64.7	1.3	61.4	4.5	22.6	41.3	7.1	40.6	48.1	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.7	1.3	61.4	4.5	22.6	41.3	7.1	40.6	48.1	0.3
Queue Length 50th (ft)	73	0	367	0	9	287	8	117	529	0
Queue Length 95th (ft)	130	0	#536	33	24	357	65	#207	#817	1
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	209	303	566	597	194	1151	642	293	1425	701
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.17	0.80	0.20	0.09	0.63	0.31	0.73	0.91	0.10

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

2043 FUTURE BUILD PM

08/20/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	43	46	372	43	109	17	665	184	198	1188	66
Future Volume (veh/h)	38	43	46	372	43	109	17	665	184	198	1188	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	41	47	50	404	47	118	18	723	200	215	1291	72
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	1	1	1	1	1	1	1	1	1
Cap, veh/h	58	67	108	470	55	464	132	1221	544	311	1405	626
Arrive On Green	0.07	0.07	0.07	0.29	0.29	0.29	0.03	0.34	0.34	0.08	0.39	0.39
Sat Flow, veh/h	852	976	1585	1616	188	1598	1795	3582	1595	1795	3582	1596
Grp Volume(v), veh/h	88	0	50	451	0	118	18	723	200	215	1291	72
Grp Sat Flow(s),veh/h/ln	1828	0	1585	1804	0	1598	1795	1791	1595	1795	1791	1596
Q Serve(g_s), s	5.8	0.0	3.7	29.1	0.0	7.0	0.8	20.5	11.6	9.4	42.2	3.5
Cycle Q Clear(g_c), s	5.8	0.0	3.7	29.1	0.0	7.0	0.8	20.5	11.6	9.4	42.2	3.5
Prop In Lane	0.47		1.00	0.90		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	125	0	108	524	0	464	132	1221	544	311	1405	626
V/C Ratio(X)	0.71	0.00	0.46	0.86	0.00	0.25	0.14	0.59	0.37	0.69	0.92	0.12
Avail Cap(c_a), veh/h	223	0	193	600	0	532	224	1221	544	311	1405	626
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	56.2	0.0	55.2	41.3	0.0	33.5	30.1	33.5	30.6	25.3	35.6	23.8
Incr Delay (d2), s/veh	23.2	0.0	10.8	15.2	0.0	1.0	0.5	2.1	1.9	6.5	11.1	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	0.0	1.8	15.1	0.0	2.9	0.3	9.0	4.6	4.4	19.6	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	79.4	0.0	66.0	56.5	0.0	34.5	30.6	35.6	32.5	31.7	46.7	24.2
LnGrp LOS	E	A	E	E	A	C	C	D	C	C	D	C
Approach Vol, veh/h		138			569			941			1578	
Approach Delay, s/veh		74.6			52.0			34.9			43.6	
Approach LOS		E			D			C			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.0	50.0		15.4	8.7	56.3		42.8				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	42.0		15.0	10.0	42.0		41.0				
Max Q Clear Time (g_c+I1), s	11.4	22.5		7.8	2.8	44.2		31.1				
Green Ext Time (p_c), s	0.0	14.0		0.7	0.0	0.0		4.7				
Intersection Summary												
HCM 6th Ctrl Delay				43.9								
HCM 6th LOS				D								
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
3: Marshall Mesa Trailhead/Eldorado Park-n-Ride & SH 170

2043 FUTURE BUILD PM
08/20/2023

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	14	399	10	0	482	9	2	0	3	4	0	15
Future Vol, veh/h	14	399	10	0	482	9	2	0	3	4	0	15
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	434	11	0	524	10	2	0	3	4	0	16
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	535	0	0	445	0	0	1012	1005	440	1001	1005	535
Stage 1	-	-	-	-	-	-	470	470	-	530	530	-
Stage 2	-	-	-	-	-	-	542	535	-	471	475	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1033	-	-	1115	-	-	218	241	617	222	241	545
Stage 1	-	-	-	-	-	-	574	560	-	533	527	-
Stage 2	-	-	-	-	-	-	525	524	-	573	557	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1032	-	-	1115	-	-	207	236	617	217	236	542
Mov Cap-2 Maneuver	-	-	-	-	-	-	207	236	-	217	236	-
Stage 1	-	-	-	-	-	-	563	549	-	522	526	-
Stage 2	-	-	-	-	-	-	507	523	-	559	546	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.3			0			15.6			14.2		
HCM LOS							C			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	344	1032	-	-	1115	-	-	412				
HCM Lane V/C Ratio	0.016	0.015	-	-	-	-	-	0.05				
HCM Control Delay (s)	15.6	8.5	0	-	0	-	-	14.2				
HCM Lane LOS	C	A	A	-	A	-	-	B				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.2				

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

2043 FUTURE BUILD PM
08/20/2023

Intersection												
Int Delay, s/veh	9.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	4	403	7	3	0	489	4	31	0	0	1
Future Vol, veh/h	0	4	403	7	3	0	489	4	31	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	4	438	8	3	0	532	4	34	0	0	1

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1088	1103	1	1088	1086	21	1	0	0	38	0	0
Stage 1	1	1	-	1085	1085	-	-	-	-	-	-	-
Stage 2	1087	1102	-	3	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	193	211	1084	193	216	1056	1622	-	-	1572	-	-
Stage 1	1022	895	-	262	293	-	-	-	-	-	-	-
Stage 2	262	287	-	1020	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	140	140	1084	83	143	1056	1622	-	-	1572	-	-
Mov Cap-2 Maneuver	140	140	-	83	143	-	-	-	-	-	-	-
Stage 1	679	895	-	174	195	-	-	-	-	-	-	-
Stage 2	171	191	-	605	895	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	10.5		47.7		7.7		0	
HCM LOS	B		E					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1622	-	-	1095	95	1572	-
HCM Lane V/C Ratio	0.328	-	-	0.404	0.114	-	-
HCM Control Delay (s)	8.3	0	-	10.5	47.7	0	-
HCM Lane LOS	A	A	-	B	E	A	-
HCM 95th %tile Q(veh)	1.4	-	-	2	0.4	0	-

Queues
1: SH 93 & SH 170

2043 FUTURE BUILD WEEKEND

08/20/2023



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	201	53	238	96	61	666	138	70	669	95
v/c Ratio	0.84	0.16	0.63	0.22	0.18	0.52	0.21	0.20	0.52	0.15
Control Delay	78.7	1.1	49.5	3.1	18.1	31.4	5.7	18.4	31.5	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.7	1.1	49.5	3.1	18.1	31.4	5.7	18.4	31.5	2.5
Queue Length 50th (ft)	149	0	164	0	23	204	0	26	205	0
Queue Length 95th (ft)	#321	0	252	17	53	304	46	60	307	19
Internal Link Dist (ft)	1141		109			363			385	
Turn Bay Length (ft)		55			205		205	320		325
Base Capacity (vph)	240	329	657	652	366	1291	648	362	1281	654
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.84	0.16	0.36	0.15	0.17	0.52	0.21	0.19	0.52	0.15

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary

1: SH 93 & SH 170

2043 FUTURE BUILD WEEKEND

08/20/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	106	93	52	135	101	95	60	659	137	69	662	94
Future Volume (veh/h)	106	93	52	135	101	95	60	659	137	69	662	94
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1841	1841	1841	1826	1826	1826
Adj Flow Rate, veh/h	107	94	53	136	102	96	61	666	138	70	669	95
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	2	2	2	2	2	2	4	4	4	5	5	5
Cap, veh/h	125	110	199	193	145	289	333	1323	575	329	1321	589
Arrive On Green	0.13	0.13	0.13	0.19	0.19	0.19	0.06	0.38	0.38	0.06	0.38	0.38
Sat Flow, veh/h	970	852	1549	1039	779	1554	1753	3497	1520	1739	3469	1547
Grp Volume(v), veh/h	201	0	53	238	0	96	61	666	138	70	669	95
Grp Sat Flow(s),veh/h/ln	1822	0	1549	1818	0	1554	1753	1749	1520	1739	1735	1547
Q Serve(g_s), s	12.0	0.0	3.4	13.6	0.0	5.9	2.2	16.2	6.9	2.6	16.4	4.5
Cycle Q Clear(g_c), s	12.0	0.0	3.4	13.6	0.0	5.9	2.2	16.2	6.9	2.6	16.4	4.5
Prop In Lane	0.53		1.00	0.57		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	234	0	199	339	0	289	333	1323	575	329	1321	589
V/C Ratio(X)	0.86	0.00	0.27	0.70	0.00	0.33	0.18	0.50	0.24	0.21	0.51	0.16
Avail Cap(c_a), veh/h	246	0	209	671	0	574	384	1323	575	375	1321	589
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.4	0.0	43.6	42.3	0.0	39.2	19.4	26.5	23.6	19.3	26.4	22.7
Incr Delay (d2), s/veh	29.2	0.0	2.6	9.3	0.0	2.4	0.3	1.4	1.0	0.3	1.4	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.3	0.0	1.5	7.0	0.0	0.2	0.9	6.7	2.5	1.0	6.7	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.6	0.0	46.2	51.6	0.0	41.6	19.6	27.9	24.6	19.7	27.8	23.3
LnGrp LOS	E	A	D	D	A	D	B	C	C	B	C	C
Approach Vol, veh/h		254			334			865			834	
Approach Delay, s/veh		70.2			48.7			26.8			26.6	
Approach LOS		E			D			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.1	50.0		21.3	11.8	50.3		27.7				
Change Period (Y+Rc), s	5.0	8.0		7.0	5.0	8.0		7.0				
Max Green Setting (Gmax), s	10.0	42.0		15.0	10.0	42.0		41.0				
Max Q Clear Time (g_c+I1), s	4.6	18.2		14.0	4.2	18.4		15.6				
Green Ext Time (p_c), s	0.0	14.9		0.3	0.0	14.3		4.5				
Intersection Summary												
HCM 6th Ctrl Delay				34.7								
HCM 6th LOS				C								
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 6th TWSC
3: Marshall Mesa Trailhead/Eldorado Park-n-Ride & SH 170

2043 FUTURE BUILD WEEKEND

08/20/2023

Intersection												
Int Delay, s/veh	1.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	11	281	15	7	296	7	15	0	12	11	0	15
Future Vol, veh/h	11	281	15	7	296	7	15	0	12	11	0	15
Conflicting Peds, #/hr	10	0	0	0	0	10	0	0	0	4	0	32
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	305	16	8	322	8	16	0	13	12	0	16

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	340	0	0	321	0	0	719	693	317	700	697	368
Stage 1	-	-	-	-	-	-	337	337	-	352	352	-
Stage 2	-	-	-	-	-	-	382	356	-	348	345	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1219	-	-	1239	-	-	344	367	724	354	365	677
Stage 1	-	-	-	-	-	-	677	641	-	665	632	-
Stage 2	-	-	-	-	-	-	640	629	-	668	636	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1207	-	-	1239	-	-	320	356	721	338	354	650
Mov Cap-2 Maneuver	-	-	-	-	-	-	320	356	-	338	354	-
Stage 1	-	-	-	-	-	-	669	633	-	651	621	-
Stage 2	-	-	-	-	-	-	600	618	-	646	628	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.3			0.2			14.1			13.2		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	425	1207	-	-	1239	-	-	467
HCM Lane V/C Ratio	0.069	0.01	-	-	0.006	-	-	0.061
HCM Control Delay (s)	14.1	8	0	-	7.9	0	-	13.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.2

HCM 6th TWSC
4: SH 170 & Eldorado Springs Dr & Marshall Dr

2043 FUTURE BUILD WEEKEND

08/20/2023

Intersection												
Int Delay, s/veh	8.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	6	293	15	4	0	320	0	26	0	0	0
Future Vol, veh/h	1	6	293	15	4	0	320	0	26	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	7	318	16	4	0	348	0	28	0	0	0

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	713	725	1	715	711	14	1	0	0	28	0	0
Stage 1	1	1	-	710	710	-	-	-	-	-	-	-
Stage 2	712	724	-	5	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	347	352	1084	346	358	1066	1622	-	-	1585	-	-
Stage 1	1022	895	-	424	437	-	-	-	-	-	-	-
Stage 2	423	430	-	1017	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	285	275	1084	200	280	1066	1622	-	-	1585	-	-
Mov Cap-2 Maneuver	285	275	-	200	280	-	-	-	-	-	-	-
Stage 1	798	895	-	331	341	-	-	-	-	-	-	-
Stage 2	326	336	-	713	895	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.6		23.7		7.2		0	
HCM LOS	A		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1622	-	-	1110	213	1585	-	-
HCM Lane V/C Ratio	0.214	-	-	0.294	0.097	-	-	-
HCM Control Delay (s)	7.8	0	-	9.6	23.7	0	-	-
HCM Lane LOS	A	A	-	A	C	A	-	-
HCM 95th %tile Q(veh)	0.8	-	-	1.2	0.3	0	-	-

APPENDIX D

PEDESTRIAN CROSSING WORKSHEETS

Pedestrian Crossing Installation Request Form

Description of Proposed Crossing Location		<input type="checkbox"/> Official School Crossing ¹
State Highway & Milepost: CO 170, MP 2.8	Cross Streets (if applicable): N/A	Crossing Location: <input type="checkbox"/> At Intersection <input type="checkbox"/> Mid-Block
Nearest Marked and/or Protected Crossing: CO 93 and CO 170		Distance to Proposed Crossing: 450
Pedestrian Traffic Volumes		
<u>AM Pedestrian Counts</u>	<u>Mid-Day Pedestrian Counts</u>	<u>PM Pedestrian Counts</u>
Peak Hour: Pedestrian Volume:	Peak Hour: Pedestrian Volume:	Peak Hour: Pedestrian Volume:
7:30-8:30 AM 10	11:15 AM - 12:15 PM (SAT) 36	5:00 -6:00 PM 5
Please provide the names of businesses and/or other traffic generators at or near the proposed crossing location. This crosswalk provides access from the Eldorado Park-n-Ride Lot (north of CO 170) to the Marshall Mesa Trailhead (south of CO 170)		
Pedestrian Crash History		
<input type="checkbox"/> Crash Reports Attached		
Please provide a brief description of the pedestrian crash history at this location. There were no recorded pedestrian crashes from January 2015 through December 2020 at the existing crosswalk location.		
Additional Information		
Please provide a brief explanation of why the crosswalk is needed. Pedestrians and bicyclist frequently use existing marked crosswalk to move from the park-n-ride lot to the trailhead. Without a marked crossing, pedestrians and bicyclists are likely to cross at unmarked locations.		
Contact Information		
Name of Person Requesting:	Phone Number:	Email:
Street Address:	State:	Zip:

¹ An official school crossing must be designated by the school.

Appendix B: Pedestrian Crossing Evaluation Worksheet

CDOT Pedestrian Crossing Installation Guide, 2021 Edition
Pedestrian Crossing Evaluation Worksheet

Location Description			
State Highway & Milepost: CO 170, MP 2.8		Major Street: CO 170	Crossing Location: <input type="checkbox"/> At Intersection <input type="checkbox"/> Mid-Block <input type="checkbox"/> Roundabout
Existing Traffic Control: <input type="checkbox"/> Stop Sign <input type="checkbox"/> Traffic Signal <input type="checkbox"/> Uncontrolled		Existing Crossing Treatments (if any): Marked Crosswalk	Speed Limit: 30
Official School Crossing: <input type="checkbox"/> Yes <input type="checkbox"/> No		Nearby Pedestrian Generators (schools, transit stops, commercial businesses, etc.): Marshall Mesa Trailhead	
Roadway Configuration: <input checked="" type="checkbox"/> 2-Lane <input type="checkbox"/> 3-Lane w/ Striped Median <input type="checkbox"/> 3-Lane w/ Raised Median <input type="checkbox"/> 4-Lane <input type="checkbox"/> 5-Lane w/ Striped Median <input type="checkbox"/> 5-Lane w/ Raised Median <input type="checkbox"/> 6-Lane <input type="checkbox"/> Other: _____		Crossing Distance by Direction: Total Distance: 40 ft. Dist. to Median: n/a <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W <input type="checkbox"/> Other _____ Dist. to Median: n/a <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W <input type="checkbox"/> Other _____	
Stopping Sight Distance (uncontrolled locations only):		WB: 240' EB: 200'	Is the SSD \geq 8x the speed limit? <input type="checkbox"/> Yes <input type="checkbox"/> No If no, are improvements to SSD feasible? <input type="checkbox"/> Yes <input type="checkbox"/> No

Traffic Volumes and Operations

	AM	MID-DAY	PM	OTHER
Start and End Time:	7:30 to 8:30	to	5:00 to 6:00	11:15 to 12:15
Day of Week:	Wednesday		Wednesday	Saturday
No. of Transit Boardings (if applicable):	not counted		not counted	not counted
No. of Young, Elderly, and Disabled Peds (YED):	not counted		not counted	not counted
No. of Bicyclists:	0		0	0
No. of Non YED Pedestrians:	not counted		not counted	not counted
Total Pedestrians (adjusted for 2x YED):	10		5	36

Major Street Vehicle Volume (Daily): 6200 _____ veh/day

Nearest Intersection (Direction #1)

Cross Street Name: CO 93 and CO 170
Located 450 _____ feet to the N E S W of the crossing location. Signalized? Yes No

	AM	MID-DAY	PM	OTHER
How many times per hour did the downstream vehicle queue back up into the pedestrian crossing?	Synchro 95% queue indicates queue does not reach crosswalk	n/a	Synchro 95% queue indicates queue extends through crosswalk	Synchro 95% queue indicates queue does not reach crosswalk
If multiple lanes per direction, are queue lengths approximately equal?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
If no, which lane is longer (inside, outside, middle) and by how much?	n/a	n/a	n/a	n/a

Nearest Intersection (Direction #2)

Cross Street Name: CO 170 and Marshall Dr/Eldorado Springs Dr
Located 850 _____ feet to the N E S W of the crossing location. Signalized? Yes No

	AM	MID-DAY	PM	OTHER
How many times per hour did the downstream vehicle queue back up into the pedestrian crossing?	0	0	0	0
If multiple lanes per direction, are queue lengths approximately equal?	<input type="checkbox"/> Yes <input type="checkbox"/> No			
If no, which lane is longer (inside, outside, middle) and by how much?	n/a	n/a	n/a	n/a

Appendix C. Figures and Tables

Figure C1. Guidelines for the Installation of Pedestrian Hybrid Beacons on Low-Speed Roadways

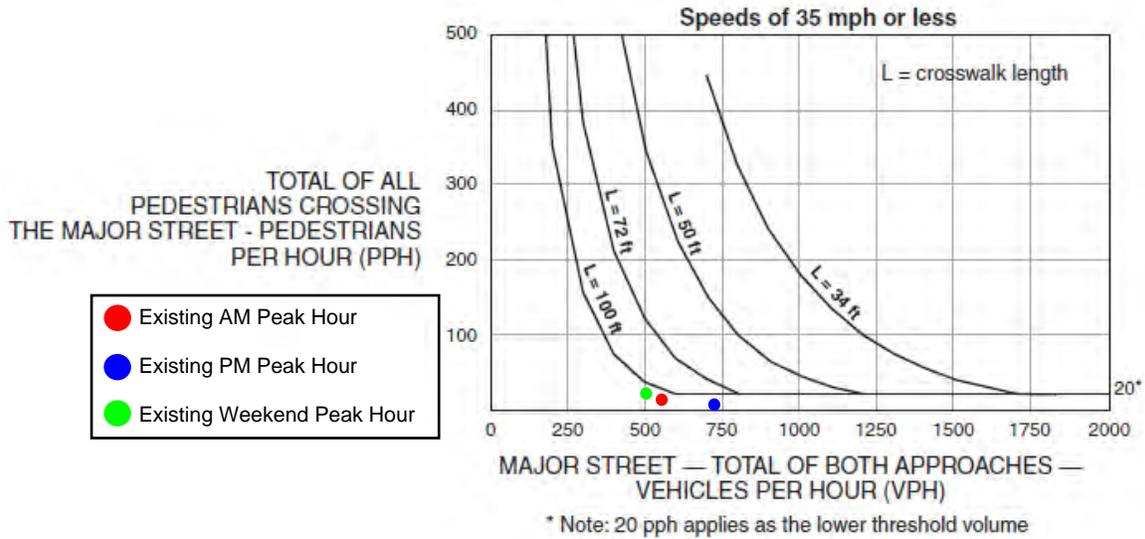


Figure C2. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways

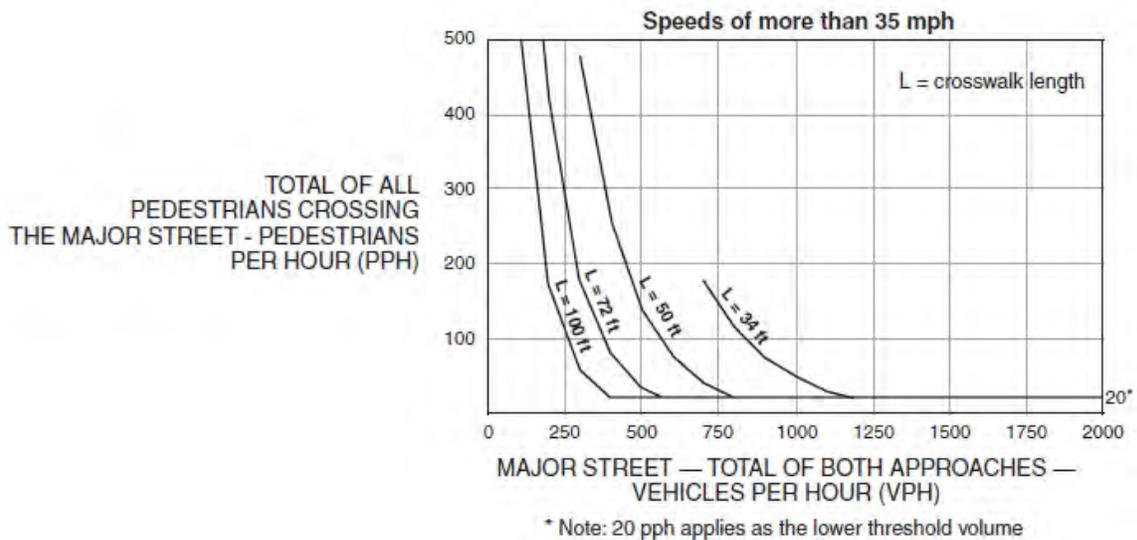
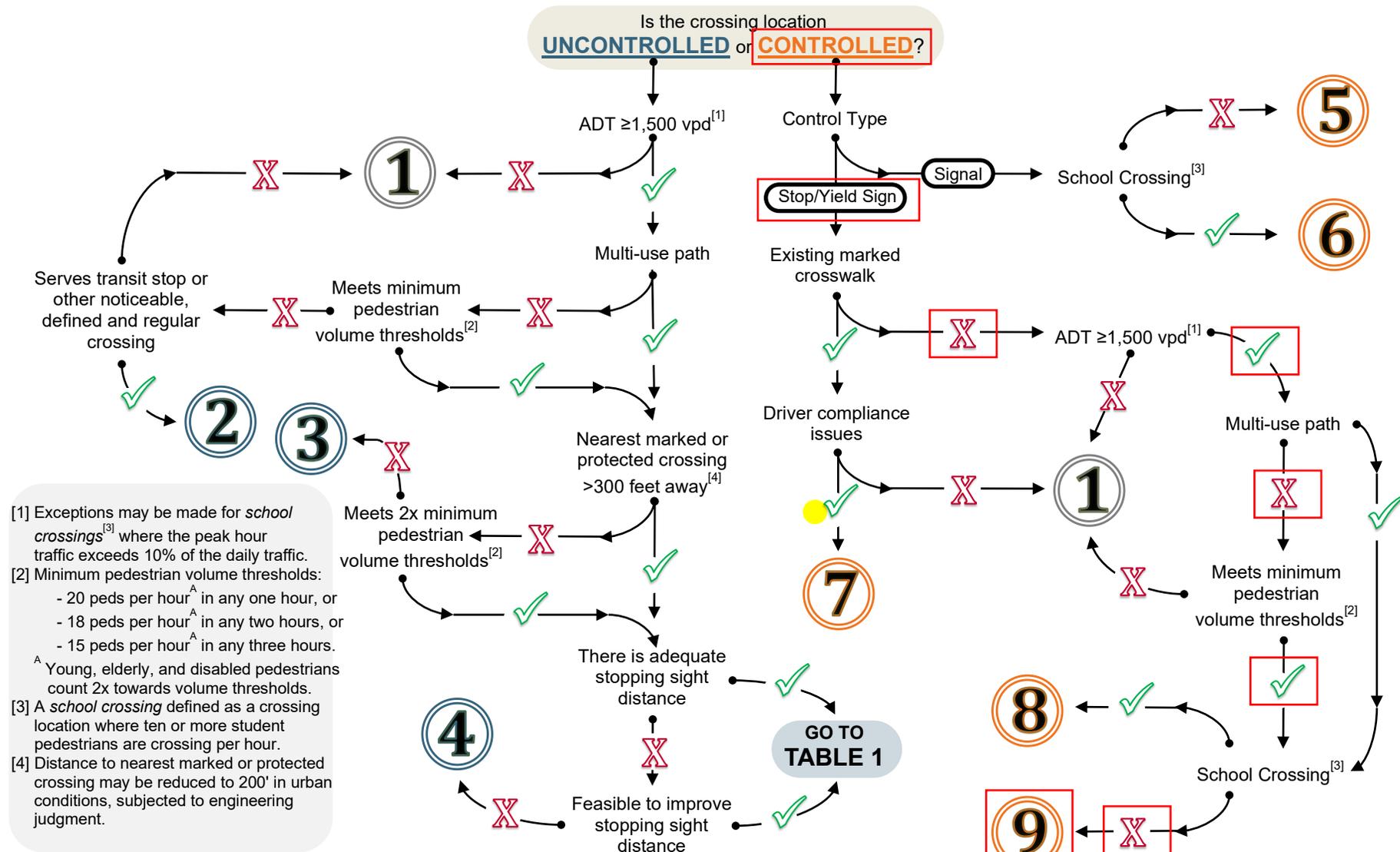


Figure C3. Pedestrian Crossing Evaluation Flowchart



[1] Exceptions may be made for school crossings^[3] where the peak hour traffic exceeds 10% of the daily traffic.
 [2] Minimum pedestrian volume thresholds:
 - 20 peds per hour^A in any one hour, or
 - 18 peds per hour^A in any two hours, or
 - 15 peds per hour^A in any three hours.
^A Young, elderly, and disabled pedestrians count 2x towards volume thresholds.
 [3] A school crossing defined as a crossing location where ten or more student pedestrians are crossing per hour.
 [4] Distance to nearest marked or protected crossing may be reduced to 200' in urban conditions, subjected to engineering judgment.

- ① No action is recommended at this time.
- ② Consider installing an unmarked pedestrian crossing facilitation.
- ③ Direct pedestrians to the nearest marked or protected crossing.
- ④ Direct pedestrians to the nearest marked or protected crossing, **OR** consider installing a pedestrian hybrid beacon, traffic signal, or grade-separated crossing.
- ⑤ Install a marked crosswalk.
- ⑥ Install a marked crosswalk with a school crossing sign (S1-1) on a mast arm.
- ⑦ Consider neck downs, median refuge, or additional signs to increase drive awareness of pedestrians.
- ⑧ Install marked crosswalk with school pedestrian crossing sign (S1-1) and down arrow (16-7p) at the crosswalk plus an advanced (S1-1) signs.
- ⑨ Install marked crosswalk with W11-2 advanced pedestrian signs.

Table C1. Criteria for Pedestrian Crossing Treatments at Uncontrolled Locations

The criteria for pedestrian crossing treatments at uncontrolled locations is intended as a general minimum. Engineering judgment should be used on a case-by-case basis. Prevailing speed may be used if significantly different than posted speed.

Roadway Configuration	Roadway ADT and Posted Speed (mph)															
	1,500 – 9,000 vpd				9,001 – 12,000 vpd				12,001 – 15,000 vpd				> 15,000 vpd			
	≤30	35	40	≥45	≤30	35	40	≥45	≤30	35	40	≥45	≤30	35	40	≥45
2 lanes, one-way street	A	B	C	E	A	B	C	E	B	B	C	E	B	C	C	E
2 lanes, two-way street with no median	A	B	C	E	A	B	C	E	B	B	C	E	B	C	C	E
3 lanes with raised median	A	B	D	E	A	C	D	E	B	D	D	E	C	D	D	E
3 lanes without raised median	C	C	D	E	C	C	D	E	C	C	D	E	C	D	D	E
4 lanes with raised median	A	B	C	E	A	B	C	E	B	B	C	E	B	C	C	E
4 lanes, two-way street without raised median	A	D	D	E	B	D	D	E	B	D	D	E	D	D	D	E
5 lanes with raised median	A	B	D	E	B	C	D	E	B	C	D	E	C	C	D	E
5 lanes without raised median	D	D	D	E	D	D	D	E	D	D	D	E	D	D	D	E
6 lanes with or without raised median	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F

Treatment Descriptions:

- A. Install marked crosswalk with enhanced roadside signs.

Install a marked crosswalk with a standard W11-2 with a W16-7p plaque mounted on the side of the roadway at the crosswalk location and a standard W11-2 advanced pedestrian warning sign. Use S1-1 signs for school crossing locations. An optional R1-6 may be used in addition.

- B. Install marked crosswalk with enhanced roadside and in-roadway signs.
- C. Install marked crosswalk with enhanced signs and geometric improvements to increase pedestrian visibility and reduce exposure.
- D. Install marked crosswalk with enhanced signs, pedestrian activated RRFBs, and geometric improvements to increase visibility pedestrian and reduce exposure.
- E. Do not install marked crosswalk at uncontrolled crossing. Determine if speed limit can effectively be reduced to 40 mph by making geometric or other infrastructure changes (i.e., bulb out, median refuge, etc.). If so, utilize criteria D above. If this is not possible, if pedestrian volume meets warrants, consider a pedestrian hybrid beacon, pedestrian traffic signal, or grade separated crossing.
- F. Do not install marked crosswalk at uncontrolled crossings with three (3) or more through lanes per direction or where the speed limit is greater or equal to 45 mph and/or there is not a median refuge on a 5-lane crossing. Consider pedestrian hybrid beacon, pedestrian traffic signal, or separated crossing.

City of Boulder Pedestrian Crossing Treatment Installation Guidelines
Crossing Location Evaluation Worksheet

Rev. 11/2/11

STEP 1 - LOCATION DESCRIPTION

Major Street: SH 170 Crossing Location: 450' east of SH 93

Is this a multi-use path crossing? Yes No Posted Speed Limit: 30 mph

Existing Traffic Control: Stop Sign Traffic Signal Uncontrolled

Existing Crossing Treatments (if any): Marked crosswalk

Nearby Pedestrian Generators (School, transit stop, commercial, etc.): _____

This crosswalk provides access from the Eldorado Park-n-Ride Lot (north of CO 170) to the Marshall Mesa Trailhead (south of CO 170)

STEP 2 - PHYSICAL DATA

Roadway Configuration: 2-Lane 5 Lane w/Striped Median
 3-Lane w/Striped Median 5 Lane w/Raised Median
 3 Lane w/Raised Median 6 Lane
 4 Lane Other: _____

Crossing Distance By Direction: 40 ft total n/a ft to median n/a ft to median
(if applicable + note direction) (if applicable + note direction)

Nearest Marked or Protected Pedestrian Crossing: CO 93/ CO 170 Distance to: _____ ft

(For uncontrolled location only) Stopping Sight Distance (SSD) = WB: 240' EB: 200' ft _____ ft.

Is SSD ≥ 8x Speed Limit? Yes No If No, are improvements to SSD feasible? Yes No

STEP 3a - TRAFFIC DATA

Pedestrian Crossing Volumes / Bicycle Crossing Volumes:

	AM	Mid-Day	PM	Other
Time:	7:30 AM to 8:30 AM	to	to	to
Date/Day of Week:	7/12/2023/ Wed	/	7/12/2023/ Wed	7/8/2023 / Sat
Major Street Vehicular Volume (Hourly):	546		735	499
# of Transit Boardings (if applicable)	Not counted		Not counted	Not counted
# of Young Peds / Bicyclists	Not counted	/	Not counted	Not counted
# of Elderly Peds	Not counted		Not counted	Not counted
# of Disabled Peds	Not counted		Not counted	Not counted
# of Non-Y/E/D Peds / Bicyclists	Not counted	/	Not counted	Not counted
TOTAL PEDS (Actual) (Include All Bicyclists in Total Sum)				
TOTAL PEDS (Adjusted for 2x Y/E/D				

Major Street Vehicular Volume (Daily): ADT 56200 Page 599 of 663 veh/day

City of Boulder Pedestrian Crossing Treatment Installation Guidelines
Crossing Location Evaluation Worksheet (Continued)

STEP 3b - OPERATIONAL OBSERVATIONS

Nearest Intersection (Direction #1): Cross Street Name: CO 93 and CO 170

Located 450 ft to the N S E W of crossing location

Signalized? Y N Distance from Crossing 300 ft

	AM	Mid-Day	PM	Other
How many times per hour did the downstream vehicle queue back up into pedestrian crossing?	Synchro 95% queue indicates queue does not reach crosswalk		Synchro 95% queue indicates queue extends through crosswalk	Synchro 95% queue indicates queue does not reach crosswalk
If multiple lanes per direction, are queue lengths approximately equal?	Y N	Y N	Y N	Y N
If NO (above), which lane is longer (inside, outside, middle) and by how much (feet)?	n/a	n/a	n/a	n/a

Nearest Intersection (Direction #2): Cross Street Name: CO 170 and Marshall Dr/Eldorado Springs Dr

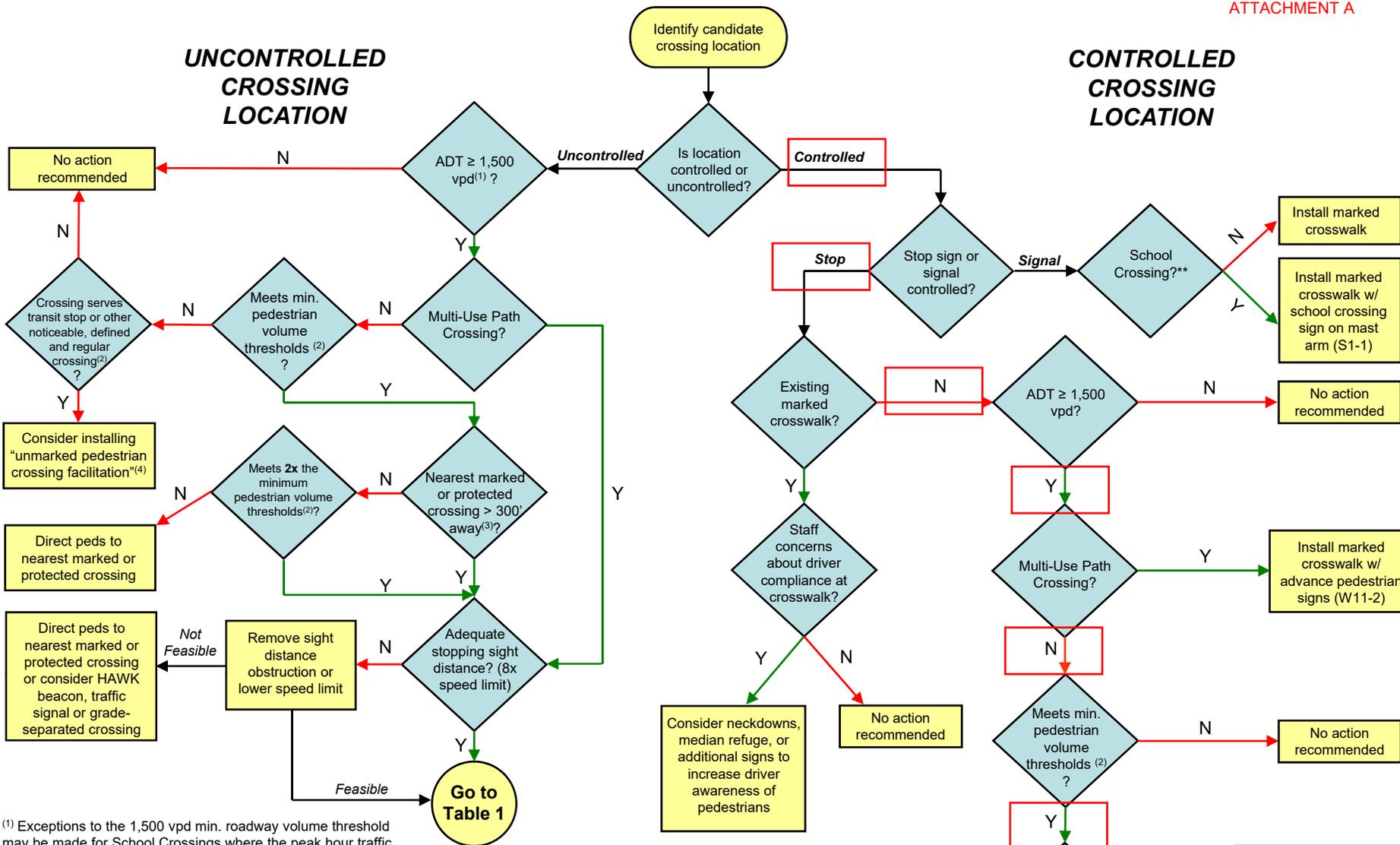
Located 850 ft to the N S E W of crossing location

Signalized? Y N Distance from Crossing 950 ft

	AM	Mid-Day	PM	Other
How many times per hour did the downstream vehicle queue back up into pedestrian crossing?	0	0	0	0
If multiple lanes per direction, are queue lengths approximately equal?	Y N	Y N	Y N	Y N
If NO (above), which lane is longer (inside, outside, middle) and by how much (feet)?	n/a	n/a	n/a	n/a

STEP 4 - APPLY DATA TO FIGURE 1 and TABLE 1

Recommended Treatment(s): _____



(1) Exceptions to the 1,500 vpd min. roadway volume threshold may be made for School Crossings where the peak hour traffic exceeds 10% of the daily traffic

(2) **Minimum Pedestrian Volume Thresholds:**

- 20 peds per hour* in any one hour, or
- 18 peds per hour* in any two hours, or
- 15 peds per hour* in any three hours

* Young, elderly, and disabled pedestrians count 2x towards volume thresholds

** School Crossing defined as a crossing location where ten or more student pedestrians per hour are crossing.

(3) Distance to nearest marked or protected crossing may be reduced to 200' in urban conditions, subject to engineering judgment, where 1) the crosswalk does cross any auxiliary lanes, and 2) crossing treatments and crossing activity would not create undue restriction to vehicular traffic operations.

(4) An "unmarked pedestrian crossing facilitation" is any treatment that improves a pedestrian's ability to cross a roadway, short of the marked, signed and enhanced crossings detailed in Table 1. Installation of this type of pedestrian facilitation is subject to engineering judgment and may include curb ramps and/or a raised median refuge. However, no effort is made to attract pedestrians or recommend that pedestrians cross at this location. The treatments simply provide an improvement for a low volume pedestrian crossing where pedestrians are already crossing and will like continue to cross.

City of Boulder Pedestrian Crossing Treatment Installation Guidelines

Table 1 - Criteria for Crossing Treatments at Uncontrolled Locations

Roadway Configuration	# of lanes crossed to reach a refuge ⁽¹⁾	# of multiple threat lanes ⁽²⁾ per crossing	Roadway ADT and Posted Speed															
			1,500-9,000 vpd				9,000-12,000 vpd				12,000-15,000 vpd				> 15,000 vpd			
			≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph
2 Lanes (one way street)	2	1	A	B	C	E	A	B	C	E	B	B	C	E	B	C	C	E
2 Lanes (two way street with no median)	2	0	A	B	C	E	A	B	C	E	B	B	C	E	B	C	C	E
3 Lanes w/Raised Median	1 or 2	0 or 1	A	B	D	E	A	C	D	E	B	D	D	E	C	D	D	E
3 Lanes w/Striped Median	3	0 or 1	C	C	D	E	C	C	D	E	C	C	D	E	C	D	D	E
4 Lanes (two way street with no median)	4	2	A	D	D	E	B	D	D	E	B	D	D	E	D	D	D	E
5 Lanes w/Raised Median	2 or 3	2	A	B	D	E	B	C	D	E	B	C	D	E	C	C	D	E
5 Lanes w/Striped Median	5	2	D	D	D	E	D	D	D	E	D	D	D	E	D	D	D	E
6 Lanes (two way street with or without median)	3 to 6	4	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F

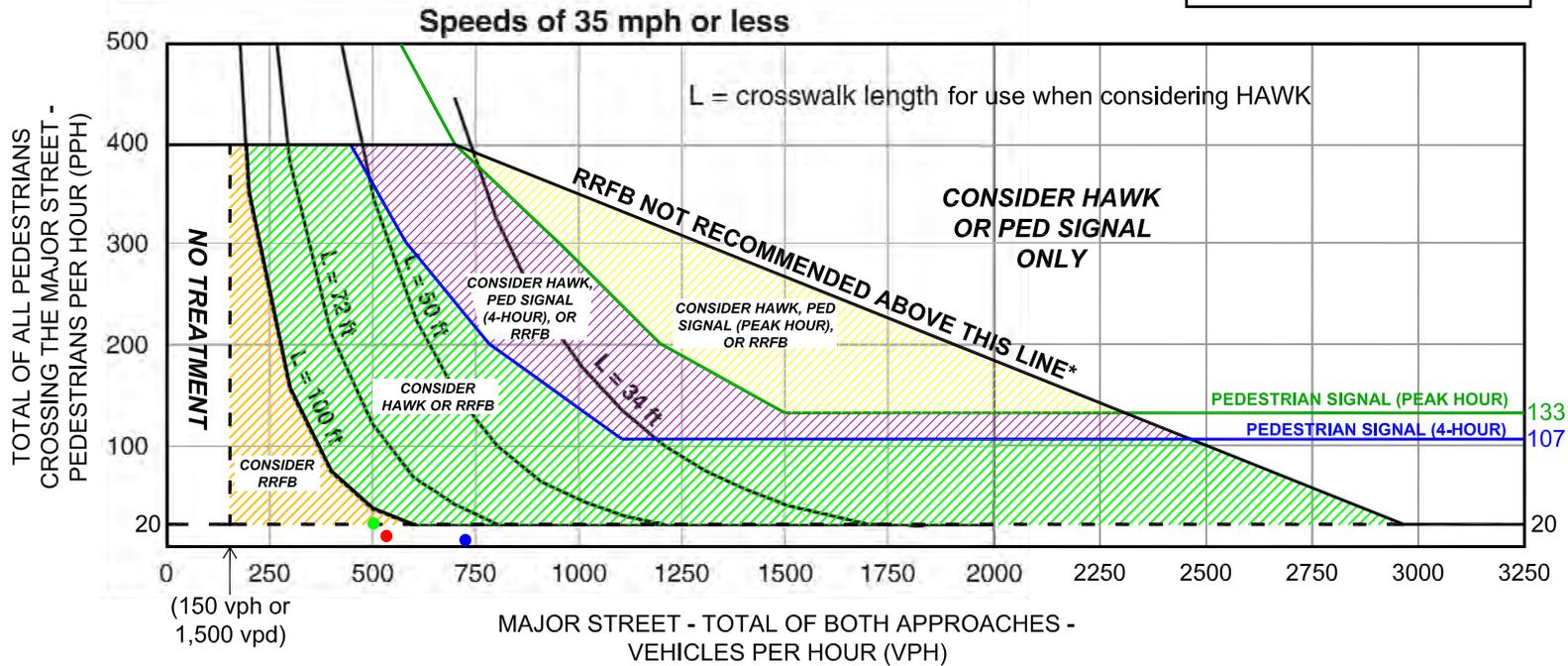
Notes:

1. Painted medians can never be considered a refuge for a crossing pedestrian. Similarly, a 4 foot wide raised median next to a left turn lane can only be considered a refuge for pedestrians if the left turning volume is less than 20 vehicles per hour (meaning that in most cases the left turn lane is not occupied while the pedestrian is crossing).
2. A multiple threat lane is defined as a through lane where it is possible for a pedestrian to step out from in front of a stopped vehicle in the adjacent travel lane (either through or turn lane).

Treatment Descriptions:

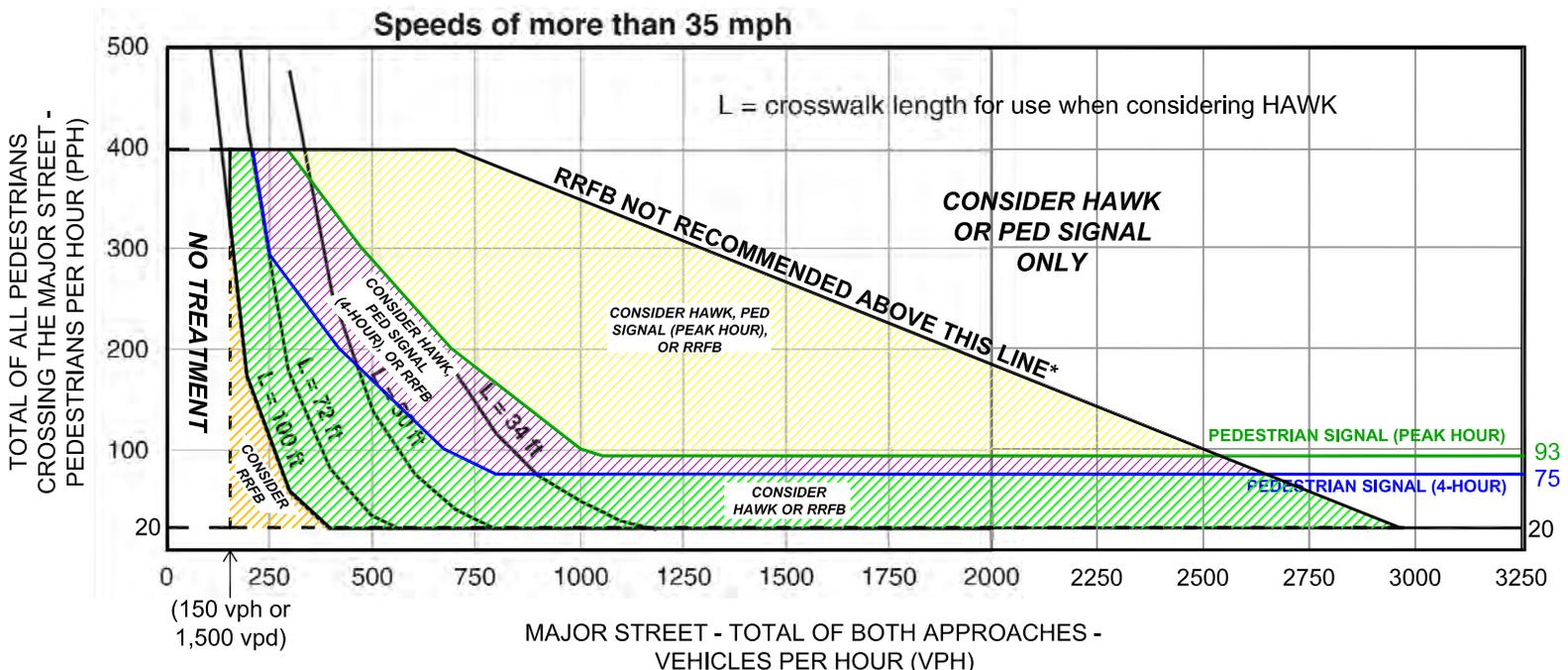
<p>A Install marked crosswalk with enhanced road-side signs</p> <p><i>Specific Guidance:</i> Install marked crosswalk with "State Law - Yield to Pedestrian" signs mounted on the side of the roadway with standard (W11-2) advance pedestrian warning signs; use S1-1 signs for School Crossing locations.</p>
<p>B Install marked crosswalk with enhanced road-side and in-roadway (bollard mounted) signs</p> <p><i>Specific Guidance:</i> Install marked crosswalk with "State Law - Yield to Pedestrian" signs mounted on the side of the roadway and on in-roadway bollards; use standard (W11-2) advance pedestrian warning signs; use S1-1 signs for School Crossing locations.</p>
<p>C Install marked crosswalk with enhanced signs and geometric improvements to increase pedestrian visibility and reduce exposure</p> <p><i>Specific Guidance:</i> For 2 or 3-lane roadways, install marked crosswalk with "State Law - Yield to Pedestrian" signs mounted on the side of the roadway and on in-roadway bollards or median mounted signs; use standard (W11-2) advance pedestrian warning signs; use S1-1 signs for School Crossing locations. Add neckdowns or median refuge islands to shorten the pedestrian crossing distance and increase pedestrian visibility to motorists.</p>
<p>D Install marked crosswalk with enhanced signs, pedestrian activated RRFBs, and geometric improvements to increase pedestrian visibility and reduce exposure</p> <p><i>Specific Guidance:</i> Install raised median refuge island (unless it is a one-way street or one already exists) to shorten the pedestrian crossing distance and increase pedestrian visibility to motorists. [If a median refuge can not be constructed on a two-way street, Go To Scenario F]. Install marked crosswalk with "State Law - Yield to Pedestrian" signs WITH pedestrian activated RRFBs mounted on the side of the roadway and on median mounted signs; use standard (W11-2) advance pedestrian warning signs; use S1-1 signs for School Crossing locations. Consider adding neckdowns at the crossing if on-street parking exists on the roadway and storm drain considerations will allow. [Note: If pedestrian volume falls above the RRFB limit line on Figure 2, consider Hawk beacon, pedestrian traffic signal, or grade-separated crossing.]</p>
<p>E Do not install marked crosswalk at uncontrolled crossing. Determine if the speed limit can be effectively reduced to 40 mph AND a raised refuge median can be installed. If so, utilize Scenario D criteria above. If this is not possible, or if pedestrian volume falls above the RRFB limit line on Figure 2, consider HAWK beacon, pedestrian traffic signal, or grade-separated crossing.</p> <p><i>Specific Guidance:</i> Consider HAWK beacon, pedestrian traffic signal or grade-separated crossing; application of these treatments will consider corridor signal progression, existing grades, physical constraints, and other engineering factors</p>
<p>F Do not install marked crosswalk at uncontrolled crossing with 3 or more THROUGH lanes per direction or where the speed limit is ≥ 45 mph and/or there is not a median refuge on a 5-lane crossing. Consider HAWK beacon, pedestrian traffic signal, or grade-separated crossing.</p> <p><i>Specific Guidance:</i> Consider HAWK beacon, pedestrian traffic signal or grade-separated crossing; application of these treatments will consider corridor signal progression, existing grades, physical constraints, and other engineering factors</p>

Figure 2a. City of Boulder Guidelines for the Installation of Pedestrian Hybrid (HAWK) Beacons, Pedestrian Signals, or Rectangular Rapid Flash Beacon (RRFB) Signs on Low-Speed Roadways



* RECOMMENDATION BASED ON CITY OF BOULDER SAFETY EVALUATIONS AT EXISTING RRFB SITES AND OBSERVED IMPACTS TO VEHICULAR TRAFFIC OPERATIONS

Figure 2b. City of Boulder Guidelines for the Installation of Pedestrian Hybrid (HAWK) Beacons, Pedestrian Signals, or Rectangular Rapid Flash Beacon (RRFB) Signs on High-Speed Roadways



* RECOMMENDATION BASED ON CITY OF BOULDER SAFETY EVALUATIONS AT EXISTING RRFB SITES AND OBSERVED IMPACTS TO VEHICULAR TRAFFIC OPERATIONS



Community Planning & Permitting

Courthouse Annex • 2045 13th Street • Boulder, Colorado 80302 • Tel: 303.441.3930 • Fax: 303.441.4856
 Mailing Address: P.O. Box 471 • Boulder, Colorado 80306 • www.bouldercounty.gov

Building Safety & Inspection Services Team

MEMO

TO: Sam Walker, Planner II
 FROM: Michelle Huebner, Plans Examiner Supervisor
 DATE: June 5, 2024

RE: Referral Response, LU-24-0009: Marshall Mesa Mitigation and Trailhead Earthwork. Limited Impact Special Use Review to permit 364,000 cubic yards of earthwork for subsurface coal fire mitigation and redevelopment of the Marshall Mesa trailhead.

Location: 1842 S. Foothills Highway

Thank you for the referral. We have the following comments for the applicants:

1. **Building Permit.** A grading permit, plan review, and inspection approvals are required for the grading, parking lot, sidewalk, curb, and gutter. The construction documents must be Stamped, signed and sealed by the Colorado design.

Please refer to the county's adopted 2015 editions of the International Codes and code amendments, which can be found via the internet under the link:

2015 Building Code Adoption & Amendments, at the following URL:

<https://assets.bouldercounty.org/wp-content/uploads/2017/03/building-code-2015.pdf>

2. **Accessibility.** Chapter 11 of the IBC and referenced standard ICC A117.1-09 provide for accessibility for persons with disabilities. Any building permit submittals are to include any applicable accessibility requirements, including accessible parking, signage, accessible routes and accessible fixtures and features.
3. **Grading Permit.** A separate grading permit and plan review and inspections approvals are required for the proposed non-foundational grading. Please refer to the county's adopted 2015 editions of the International Codes and code amendments, including IBC Appendix Chapter J for grading.
4. **Observation Reports.** The design professional responsible for the design or a similarly qualified Colorado-licensed design professional is to observe the grading and submit a stamped report to Building Safety & Inspection Services for review and

approval. The final report is to state that the work has been completed in substantial conformance with the approved engineered plans.

5. **Plan Review.** The items listed above are a general summary of some of the county's building code requirements. A much more detailed plan review will be performed at the time of grading permit application.

If the applicants should have questions or need additional information, we'd be happy to work with them toward solutions that meet minimum building code requirements. Please call (720) 564-2640 or contact us via e-mail at building@bouldercounty.org



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 Mailing Address: P.O. Box 471 • Boulder, Colorado 80306
 303-441-3930 • www.BoulderCounty.gov

MEMO TO: Agencies and Adjacent Property Owners
FROM: Sam Walker, Planner II
DATE: June 4, 2024
RE: Docket LU-24-0009

Docket LU-24-0009: Marshall Mesa Mitigation and Trailhead Earthwork

Request: Limited Impact Special Use Review to permit 364,000 cubic yards of earthwork for subsurface coal fire mitigation and redevelopment of the Marshall Mesa trailhead.
Location: 1842 S. Foothills Highway, at the southeast corner of the intersection of SH 170 and SH93 in Section 21, Township 1S, Range 70W.
Zoning: Business (B) and Agricultural (A) Zoning Districts
Applicant: City of Boulder c/o Adam Gaylord

Limited Impact Special Review is required of proposed uses that may have greater impacts on services, neighborhoods, or the environment than those allowed by right under the Boulder County Land Use Code. This process will review conformance of the proposed use with the Boulder County Comprehensive Plan and the Land Use Code.

This process includes a public hearing before the Board of County Commissioners. Adjacent property owners and holders of liens, mortgages, easements or other rights in the subject property are notified of this hearing.

The Community Planning & Permitting staff and County Commissioners value comments from individuals and referral agencies. Please check the appropriate response below or send a letter to the Community Planning & Permitting Department at P.O. Box 471, Boulder, Colorado 80306 or via email to planner@bouldercounty.gov. All comments will be made part of the public record and given to the applicant. Only a portion of the submitted documents may have been enclosed; you are welcome to call the Community Planning & Permitting Department at 303-441-3930 or email planner@bouldercounty.gov to request more information. If you have any questions regarding this application, please contact me at 720-564-2738 or swalker@bouldercounty.gov.

Please return responses by **June 19, 2024**.

We have reviewed the proposal and have no conflicts.
 Letter is enclosed.

Signed  PRINTED Name Jessica Fasick

Agency or Address CP&P Historic Review

Date 6/6/24



Dedicated to protecting and improving the health and environment of the people of Colorado

Sam Walker
 Planner II
 Boulder County Community Planning & Permitting
 P.O. Box 471, Boulder, CO 80306

VIA EMAIL

RE: Referral Packet for Docket LU-24-0009: Marshall Mesa Mitigation and Trailhead Earthwork at 1842 S. Foothills Highway

Dear Sam Walker,

The Colorado Department of Public Health and Environment's Air Pollution Control Division (APCD or Division) received a request for conformity review concerning the proposed Marshall Mesa Mitigation and Trailhead Earthwork project as described in your correspondence dated June 4, 2024. The Division has reviewed the project letter and respectfully offers the following comments. Please note that the following Air Quality Control Commission (AQCC) regulations may not be inclusive of the regulations the proposed project will be subject to. It is the responsibility of the involved parties to determine what regulations they are subject to and follow them accordingly.

Odor

All businesses in Colorado are subject to AQCC Regulation Number 2 (Odor Emission) and a permit may be required for the installation of odor control equipment. Please refer to AQCC Number 2 for guidance on odor suppression actions. You may also view the complete regulatory language at <https://cdphe.colorado.gov/aqcc-regulations>.

Land Development

We also note that projects similar to this proposal often involve land development. Under Colorado air quality regulations, land development refers to all land clearing activities, including but not limited to land preparation such as excavating or grading, for residential, commercial or industrial development. Land development activities release fugitive dust, a pollutant regulated by the Division. Small land development activities are not subject to the same reporting and permitting requirements as large land activities. Specifically, land development activities that are less than 25 contiguous acres and less than 6 months in duration do not need to report air emissions to the Division. It is important to note that even if a permit is not required, fugitive dust control measures including the Land Development APEN Form APCD-223 must be followed at the site. Fugitive dust control techniques commonly included in the plan are included in the table below.

Control Options for Unpaved Roadways	
Watering	Use of chemical stabilizer
Paving	Controlling vehicle speed



Graveling	
Control Options for Mud and Dirt Carry-Out Onto Paved Surfaces	
Gravel entry ways	Washing vehicle wheels
Covering the load	Not overfilling trucks
Control Options for Disturbed Areas	
Watering	Application of a chemical stabilizer
Revegetation	Controlling vehicle speed
Compaction	Furrowing the soil
Wind Breaks	Minimizing the areas of disturbance
	Synthetic or Natural Cover for Slopes

Please refer to the website <https://cdphe.colorado.gov/apens-and-air-permits> for information on land use APENs and permit forms. Click on “Land Development” to access the land development specific APEN form. Please contact KC Houlden, Construction Permits Unit Supervisor, at 303-692-4092, kenneth.houlden@state.co.us if you have any specific questions about APENs and permit forms.

If you have any other questions or need additional information, please use the contact info listed above, or e-mail or call me directly. Thank you for contacting the Air Pollution Control Division about your project.

Sincerely,
 Brendan Cicione
 Air Quality and Transportation Planner
 General SIP Unit
 Air Pollution Control Division
 Colorado Department of Public Health and Environment
 303-691-4104 // brendan.cicione@state.co.us





Public Health

Environmental Health Division

June 12, 2024

TO: Staff Planner, Land Use Department

FROM: Jessica Epstein, Environmental Health Specialist

SUBJECT: LU-24-0009: Marshall Mesa Mitigation and Trailhead Earthwork

OWNER: City of Boulder

PROPERTY ADDRESS: 1842 S. Foothills Highway

SEC-TOWN-RANGE: 21 -1S -70

The Boulder County Public Health (BCPH) – Environmental Health division has reviewed the submittals for the above referenced docket and has the following comments.

OWTS Application Needed:

1. Boulder County Public Health issued a new permit for the installation of a vaulted privy on 5/10/06. Boulder County Public Health approved the installation of the vaulted privy on 9/20/06. The parcel number associated with the permit is 157721000023. The updated parcel number for this address is 157721000077.
2. The application mentions a installing a new vaulted restroom. The owner or their agent (e.g., contractor) must apply for an OWTS permit, and the OWTS permit must be issued prior to vaulted pricy installation and before a building permit can be obtained. The vaulted privy be installed, inspected and approved before Final Building Inspection approval will be issued by Community Planning and Permitting (CP&P).

This concludes comments from the Public Health - Environmental Health division at this time. For additional information on the OWTS application process and regulations, refer to the following website: www.SepticSmart.org. If you have additional questions about OWTS, please do not hesitate to contact HealthOWS@bouldercounty.org.

Cc: OWTS file, owner, Community Planning and Permitting



Community Planning & Permitting

Courthouse Annex • 2045 13th Street • Boulder, Colorado 80302

Mailing Address: P.O. Box 471 • Boulder, Colorado 80306 •

Tel: 303-441-3930 • www.BoulderCounty.gov

June 14, 2024

TO: Sam Walker, Planner II; Community Planning & Permitting, Development Review Team - Zoning

FROM: Brian P. Kelly, Planner II, Community Planning & Permitting, Development Review Team – Access & Engineering

SUBJECT: Docket # LU-24-0009: City of Boulder Marshall Mesa Mitigation and Trailhead Earthwork - 1842 S Foothills Highway

The Development Review Team – Access & Engineering staff has reviewed the above referenced docket and has the following comments:

1. The subject property is accessed from Marshall Drive, also known as State Highway 170, a Colorado Department of Transportation (CDOT) owned and maintained right-of-way (ROW). Legal access has been demonstrated via adjacency to the public ROW.
2. The submitted plans appear to meet the Boulder County Multimodal Transportation Standards (Standards). However, the quality of the submitted plans were not completely legible and the parking lot details and callouts could not always be read.
 - a. The negative 5.12% grade at the approach exceeds the negative 2% requirement specified in the Standards and must be revised.
 - b. The curve through the grade at Station 11+00 exceeds the maximum allowable of 6% and must be revised.
 - c. Parking space dimensions and wheel stop details must meet the Standards.
 - d. Given the tight turning radii at the general parking area, staff recommends clear signage directing oversize vehicles to the oversize parking area.
3. The parking plans submitted do not demonstrate provisions for electric vehicle service equipment (Charging Station). Plans must provide adequate number of Charging Station parking in accordance with Article 4-513(D) of the Boulder County Land Use Code.
4. Be aware, if traffic volume has increased by 20% or more, the access permit must be revised. Contact CDOT for more information at Timothy Bilobran (timothy.bilobran@state.co.us), 970-350-2163.
5. Staff noticed in the Traffic Impact Study (TIS) that bookmarked references in the text, displayed “Error! Not a valid bookmark” or something similar (See top of p. 34 of TIS as an example). Staff concurs with the findings of the report but recognizes CDOT approval is necessary to implement the following recommendations:
 - Adjust the signal timing at the intersection of Colorado SH93/SH170
 - Relocate the pedestrian crossing to the new access location
 - Add Rectangular Rapid Flashing Beacons (RRFB) at the pedestrian crosswalk
 - Install advance pedestrian warning signs

At building permit, resubmit report with corrected bookmark links or provide alternative reference notation.

At building permit, submit plans that demonstrate a Boulder County Multimodal Transportation Standards compliant access and parking plan. If designed to the City of Boulder Standards and not the County Standards, please provide the specification standards.

Prior to issuance of a Certificate of Occupancy/At final inspection, the Community Planning & Permitting Department must verify that the access and parking area has been constructed to comply with the Standards.

6. A drainage letter was not submitted that includes calculations demonstrating that the access culvert, cross culvert, detention basin and bioretention drainage facilities have been sized appropriately.

At building permit, submit hydraulic calculations for the proposed culverts and associated drainage facilities. Revise plans, as necessary.

7. As a part of Boulder County's water quality protection and Municipal Separate Storm Sewer System (MS4) Construction Program, a Stormwater Quality Permit (SWQP) is required for this project based on the disturbance illustrated in the submitted materials.

At building permit, provide a complete SWQP submittal to stormwater@bouldercounty.gov.

8. During construction, all vehicles, materials, machinery, dumpsters, and other items shall be staged on the subject property; no items shall be stored or staged on Marshall Drive (SH170).

This concludes our comments at this time.



Right of Way & Permits

1123 West 3rd Avenue
 Denver, Colorado 80223
 Telephone: **303.571.3306**
 Facsimile: 303.571.3284
 donna.l.george@xcelenergy.com

June 17, 2024

Boulder County Community Planning and Permitting
 PO Box 471
 Boulder, CO 80306

Attn: Sam Walker

Re: Marshall Mesa Mitigation and Trailhead Earthwork, Case # LU-24-0009

Public Service Company of Colorado's (PSCo) Right of Way & Permits Referral Desk has reviewed the limited impact special use for **Marshall Mesa Mitigation and Trailhead Earthwork**. Please be aware PSCo owns and operates existing natural gas and electric distribution facilities within the proposed project activities. Note that proper clearances must be maintained including ground cover over buried facilities that should not be modified from original depths. In other words, if the original cover is changed (less or more), PSCo facilities must be raised or lowered to accommodate that change. Contact Colorado 811 before excavating. Use caution and hand dig when excavating within 18-inches of each side of the marked facilities. Please be aware that all risk and responsibility for this request are unilaterally that of the Applicant/Requestor.

Additionally, per the National Electric Safety Code, a minimum 10-foot radial clearance must be maintained at all times from all overhead electric facilities including, but not limited to, construction activities and permanent structures.

For any new natural gas or electric service or modification to existing facilities, the property owner/developer/contractor must complete the application process via www.xcelenergy.com/InstallAndConnect.

If additional easements need to be acquired by separate PSCo, a Right-of-Way Agent will need to be contacted.

Donna George
 Right of Way and Permits
 Public Service Company of Colorado dba Xcel Energy
 Office: 303-571-3306 – Email: donna.l.george@xcelenergy.com

Walker, Samuel

From: CGS_LUR <CGS_LUR@mines.edu>
Sent: Tuesday, June 18, 2024 2:40 PM
To: Walker, Samuel
Subject: Re: [EXTERNAL] Referral Packet for Docket LU-24-0009: Marshall Mesa Mitigation and Trailhead Earthwork at 1842 S. Foothills Highway

Hi Sam,

The Colorado Geological Survey fully supports the Marshall Mesa mitigation and earthwork proposed by the Colorado Division of Reclamation, Mining, and Safety. CGS has no objection to approval of Docket LU-24-0009.

Thanks,
 Jill Carlson

Land Use Review Program
 Colorado Geological Survey
 1801 Moly Road
 Golden, CO 80401
 cgs_lur@mines.edu
 303-384-2655

From: Morgan, Heather <hmorgan@bouldercounty.gov>
Sent: Tuesday, June 4, 2024 9:01 AM
To: !LongRange <longrange@bouldercounty.gov>; Historic <historic@bouldercounty.gov>; #WildfireMitigation <WildfireMitigation@bouldercounty.org>; Ruzzin, Mark <mruzzin@bouldercounty.gov>; #AssessorReferral <AssessorReferral@bouldercounty.org>; #CAreferral <CAreferral@bouldercounty.gov>; #CEreferral <CEreferral@bouldercounty.gov>; Skufca, Erika <eskufca@bouldercounty.gov>; Oehlkers, Jason <joehlkers@bouldercounty.gov>; Allshouse, Alycia <aallshouse@bouldercounty.gov>; Kiepe, Bob <bkiepe@bouldercounty.gov>; Kelly, Allison <akelly@bouldercounty.gov>; nfishbein@tnc.org <nfishbein@tnc.org>; eldocommunity@gmail.com <eldocommunity@gmail.com>; info@eldoradosprings.com <info@eldoradosprings.com>; BDRCO@xcelenergy.com <BDRCO@xcelenergy.com>; Donna.L.George@xcelenergy.com <Donna.L.George@xcelenergy.com>; Ranglos, Chris <ranglosc@bouldercolorado.gov>; bonnellj@bouldercolorado.gov <bonnellj@bouldercolorado.gov>; CollinsB@bouldercolorado.gov <CollinsB@bouldercolorado.gov>; CassidyJ@bouldercolorado.gov <CassidyJ@bouldercolorado.gov>; planning@superiorcolorado.gov <planning@superiorcolorado.gov>; planning@louisvilleco.gov <planning@louisvilleco.gov>; Vanessa McCracken <bldrvalleyandlongmontcds@gmail.com>; cdphe_localreferral@state.co.us <cdphe_localreferral@state.co.us>; CGS_LUR <CGS_LUR@mines.edu>; hc_filesearch@state.co.us <hc_filesearch@state.co.us>; eldorado.park@state.co.us <eldorado.park@state.co.us>; john.carson@state.co.us <john.carson@state.co.us>; stephanie.sisroy@state.co.us <stephanie.sisroy@state.co.us>; mike.mchugh@state.co.us <mike.mchugh@state.co.us>; Gill, Lisa <lisa.gill@state.co.us>; david.dixon@state.co.us <david.dixon@state.co.us>; coloradoes@fws.gov <coloradoes@fws.gov>; prevention@mvfpd.org <prevention@mvfpd.org>; Atherton-Wood, Justin <jatherton-wood@bouldercounty.gov>; Moline, Jeffrey <jmoline@bouldercounty.gov>; Flax, Ron <rflax@bouldercounty.gov>; Frederick, Summer <sfrederick@bouldercounty.gov>; HealthWaterQuality-EnvironmentalBP LU <HealthWQ-EnvironBPLU@bouldercounty.gov>; Huebner, Michelle <mhuebner@bouldercounty.gov>; Morgan, Heather <hmorgan@bouldercounty.gov>; Sanchez, Kimberly <ksanchez@bouldercounty.gov>; Transportation Development Review <TransDevReview@bouldercounty.gov>; West, Ron <rowest@bouldercounty.gov>
Cc: Walker, Samuel <swalker@bouldercounty.gov>; Duchi, Trevor <tduchi@bouldercounty.gov>
Subject: [EXTERNAL] Referral Packet for Docket LU-24-0009: Marshall Mesa Mitigation and Trailhead Earthwork at 1842 S. Foothills Highway

CAUTION: This email originated from outside of the Colorado School of Mines organization. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Please find attached the public notice and [click here](#) for the referral packet for Docket **LU-24-0009: Marshall Mesa Mitigation and Trailhead Earthwork** at **1842 S. Foothills Highway**.

Please return responses and direct any questions to [Sam Walker](#) by **June 19, 2024**. (Boulder County internal departments and agencies: Please attach the referral comments in Accela.)



Heather Morgan | Lead Administrative Technician

Planning Division | Boulder County Community Planning & Permitting

P.O. Box 471, Boulder, CO 80306 | Courthouse Annex—2045 13th St., Boulder, CO 80302

hmorgan@bouldercounty.gov | (720) 864-6510 | www.boco.org/cpp

My usual working hours are Monday – 7:00-11:00 a.m., Tuesday-Friday – 6:30 a.m. – 4:00 p.m.

*Boulder County has migrated all email to the .gov domain. Please update your contact lists to reflect the change from hmorgan@bouldercounty.org to hmorgan@bouldercounty.gov. **Emails sent to both .org and .gov addresses will continue to work.** This work is part of the migration to the .gov domain that began in July 2022 when the Boulder County website moved to www.bouldercounty.gov. This move to the .gov domain provides a higher level of cybersecurity protection.*



Parks & Open Space

5201 St. Vrain Road • Longmont, CO 80503
 303-678-6200 • POSinfo@bouldercounty.org
 www.BoulderCountyOpenSpace.org

TO: Sam Walker, Community Planning & Permitting Department
FROM: Ron West, Natural Resource Planner
DATE: June 24, 2023
SUBJECT: Docket LU-24-0009, OSMP, Marshall Mesa Mitigation and Trailhead

Site Conditions

I have reviewed the submitted materials, and have visited the trailhead and environs many times in the past. Current conditions are well-described in the application and will not be repeated here.

County Comprehensive Plan Designations

The parcel has the following designations in the Boulder County Comprehensive Plan, or from other resource inventories.

- Environmental Conservation Area – Boulder Mountain Park/South Boulder
- High Biodiversity Area – Marshall Mesa, ranked B2, of very high significance
- Public Lands and Trails – City of Boulder OSMP
- Rare Plant Area
- View Protection Corridor – associated with highways 93 and 170
- Major Agricultural Ditch -- Davidson

Discussion

Although a large area would be disturbed, staff supports the proposal as a long-term necessity. Staff estimates the overall disturbance – including the two excavations and work areas, and the entire trailhead – to be about 8 acres total. Some of the above-listed resources, as mapped in the Comprehensive Plan, would be temporarily impacted, but benefitted in the long-term. Restoration of the large subsurface work areas with native species should actually be an improvement over the existing conditions with many non-native species

Staff has the following questions and comments.

The OSMP narrative states that, “The project will not result in excess cut” yet the February 1, 2024, letter from Tetra Tech to the Colorado Division of Reclamation, Mining, and Safety states that, “It is anticipated that *most* of the excavated materials will be blended and placed back in the excavations” (emphasis added). What was the experience with the already-completed coal-fire mitigation work on the south side of the highway – the Lewis project? Was some material hauled away? This could occur if: the engineers determine that some material – unburned coal(?) – should be removed; or post-excavation compaction results in an “expanded” amount of material than that which was excavated; or unexpected material such as concrete waste is encountered.

Tetra Tech's 1/30/2024 Figure 1 in this same letter does not include a legend. Are the three "cobbled" icon areas for stockpiling, and if so are these large enough? (Staff understands, however, the staged nature of the excavation and filling.) Is the "double-X" line a fence, and if so why is it only on one side of the excavation? What are the small boxes and the one bold box next to the highway on the north end? The former might be tracking pads, but the narrative states that access will be via the existing trailhead access.

Although "topsoil" may not exist per se in the excavation areas, would the surface layers be removed and isolated to be replaced on top? Presumably the upper soils would at least be more fertile than lower layers.

All machinery needs to be pressure washed before entering the site to remove mud and possible weed seeds. A spill kit, with written instructions, must be kept on-site at all times. These should be conditions of approval.

How long is it expected that the trailhead will be closed?

As stated in the application, OSMP must comply with the Best Management Practices (BMPs) in their Wetlands Protection Program (1995), and their Ecological Best Management Practices (2013). Grading limits will be clearly marked. Where will refueling take place and what type of BMP's used?

A Revegetation Plan is required that includes: native species to be used, an explanation of the treatment of excavated topsoil, mapped delineation of all disturbance areas (this includes construction staging and stockpiling areas), tree protection details, locations of silt fences or erosion control logs down slope of disturbed areas, and matting requirements on steeper slopes.

The narrative states that, "...restoration areas and areas of temporary impact will be seeded...*and covered with...erosion control blanket*" (emphasis added). This totals about 8 acres. Staff questions whether so much blanket is necessary, not to mention the cost of such. On the other hand, it certainly is a windy site. Though mentioned in the narrative, "cuttings" likely would not be used, and non-native crack willow should not be a problem.

Who is responsible for revegetation of the subsurface work areas – OSMP or the state? Or, the state with oversight of OSMP?

Recommendations

- The above questions and comments should be considered and resolved.

Walker, Samuel

From: Molly Bockmann <mollybockmann@gmail.com>
Sent: Tuesday, June 4, 2024 8:17 AM
To: Levy, Claire; Walker, Samuel; Case, Dale
Subject: [EXTERNAL] LU-24-0009 Marshall Mesa trailhead

I'd like to submit a public comment regarding the crosswalk from the park and ride to the trail correcting it to the main Marshall parking area.

Due to the location of this crosswalk being set back from the intersection at 93 and after a curve, it seems like it should have a blinker. I have on several occasions ridden out this way from town and attempted to cross at this crosswalk. The traffic was backed up from the stoplight, past the crosswalk. In order to cross, I had to go between cars and then put the nose of my bike out in order for the traffic coming east to see me. On two occasions none of the cars stopped for me despite being in the crosswalk.

I'm a coach for Boulder High mountain bike team, and I take riders out this direction when we have permits and have seen Fairview coaches do the same. I also take my own children out here to ride. This crosswalk is very dangerous, especially during rush hours, which is typically when people are riding after school and work. I would highly recommend adding a blinker, either a push button or automatic to this crosswalk.

Thanks for your consideration.
Molly Bockmann

Walker, Samuel

From: Pam Decker <PamDecker@CollegeCounselingService.com>
Sent: Tuesday, June 11, 2024 10:50 AM
To: Walker, Samuel; Case, Dale
Cc: Pam Decker
Subject: [EXTERNAL] Marshall Mesa Reclamation

Dear Boulder County,

I am a resident of the Marshall area and would like to support the following comments regarding the Marshall Mesa reclamation and trailhead improvements (regarding docket: LU-24-0009):

1- It has been brought to our attention that the Federal Infrastructure Bill is funding the reclamation of the underground burning coal fire at the City's trailhead- we understand that a priority of this funding is to repair/replace water supplies that are impacted by some of the very mines that are being reclaimed on the City's property. We ask that the City and County support our community and the Department of Mining with the evaluation of water supplies and replacement of supplies impacted by the abandoned coal mines, aligning with the guidance of the Federal Infrastructure Bill. Furthermore, unless the risk of surface ignition by this underground coal fire will be eliminated by the reclamation, we ask the City and County to do everything possible to ensure the safety of our community, this includes working with the Department of Mining to secure water resources for the community that is impacted.

2- We are aware that in the process to open the Marshall Mesa trailhead in 2006, the City of Boulder stated they would fill a 27,000 gallon cistern as a fire supply point for the Town of Marshall and Eldorado Springs. We understand that this was never completed but are pleased to hear a cistern will be installed by Mountain View Fire District under this current proposal. We ask the County to ensure the cistern is a "condition of approval" of the City's permit to make sure the cistern is installed as proposed this time.

3- The Traffic Report provided by the City states: "Due to the SSD [stopping sight distance] limitations in the eastbound direction that is not feasible to remove, it is recommended an enhanced crosswalk be evaluated, such as an RRFB [rectangular rapid flashing beacon]." (pg 35 of Mueller Report) further, the report states: 'In addition to the RRFB, it is recommended that Advanced Pedestrian Warning Signs be installed in advance of the crosswalk in both the eastbound and westbound direction.' We support the recommendations for a RRFB in addition to pedestrian warning signs at this crosswalk.

Thank you for considering these comments,

Pamela and Daniel Decker

*Marshall Area Resident
 5608 Marshall Dr
 Boulder, CO 80303*

*Pamela Decker
 Senior Consultant /Educational Counselor*

College Counseling Service

www.collegecounselingservice.com

720-320-4923 Fax: 303-499-2063



Walker, Samuel

From: Laura Schmonsees <lkschmoo73@gmail.com>
Sent: Wednesday, June 19, 2024 2:12 PM
To: Walker, Samuel; dcase@bouldercounty.gov
Subject: [EXTERNAL] Marshall mesa reclamation and trailhead comments

Dear Boulder County,

I am a resident of the Marshall area just North of the reclamation area, and have some comments regarding the Marshall Mesa reclamation and trailhead improvements (regarding docket: LU-24-0009):

*1- It has been brought to our attention that the Federal Infrastructure Bill is funding the reclamation of the underground burning coal fire at the City's trailhead- we understand that a priority of this funding is to repair/replace water supplies that are impacted by some of the very mines that are being reclaimed on the City's property. **We ask that the City and County support our community and the Department of Mining with the evaluation of water supplies and replacement of supplies impacted by the abandoned coal mines, aligning with the guidance of the Federal Infrastructure Bill.** Furthermore, unless the risk of surface ignition by this underground coal fire will be eliminated by the reclamation, we ask the City and County to do everything possible to ensure the safety of our community, this includes working with the Department of Mining to secure water resources for the community that is impacted.*

*2- We are aware that in the process to open the Marshall Mesa trailhead in 2006, the City of Boulder stated they would fill a 27,000 gallon cistern as a fire supply point for the Town of Marshall and Eldorado Springs. We understand that this was never completed but are pleased to hear a cistern will be installed by Mountain View Fire District under this current proposal. **We ask the County to ensure the cistern is a "condition of approval" of the City's permit to make sure the cistern is installed as proposed this time.***

3- upon looking at the proposed new trailhead plan, I believe there's not enough parking for the predicted growth of use at these trailheads. Already currently during the weekends people are parking all along the road. This is only going to increase, and since there is such an impacted area due to reclamation, there should be more parking created over this impacted site to account for future use at the trailhead as well as more shuttle driving to Eldorado Canyon.

4- The Traffic Report provided by the City states: "Due to the SSD [stopping sight distance] limitations in the eastbound direction that is not feasible to remove, it is recommended an enhanced crosswalk be evaluated, such as an RRFB [rectangular rapid flashing beacon]." (pg 35 of Mueller Report) further, the report states: 'In addition to the RRFB, it is recommended that Advanced Pedestrian Warning Signs be installed in advance of the crosswalk in both the eastbound and westbound direction.' We support the recommendations for a RRFB in addition to pedestrian warning signs at this crosswalk.

Thank you for considering these comments,

Laura Schmonsees
 Marshall Area Resident
 Sent from my iPhone
 Sent from my iPhone

Walker, Samuel

From: Jeff Giddings <jeffgiddings1@gmail.com>
Sent: Wednesday, June 19, 2024 2:26 PM
To: Walker, Samuel
Cc: Case, Dale
Subject: [EXTERNAL] Marshall Mesa reclamation and trailhead comments

Dear Boulder County,

I am a resident of the Marshall area just North of the reclamation area, and have some comments regarding the Marshall Mesa reclamation and trailhead improvements (regarding docket: LU-24-0009):

1- It has been brought to our attention that the Federal Infrastructure Bill is funding the reclamation of the underground burning coal fire at the City's trailhead- we understand that a priority of this funding is to repair/replace water supplies that are impacted by some of the very mines that are being reclaimed on the City's property. **We ask that the City and County support our community and the Department of Mining with the evaluation of water supplies and replacement of supplies impacted by the abandoned coal mines, aligning with the guidance of the Federal Infrastructure Bill.** Furthermore, unless the risk of surface ignition by this underground coal fire will be eliminated by the reclamation, we ask the City and County to do everything possible to ensure the safety of our community, this includes working with the Department of Mining to secure water resources for the community that is impacted.

2- We are aware that in the process to open the Marshall Mesa trailhead in 2006, the City of Boulder stated they would fill a 27,000 gallon cistern as a fire supply point for the Town of Marshall and Eldorado Springs. We understand that this was never completed but are pleased to hear a cistern will be installed by Mountain View Fire District under this current proposal. **We ask the County to ensure the cistern is a "condition of approval" of the City's permit to make sure the cistern is installed as proposed this time.**

3- upon looking at the proposed new trailhead plan, I believe there's not enough parking for the predicted growth of use at these trailheads. Already currently during the weekends people are parking all along the road. This is only going to increase, and since there is such an impacted area due to reclamation, there should be more parking created over this impacted site to account for future use at the trailhead as well as more shuttle driving to Eldorado Canyon.

4- The Traffic Report provided by the City states: "Due to the SSD [stopping sight distance] limitations in the eastbound direction that is not feasible to remove, it is recommended an enhanced crosswalk be evaluated, such as an RRFB [rectangular rapid flashing beacon]." (pg 35 of Mueller Report) further, the report states: 'In addition to the RRFB, it is recommended that Advanced Pedestrian Warning Signs be installed in advance of the crosswalk in both the eastbound and westbound direction.' We support the recommendations for a RRFB in addition to pedestrian warning signs at this crosswalk.

Thank you for considering these comments,

Jeff Giddings
 Marshall Area Resident

Walker, Samuel

From: Bruce Bryant <brucehbryant@gmail.com>
Sent: Wednesday, June 19, 2024 2:56 PM
To: LU Land Use Planner; Walker, Samuel
Subject: [EXTERNAL] LU-24-0009

To CPP regarding Marshall Mesa trailhead -

It seems to me Boulder is proposing modifications to the trailhead at the El Dorado Springs traffic light. How exactly is it that they intend to proceed with modifications to the trailhead- piggybacking on top of the mine reclamation project? Boulder County is actively preventing our family from doing the very same thing which Boulder proposes here.

Secondarily, this proposal is failing to take into account the actual number of visitors to this trailhead due to the fact that an overwhelming percentage of them park at the DOT property across the street and cross the installed crosswalk and enter the gate into the property. Also, from a fire risk standpoint, these patrons of the trailhead are not being properly accounted for. They need safe road crossing with blinking lights like many other places. Boulder County is simultaneously trying to prevent a water project that would bring clean drinking water to mining affected communities, and unincorporated boulder county as well as provide firefighting water for the city of Marshall as well as the trailhead in question. Why won't Boulder just put emergency water for this trailhead? We need a fire hydrant to deal with the ongoing threat of coal mine fires and overhead power lines.

Given Boulder's track record of failing to follow its own planning laws in maintaining the last water system at this location, which likely would've prevented my home from burning down. It's hard to imagine how Boulder and Boulder County collude, and that the city of Boulder will be held to a different standard than that to which I am being held. I wish you would put some of your planning energy into approving my perfectly reasonable site location for my fire rebuild based on the same criteria rather than Green-lighting a project for the city of Boulder and giving my project a pre-application denial.

Good day.

Bruce Bryant

Walker, Samuel

From: Ellen Berry <urchinchan@yahoo.com>
Sent: Wednesday, June 19, 2024 3:10 PM
To: LU Land Use Planner; Walker, Samuel
Subject: [EXTERNAL] Lu-24-0009 Marshall Mesa Coal fire and trailhead development

CP&P -

I am disappointed at the rushed process for this massive project. It is true that it's important to deal with the burning coal mine fire, but the trailhead development surely needs more time for public comment. Many many people use the trailhead and adjacent park n ride, everyone cares how this is handled and there is NO STAKING NO MARKING NO INFO SIGN and nothing to tell visitors of the giant project/changes planned. As a resident of the marshall community, I want to see that this heavily visited area is treated carefully. Visitors needs somewhere to park and safe road crossing. Everyone knows that they park at the DOT lot and all throughout old Marshall and then cross hwy 170 to the trailhead. What will you do to accommodate safe crossing on this really busy road? The current crosswalk is NOT ENOUGH and cyclists are nearly being hit by cars every day. Do you want another Magnus White memorial crossing? Can we just put in a decent crossing - with lights, barricades and SAFETY?

Another concern is where all of the cars will park during construction. Will they fill up our yard and head for the other trailhead on 170 or park all over 66th st? Are you closing the whole are? What is the plan. We read the docket and can not see the care and handling of the visitor load.

As a Marshall Fire survivor, I would really like to see wildfire treated seriously at the trailhead. I don't trust that a cistern will be enough to fight fires at this location. There is reason and funding to put an emergency water fire hydrant at the trailhead. Please make sure this happens! We cannot get away from the risk of the coal fire and the arcing power lines and the FIREWORKS tent across the street. We need to fight fires so they don't turn into multi-billion dollar disasters.

Please try to do a good and safe and proper job - wildfire risk is ongoing and real.

Thank you,

Ellen Berry

Walker, Samuel

From: Diana Gabriella <dgabriella1976@gmail.com>
Sent: Wednesday, June 19, 2024 3:24 PM
To: Case, Dale; Walker, Samuel
Subject: [EXTERNAL] Marshall Mesa reclamation

Dear Boulder County,

I am a resident of the Marshall area and would like to support the following comments regarding the Marshall Mesa reclamation and trailhead improvements (regarding docket: LU-24-0009):

1- It has been brought to our attention that the Federal Infrastructure Bill is funding the reclamation of the underground burning coal fire at the City's trailhead- we understand that a priority of this funding is to repair/replace water supplies that are impacted by some of the very mines that are being reclaimed on the City's property. We ask that the City and County support our community and the Department of Mining with the evaluation of water supplies and replacement of supplies impacted by the abandoned coal mines, aligning with the guidance of the Federal Infrastructure Bill. Furthermore, unless the risk of surface ignition by this underground coal fire will be eliminated by the reclamation, we ask the City and County to do everything possible to ensure the safety of our community, this includes working with the Department of Mining to secure water resources for the community that is impacted.

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Thank you for considering these comments,

Diana Gabriella
Marshall Area Resident

Walker, Samuel

From: Megan Monroe <megsmonroe@gmail.com>
Sent: Wednesday, June 19, 2024 4:25 PM
To: LU Land Use Planner; Walker, Samuel
Subject: [EXTERNAL] LU-24-0009 Marshall Mesa

It has been brought to my attention that today is the deadline to comment regarding Boulder County LU-24-0009, City of Boulder (City) redevelopment of Marshall Mesa trailhead.

While no one wants to delay reclamation work the State Department of Reclamation and Mine Safety (DRMS) needs to conduct to reduce the risks associated with the underground burning coal fire, this does not mean the City's proposal should be expedited. It is critical for Boulder County to hold the City's redevelopment of this location to the same standards as other Use Reviews- especially since this exact location was an ignition point of the Marshall Fire, the State's largest federally declared disaster, and especially because the City of Boulder has been named a as responsible party by Xcel for failure to maintain this property.

I believe few comments will material change the reclamation work and that most agree this work should absolutely be expedited - however there is concern in the community that the City's proposal should not be attached to reclamation - it should neither expedite or slowing down reclamation. So while I do not want to slow reclamation, I have a number of comments related to the city's proposal.

PARKING: The trailhead proposal seeks to increase parking on the City's parcel, however the proposal doesn't seem to consider to fact the newly established park and ride also functions as overflow parking for the trailhead. It should be noted that this park and ride is operated/supported by Boulder County and is heavily used. Attached photos were taken the weekend of June 8th, 2024 (during this review period), showing use that often (especially during spring/fall weekends) results in a full parking lot and additional cars parked along the side of the Eldorado Springs Drive.

There is concern that the combined use of the two lots well exceeds 150 trips per day (limited impact review standards) and that separating the two locations seems to be skirting the intent of these review limits. (Please clarify to the community if "trips per day" means 150 cars- or if "trips per day" means cars-in and cars-out and therefore the equivalent of 75 cars?)

The lots both serve the Trailhead; even the Boulder County press release of the crosswalk install in 2023 (<https://bouldercounty.gov/news/improvements-coming-soon-to-eldorado-park-n-ride-in-boulder/>) clearly stated this crosswalk (1) was to serve the trailhead and (2) was temporary while additional improvements would be made to the trailhead to "align with the city's goal of vision zero".

The second concern is that the crosswalk from this park and ride to the trailhead does not align with "vision zero". This is a congested and often dangerous intersection where young mountain bike teams or young families cross to the trailhead. It seems this crosswalk should have a blinker or beacon light- and this appears to be what the City's own traffic study supplied for this use review recommends (see recommendations on page 37 of mueller traffic study, page 415 of pdf)? (Although it appears the City analysis (Figure C3, pg 415) indicates this is a controlled crosswalk, please clarify? And that a blinker isn't necessary? Community members would appreciate clarification or explanation on the traffic report.)

Infrastructure: Finally, the City's past land use approval, the approval that granted trailhead opening at this location, included a cistern for fire supply for the town of Marshall. The fact that this proposal was never accomplished and the Marshall fire ignited at this very location is nothing short of horribly ironic. The City bought this property knowing the hazards located at the site and yet, opened a trailhead without any mitigation of such hazards (as required by boulder

county land use article 4). I will always believe that the Marshall fire would have unfolded differently - that homes and even lives could have been saved if the City had fulfilled its proposal and the cistern had water in it that day.

If the City had properly communicated risks they knew about, I think the public would have wanted those risks addressed and would have supported water supply to a community that desperately needed and deserves it. Instead, the City has denied efforts to support the surrounding community in the name of Area III "preservation"- while it purchased all surrounding land and intensified the use of the area without addressing the need for infrastructure to support such use.

This isn't about zoning, this is about environmental justice and supporting the community that has become an island in the City's green belt.

So pertaining to this proposal, considering the concern that parking is over 150 trips per day- and considering a shuttle service, operated by Boulder County, shuttles people to this trailhead, I feel the City's proposal does not adequately address peak wastewater demands - the facilities before the fire were inadequate and something similar would continue to be inadequate moving forward considering the increased use of the trailhead and park and ride.

Other than the parking and infrastructure pieces, I look forward to using the trailhead and recreating with the droves of trail users out there! :)

Respectfully,
Megan Monroe
Adjacent landowner and Marshall fire total loss



Walker, Samuel

From: ellen berry <cmdanceellen@gmail.com>
Sent: Wednesday, June 19, 2024 4:34 PM
To: LU Land Use Planner; Walker, Samuel; Case, Dale
Subject: [EXTERNAL] LU-24-0009
Attachments: UBCC Comment on Marshall Mesa LU-24-0009_6.2024.docx; ATTACHMENT 1 City of Boulder SPR 2006.pdf; ATTACHMENT 2 BIL_AML_Guidance_7-19-22.pdf

CP&P

This letter is submitted by the Unincorporated Boulder County Committee of Marshall Fire victims. Please include the letter and referenced attachments as comment for this proposal.



To: Boulder County Commissioners
 Boulder County Community Planning and Permitting,
 City of Boulder Council Members,
 City of Boulder Open Space and Mountain Parks
 Rep. Joe Neguse,
 Sen. Rachel Zenzinger,
 Sen. Jeff Bridges,
 Rep. Judy Amabile,
 Rep. Kyle Brown

Date: June 19, 2024

Re: Boulder County Limited Impact Review #LU-24-0009: Limited Impact Special Use Review to permit 364,000 cubic yards of earthwork for subsurface coal fire mitigation and redevelopment of the Marshall Mesa trailhead.

The City of Boulder (City) has submitted a Limited Impact Special Use permit for review by Boulder County for reclamation of an underground coal fire and trailhead improvements at the City of Boulder Marshall Mesa Trailhead (Trailhead). Considering this proposal encompasses the “Trailhead Ignition Point” of the Marshall Fire, and considering the underground coal fire could not be ruled out as a potential cause of the Marshall Fire, it is important that the wider Marshall Fire community voice be heard during this public review process.

First, the previous Use Review for this location (SPR-06-078 – Attachment 1) included a proposal by the City to fill a 27,000 gallon cistern for a fire supply system for the town of Marshall and Eldorado Springs (Attachment 1). This proposal was never fulfilled and that cistern was empty during the Marshall Fire. We are pleased to learn Mountain View Fire Protection District will be installing a 20,000 gallon cistern as part of the current proposal at the trailhead. We encourage Boulder County Commissioners to make this a “Condition of Approval” to ensure the cistern is *installed and functions* in accordance to the proposal this time.

Secondly, the requested reclamation at the trailhead under this public review is funded by the Federal Infrastructure Investment and Jobs Act (IIJA) which has granted the State of Colorado, Department of Reclamation and Mine Safety (DRMS) an additional \$150 million to address abandoned coal mining issues in the state of Colorado. This funding prioritizes water supply to adjacent properties that are impacted by some of the very mines being reclaimed (Attachment 2). This prioritization is because the adjacent communities have not only lived with environmental and public health risks for far too long- but also, because the reclamation will be a disruption to the community’s sense of safety, peace and healing. The Marshall community and surrounding mine impacted properties deserve the support the IIJA is intending such communities to have access to.

The reclamation this Boulder County Land Use Review addresses is part of the first round of IJJA funding in Colorado in part because of the unfortunate fact that the coal fire could not be ruled out as a cause of the Marshall Fire, but also, because of the coal fire's unique proximity to urban development including Unincorporated Boulder County (UBC), the Town of Superior and the City of Louisville. The rapid spread of the Marshall Fire proved the proximity of this site and the underground burning coal seam fire should be a concern to everyone in the vicinity of the Trailhead. To have this risk close to homes, neighborhoods and urban centers without adequate water supply is no longer acceptable.

As part of this IJJA funding, DRMS is currently evaluating impacts to water quality and options for repair/replacement for properties in the area that impacted by abandoned coal mines. Due to the extent of abandoned coal mine reclamation in this land use proposal (LU-24-0009), not only is the surrounding adjacent community a candidate for these Federal IJJA Funds, but the City of Boulder parcel under this public review is undeniably impacted and a candidate for these Federal funds as well.

Since the underground coal fire could not be ruled out as a potential cause of the Marshall Fire (a two billion dollar federally declared disaster), it is essential for the City of Boulder to work with the State of Colorado and DRMS to utilize Federal IJJA funds to supply a pressurized hydrant at the City of Boulder property. Anything less is ignoring the risks these Federal funds are intended to address and would be minimizing the destruction and loss that occurred because of the Marshall Fire and specifically, the ignition point that occurred at this very trailhead.

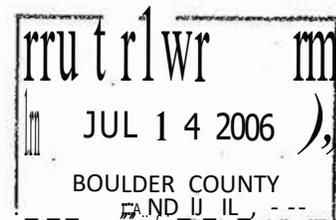
In support of our community,

Unincorporated Boulder County Committee (UBCC)



City of Boulder Open Space & Mountain Parks

P.O. Box 791, Boulder, CO 80306; 303-441-3440
www.ci.boulder.co.us/openspace/



Pac-06-095

July 14, 2006

Boulder County Land Use Dept.
 Courthouse Annex, 13th & Spruce Street
 P.O. Box 471
 Boulder, Colorado 80306
 Attn: Greg Oxenfeld, County Planner
 Eric Tkachenko, Planner

Re: Site Plan Review for change in use to Parking
 1842 South Foothills Highway

Dear Greg, Eric,

The City of Boulder Open Space and Mountain Parks desires to construct a trailhead on 2.33 acres of land located at 1842 South Foothills Highway, Boulder, Colorado. This property was purchased by the City of Boulder on December 8, 2004. The proposed trailhead will include gravel parking for 6 trucks with horse trailers, 36 vehicles and 4 ADA parking spaces (total of 46 parking spaces), a men and women's vault privy, an interpretive area, several picnic tables, a small horse corral, and native plant restored islands and berms areas. Two new trail connections will extend to the south from this new trailhead in the future. A trailhead identity sign as well as an information board will be installed on this site to inform the public of our trails, information, and regulations.

Existing Conditions-

Currently on the site is a 27,000 gallon underground water storage tank holding water pumps with sufficient capacity to provide sprinkler protection for the previously designed 24,000 square foot commercial office space (never completed). We are working with EXCEL to reconnect the power to these pumps which should occur very soon. Additionally, in cooperation with the Front Range Fire Protection District (former Cherryvale FD), we plan to operate this site as a fire water supply point/system to service this southern Boulder County area, the Towns of Marshall and Eldorado Springs. Front Range Fire has agreed to refill this tank when they are able after any useage.

The previous owner(s) had installed an 8 gallon a minute (gpm) water well and 1000 gallon drinking water storage tank on the site that will be used to provide water for horses and other animals in the new trailhead area. At this time, we are not planning to provide potable water for public use. Signs will be placed to inform the public of this "non-potable water" source for their animals.

We have applied to Boulder County Building inspection and received a building permit #37860 to install a men and women's vaulted privy on this site. Included in this design is a small storage area to store

July 2022

GUIDANCE ON THE BIPARTISAN INFRASTRUCTURE LAW
ABANDONED MINE LAND GRANT IMPLEMENTATION

I. OVERVIEW

The Bipartisan Infrastructure Law (BIL) (Pub. L. No. 117-58), also known as the Infrastructure Investment and Jobs Act, was enacted on November 15, 2021. The BIL authorized and appropriated \$11.293 billion for deposit into the Abandoned Mine Reclamation Fund administered by the Office of Surface Mining Reclamation and Enforcement (OSMRE). Of the \$11.293 billion appropriated OSMRE will distribute approximately \$10.873 billion¹ in BIL Abandoned Mine Land (AML) grants to eligible States and Tribes on an equal annual basis—approximately \$725 million a year—over a 15-year period.² In accordance with Executive Order 14008, States and Tribes are encouraged to prioritize projects that equitably provide funding under the Justice40 Initiative towards meeting the goal that 40 percent of the overall benefits flow to disadvantaged communities.³ BIL funds will expand the AML Reclamation Program to meet the priorities described in the BIL and the Surface Mining Control and Reclamation Act of 1977 (SMCRA), as amended. States and Tribes may use BIL AML grants to address coal AML problems, including:

- Hazards resulting from legacy coal mining that pose a threat to public health, safety, and the environment within their jurisdictions (including, but not limited to, dangerous highwalls, waste piles, subsidence, open portals, features that may be routes for the release of harmful gases, acid mine drainage, etc.);
- Water supply restoration (infrastructure); and
- Coal AML emergencies.

The purpose of this guidance document is to provide State/Tribal AML Programs with overarching information concerning the interpretation, project eligibility, and priorities for the use of BIL AML

¹ Section 40701 of the BIL authorizes \$11.293 billion for deposit into the AML Fund, and Division J, Title VI appropriates and apportions the funds in the following ways: up to 3% for OSMRE Operations, 0.5% for Office of Inspector General (OIG) Operations, and \$25 Million for OSMRE to provide States and Tribes financial and technical assistance in making amendments to the inventory system for documenting eligible lands and waters. The remaining funds, approximately \$10.873 billion, will be distributed to eligible States and Tribes as BIL AML grants.

² Section 40701(c) of the BIL limits the use of BIL AML grants to the activities described in subsections (a) and (b) of section 403 and 410 of SMCRA. OSMRE will ensure that the annual grants provided to a State or Tribe do not exceed its estimated cost to reclaim its remaining coal AML problems and water supply restoration, as documented in the Abandoned Mine Land Inventory System (e-AMLIS).

³ “Disadvantaged Community” – a community may be considered disadvantaged based on a combination of: low income, high and/or persistent poverty; high unemployment and underemployment; racial and ethnic residential segregation, particularly where the segregation stems from discrimination by government entities; linguistic isolation; high housing cost burden and substandard housing; distressed neighborhoods; high transportation cost burden and/or low transportation access; disproportionate environmental stressor burden and high cumulative impacts; limited water and sanitation access and affordability; disproportionate impacts from climate change; high energy cost burden and low energy access; jobs lost through the energy transition; access to healthcare; and geographic areas within Tribal jurisdictions; or based on the community’s inclusion in the Climate and Economic Justice Screening Tool. Definition adapted from OMB and CEQ Interim Implementation Guidance for the Justice40 Initiative (M-21-28) dated July 20, 2021. See Climate and Economic Justice Screening Tool at: [Explore the tool - Climate & Economic Justice Screening Tool \(geoplatform.gov\)](https://www.eplanning.gov/data-tools/justice40).

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grant funds.⁴ It also clarifies how BIL AML grant funding differs from the traditional fee-based AML grant distributions authorized by SMCRA. OSMRE will consider initiating rulemaking to establish requirements and obligations related to application procedures, allowable uses of funds, and reporting program activities and outcomes.

II. ELIGIBLE STATES AND TRIBES

Pursuant to section 40701(b)(2) of the BIL, eligible grant recipients include both certified and uncertified States and Tribes carrying out approved AML Programs. A certified State or Tribe is a State or Tribe that has certified that all coal reclamation projects that are considered a priority under section 403(a) of SMCRA have been completed. An uncertified State or Tribe is a State or Tribe that has not yet made the certification that reclamation of all priority coal reclamation projects in the State or on applicable Indian lands have been completed.

III. ELIGIBLE PROJECTS & PRIORITIZATION

BIL AML funding may only be spent on eligible abandoned coal mine reclamation projects.⁵ According to section 40701(c) of the BIL, BIL AML grants may only be used on one or more of the following:

- Priority 1 Projects – These projects protect public health and safety from extreme effects of coal mining practices, including the restoration of adjacent land and water resources and the environment (Section 403(a)(1) of SMCRA).
- Priority 2 Projects – These projects protect public health and safety from adverse effects of coal mining practices, including the restoration of adjacent land and water resources and the environment (Section 403(a)(2) of SMCRA).
- Priority 3 Projects – These projects restore land and water resources and the environment previously degraded by adverse effects of coal mining practices (Section 403(a)(3) of SMCRA). These projects may include the design, construction, operation, maintenance, and rehabilitation of acid mine drainage (AMD) treatment facilities regardless of whether they are part of a qualified hydrologic unit.
- Water Supply Restoration Projects - protection, repair, replacement, construction, or enhancement of facilities relating to water supply, including water distribution facilities and treatment plants, to replace water supplies adversely affected by coal mining practices (Section 403(b) of SMCRA).

⁴ As this is a guidance document, it does not create legally binding requirements and should not be construed to create any rights or benefits, either substantive or procedural, that are enforceable by law. To the extent there is any inconsistency between a provision of this guidance document and any applicable law or regulation, the law or regulation will control.

⁵ In general, section 404 of SMCRA describes “[l]ands and waters eligible for reclamation or drainage abatement expenditures” under SMCRA as those lands and waters “which were mined for coal or which were affected by such mining, wastebanks, coal processing, or other coal mining processes . . . and abandoned or left in an inadequate reclamation status prior to” August 3, 1977.

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- AML Emergency Projects - Emergency projects that restore, reclaim, abate, control, or prevent adverse effects of coal mining practices, on eligible lands when an emergency exists constituting a danger to the public health, safety, or general welfare and no other person or agency will act expeditiously to restore, reclaim, abate, control, or prevent adverse effects of coal mining practices (Section 410 of SMCRA).

Use of BIL funding differs from the traditional fee-based AML funding in a few important ways:

- Stand-alone projects classified as Priority 3 under SMCRA Title IV are eligible for BIL funding, whether or not the project is in conjunction with other projects classified as Priority 1 and Priority 2 projects under SMCRA Title IV;
- AMD treatment projects that are not part of a qualified hydrologic unit are eligible for BIL funding;
- Eligible states and tribes are not authorized under the BIL to place BIL AML grant funds into AMD set-aside accounts.⁶

Under section 405(e) of SMCRA, State and Tribal AML Reclamation Plans must identify the specific criteria for ranking and identifying projects to be funded. The *overall* State or Tribal AML Program must reflect the priorities listed in section 403(a), and, accordingly, the BIL does not require strict adherence to those priorities when grantees and OSMRE work to evaluate, apply for, and approve particular projects.

OSMRE will consult with each State and Tribe receiving funds under the BIL to identify which updates to the grantee's Reclamation Plan, if any, are necessary to ensure that the Plan's complies with the BIL.

In spending BIL AML funds, as authorized by section 40701(f) of the BIL, States and Tribes should, consistent with State or Tribal applicable law, prioritize providing employment opportunities to current and former employees of the coal industry, when such employees are available to work on projects within the region, State, or local area. OSMRE will work with States and Tribes to incorporate such prioritization into their reclamation plans. Measures to implement these priorities may include: (1) requiring contractors to affirm that they will give preference to current and former employees of the coal industry in any hiring for BIL-funded AML projects; (2) requiring contractors to report on the extent to which current and former employees of the coal industry have been employed in any AML work the contractors perform; (3) requiring contractors to retain data that can substantiate the reported information; and (4) providing to OSMRE the information reported by the contractors as part of the State or Tribe's regular AML reporting processes. To further implement the section 40701(f) prioritization, States and Tribes should engage with other Federal, State, Tribal, and local government agencies, and labor or worker organizations that represent coal industry workers to identify current or former employees of the coal industry who are candidates to be employed by AML reclamation contractors and provide OSMRE with certifications of this engagement.

⁶ Section 402(g)(6) of SMCRA authorized the creation and use of AMD set aside accounts, which allow uncertified States to apply for up to 30% of certain fee-based funds received as part of their traditional annual AML grant to be transferred to an interest-bearing account established by the State/Tribe to be used for the abatement of the causes and the treatment of the effects of AMD in a comprehensive manner within qualified hydrologic units affected by coal mining practices.

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The Department will commence notice and comment rulemaking, as necessary, to further implement section 40701(f) and to provide additional guidance as to its scope. Such a proposed rule would, if finalized, based on section 40701(f), require that States and Tribes provide employment opportunities to current and former employees of the coal industry, prioritize projects that provide such employment opportunities, and prioritize use of BIL AML funding on AML projects that promote the revitalization of coal communities.

States and Tribes should also prioritize projects that deliver benefits to disadvantaged communities including the reduction of environmental burdens on such communities in alignment with the overall objectives of the Justice40 Initiative.

States with unreclaimed mines on the list of EPA's Methane Coal Mine Opportunities Database (<https://www.epa.gov/cmop/coal-mine-methane-abandoned-underground-mines>) are encouraged to prioritize the reclamation of such sites where eligible for BIL AML funding in a manner that eliminates methane emissions to the greatest extent possible.

IV. AML PROGRAM MANAGEMENT

In carrying out their programs with BIL AML funding, OSMRE encourages States and Tribes, consistent with State or Tribal applicable law, to:

- Use procurement processes that incentivize AML contractors to hire current and former employees of the coal industry when bidding on BIL-funded AML projects and require the collection of information from AML contractors about the number of current and former coal industry employees they employ;
- Aggregate projects into larger statewide or regional contracts as part of their procurement processes, in order to improve efficiencies in their BIL AML grant funding;⁷
- Prioritize aggregated or larger projects in selecting projects to be funded;
- Support pre-apprenticeship, registered apprenticeship, and youth training programs that open pathways to employment by collaborating with other Federal, State, Tribal, and local government agencies and non-governmental organizations that have the relevant expertise in these areas, including the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization. While BIL AML grants may not be used to directly fund pre-apprenticeships, apprenticeships and training programs, States and Tribes are encouraged to strengthen existing partnerships with governmental agencies and non-governmental entities that provide these types of services and to strategize on ways to promote these types of opportunities for BIL AML projects, including by identifying workforce needs for AML projects.

⁷ Section 40701(b)(3) of the BIL allows states to aggregate bids in this manner.

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- Require contractors to support safe, equitable, and fair labor practices by adopting collective bargaining agreements, local hiring provisions (as applicable), project labor agreements, and community benefits agreements.
- When applicable, select project designs that reduce methane emissions from abandoned coal mine sites.
- Incorporate input from disadvantaged communities, communities of color, low-income communities, and Tribal and Indigenous communities⁸ into prioritization criteria and the method for selecting projects to be funded. For more information, see the “Public Engagement” section.

If any of the aforementioned activities cannot be reasonably accomplished in carrying out the BIL AML program, States and Tribes should include in their grant application a detailed rationale for why the specified activity(ies) could not be implemented.

OSMRE and the Department of the Interior (DOI) will engage with the Department of Labor (DOL) to determine what information and tools DOL can provide to States and Tribes to support the above efforts.

BIL AML funds may not be used, directly or indirectly, to support or oppose union organizing.

Further, States and Tribes must implement measures to ensure that a bidder for a BIL AML contract cannot be awarded a contract or subcontract or perform any work funded by the BIL AML, if their company, their owners and controllers, their corporate officers and their shareholders own or control mine operations that have any outstanding uncorrected or unabated violations. Consistent with 30 C.F.R. § 874.16 and § 875.20, every successful bidder for an AML contract must be eligible under 30 C.F.R. §§ 773.12, 773.13, and 773.14 at the time of contract award to receive a permit or be provisionally issued a permit to conduct surface coal mining operations. At a minimum, States and Tribes must review the Applicant Violator System, and the System for Award Management and any other available information to verify the eligibility of each bidder before a contract or subcontract is awarded for any work performed and funded under the BIL AML.

V. BIL AML GRANTS

⁸ “Low-income communities” are those communities that in the last 12 months had a median household income less than twice the poverty level. This definition is similar to USEPA’s EJSCREEN definition at <https://www.epa.gov/ejscreen/ejscreen-map-descriptions#category-demographics>

“Communities of color” are those communities with a higher than national average percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word "alone" in this case indicates that the person is of a single race, not multiracial. A block group is an area defined by the Census Bureau that usually has in the range of 600-3,000 people living in it. This definition is adopted from USEPA’s EJSCREEN definitions at: <https://www.epa.gov/ejscreen/overview-demographic-indicators-ejscreen#demoindex>

“Tribal and Indigenous communities” are communities whose members make up a Federally recognized Indian Tribe, a State-recognized Indian Tribe, an Alaska Native community or organization, a Native Hawaiian organization, or any other community of indigenous people located in a State, including indigenous persons residing in urban communities.

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On February 7, 2022, DOI announced the BIL AML grant distribution amounts that each eligible State and Tribe will receive in fiscal year (FY) 2022. The Notice of Funding Opportunity for the BIL AML grants will be available before the end of the 4th quarter of FY 2022.

Annual BIL AML grant amounts are calculated using a congressionally mandated formula based on the number of tons of coal historically produced in the States or from applicable Indian lands before August 3, 1977. Adjustments will be made to ensure the total amount of the distributions to any individual State or Tribe is not less than \$20 million over the life of the program to the extent that amount is needed for eligible projects described above and to reconcile the amount of the BIL AML funding with the total unfunded cost of coal problems at the end of the preceding fiscal year, as reflected in the enhanced Abandoned Mine Land Inventory System (e-AMLIS).

BIL AML grants will be awarded to eligible State and Tribal AML Programs on an annual basis and adjustments will be made to these distributions as required and needed to achieve the objectives of the program. For example, adjustments will be made as changes to the number of eligible States and Tribes increase or decrease. The period of performance for BIL grants will be five-years, with an option for a one-time no-cost extension of up to one year, subject to OSMRE's review and approval. BIL AML grants will be disbursed and tracked under the Assistance Listing Numbers (ALN) No. 15.252.⁹ In order to receive BIL AML funding in FY22, each eligible State and Tribe will need to submit a separate grant application for BIL AML grants from the traditional AML fee-based grants through [GrantSolutions](#). For FY23 and beyond, due to the differing requirements and timeframes of BIL and fee-based grants, OSMRE expects to require separate grant applications for the two programs, but the agency will continue working with the States and Tribes in order to develop procedures that minimize burdens on applicants. States and Tribes are required to ensure that expenditures for the two programs are tracked separately.

BIL AML grant recipients will be required to comply with all applicable Federal grant award requirements, including but not limited to, the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards ([2 C.F.R. part 200](#)). OSMRE anticipates that State and Tribal AML Programs will incur higher staffing and operational costs as they stand up programs to effectively implement their BIL AML programs. In addition, the administrative costs for annual BIL AML grant awards will be available for the entire grant performance period (i.e., five years, with the possibility of a one-year extension).

The BIL AML funded projects are subject to the Build America Buy America (BABA) Act that was enacted as part of the BIL in 2021. As required by Section 70914 of the BIL and consistent with the Office of Management and Budget's (OMB) Made in America's April 18, 2022 guidance for implementing the BABA Act, none of the funds under a federal award that are part of Federal financial assistance for infrastructure may be obligated on or after May 14, 2022, for a project unless all of the iron, steel, manufactured products, and construction materials (excluding concrete and aggregates) used in the project are produced in the United States, unless subject to an approved waiver. The requirements of this section must be included in all subawards, including all contracts and purchase orders for work or products.

⁹ The ALN number is a five-digit number assigned in an awarding document for any financial assistance (e.g., grants) funded by the Federal government. Although both the BIL AML Funds and the traditional AML fee-based grants will be disbursed under the same ~~CFDA~~ ALN No. 15.252, separate grant applications via GrantSolutions will be necessary in FY22.

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Appendix I, which is entitled, “Subaccounts for BIL AML Financial Assistance,” provides guidance on the available subaccount categories that State/Tribal AML Programs can use in the development of their BIL AML grant application. Outlined below are the main subaccounts:

- BIL – Non-Emergency Administrative Costs
- BIL – Non-Water Supply (Coal Project) Costs
- BIL – Water Supply Project Costs
- BIL – Coal Projects Engineering & Design Costs
- BIL – AMD Operational and Maintenance Costs
- BIL – Emergency Project Costs

For FY22, States and Tribes are encouraged, but will not be required, to provide a list of projects expected to be funded in the upcoming year in their application (see Appendix II). Beginning with FY23 grant applications, States and Tribes will be required to include lists of projects to be funded over a one-year timeframe; additional details on this requirement will be provided in future guidance.

When applying for BIL AML grants, State and Tribal AML Programs should include:

- Starting in FY 2023, a description of each proposed projects to be funded during the grant period of performance (see Appendix II).
- A description of the State and Tribe’s prioritization process or ranking system for the selection of proposed projects;
- A description of the process the State or Tribe will use to obtain public input to develop the list of projects to be funded;
- A statement of the estimated benefits that will result from proposed projects;
- A statement of how the State or Tribe will prioritize projects employing current or former employees of the coal industry, consistent with State or Tribal applicable law;
- Plans for engaging with other Federal, State, Tribal, or local governmental agencies and non-governmental entities on workforce training and development issues, including how activities encouraged under Section III will be implemented, if applicable, along with the names of potential partners to support recruiting and training efforts, including community colleges, workforce partners, community-based groups, and unions;
- Any known linkages to economic redevelopment opportunities created by carrying out proposed projects;
- A description of how the grantee will address environmental justice issues within coalfield communities;
- Details of how the grantee will engage with relevant State, Tribal, or local governmental agencies or non-governmental organizations to identify and address any disproportionate burden of adverse human health or environmental effects of coal AML problems on disadvantaged communities, communities of color, low-income communities, and Tribal and Indigenous communities;
- A description of whether and to what extent proposed projects may reduce greenhouse gas emissions, particularly methane emissions;
- Estimated costs for each project to be completed using the BIL AML grant funding. If BIL AML funds will be leveraged with other funding sources, such as AML-fee based grants, include this information; and,

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- Proposed performance measurement (See Section XI).

OSMRE understands that it will be difficult for States and Tribes to determine or estimate much of this information for projects to be funded with the first year of BIL AML grant funding, but is listing them here to allow States and Tribes to prepare for future application requirements. In FY22, States and Tribes should spell out how their project selection practices will achieve reclamation, remediation, and socio-economic benefits.

When possible, a project's scope or outcome may be expanded or enhanced. States and Tribes are encouraged to identify and leverage additional funding sources (e.g., Clean Energy Demonstration Program under Title III, Section 40341 of the BIL; DOI's Ecosystem Restoration Program under Title VIII, Section 40804 of the BIL; and EPA Brownfield Job Training Grants) and in-kind contributions to be used in conjunction with BIL AML monies.

VI. DAVIS-BACON ACT

The BIL requires that all laborers and mechanics employed by the applicant, recipient, subrecipient, contractors, or subcontractors in the performance of construction, alteration, or repair work on a project that will be assisted in whole or in part by funding made available under the BIL must be paid wages at rates not less than those prevailing on similar projects in the locality, as determined by the Secretary of Labor in accordance with the Davis-Bacon Act (40 U.S.C. §§ 3141-3148). The Davis-Bacon labor standards are applicable to the reclamation projects completed using BIL AML funding and Davis-Bacon clauses must be included in BIL AML work contracts. The Department of Labor [Fact Sheet #66A: Bipartisan Infrastructure Law](#) provides additional information on the responsibilities of BIL funding recipients (see Appendix IV).

Technical assistance to States and Tribes to meet the requirements of the Davis Bacon Act is also available through the Department of Labor. Currently, the Department of Labor offers free Prevailing Wage Seminars several times a year that focus on compliance with the Davis Bacon Act, at <https://www.dol.gov/agencies/whd/government-contracts/construction/seminars/events>. For additional resources on how to comply with DBA provisions and clauses, see <https://www.dol.gov/agencies/whd/government-contracts/construction> and <https://www.dol.gov/agencies/whd/government-contracts/protections-for-workers-in-construction>.

VII. PUBLIC ENGAGEMENT

When selecting and developing eligible projects for the BIL AML Program, State and Tribal AML Programs should ensure public engagement at the local level through engagement with affected communities. The term, "public" includes all stakeholders (e.g., citizens at large, industry, other Federal, State, Tribal, or local agencies, Tribal Nations, unions and worker organizations, non-governmental organizations, community colleges, workforce boards, community-based groups, and environmental groups). Engaging with the public to identify potential projects before the projects are selected will ensure that the projects completed through this program best address the needs of the relevant communities.

States and Tribes are encouraged to use existing best practices for public engagement or develop a process for public outreach and communication with local citizens, agencies, and organizations that best

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fits their unique circumstances. For example, States and Tribes could notify local citizens of the intent/purpose of a project via meetings, print media, websites, and social media and/or partner with organizations that facilitate public outreach and communication. OSMRE recommends that public engagement occur as early as possible for each grant cycle, with the public provided at least 60 days to review and provide input on the projects that will be proposed for funding in the State or Tribe's grant application.

VIII. ENHANCED ABANDONED MINE LAND INVENTORY SYSTEM (e-AMLIS)

Pursuant to section 403(c) of SMCRA, OSMRE maintains e-AMLIS, the central electronic database for housing the national inventory of unreclaimed AML problems affecting public health, safety, and the environment and reclaimed sites, along with their associated reclamation costs. Data maintained in e-AMLIS are provided by States and Tribes using standardized procedures approved by OSMRE.

States and Tribes are required to enter all coal AML projects into e-AMLIS and identify them as BIL AML projects when funds are expended. To ensure that States and Tribes are able to update their respective AML inventories in e-AMLIS, the BIL makes \$25 million available to the Secretary of the Interior to provide financial and technical assistance to States and Tribes to amend e-AMLIS. OSMRE will provide further guidance on its implementation of this specific requirement of the BIL at a later date.

IX. COMPLIANCE WITH THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

OSMRE has determined that all BIL AML funded reclamation projects are major Federal actions¹⁰ subject to review under the NEPA because, in accordance with NEPA regulations,¹¹ BIL AML projects are federally assisted activities performed using Federal funds.

OSMRE REG-1, Handbook on Procedures for Implementing the National Environmental Policy Act ([NEPA Handbook](#)) (Revised 2019), provides additional information on NEPA compliance.

Depending on the significance of the actual and potential impacts of the proposed action, there are three potential analytical approaches under NEPA, including a:

- 1) Categorical Exclusion (CE);
- 2) Environmental Assessment (EA), which may result in a Finding of No Significant Impact (FONSI) or a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS); or
- 3) Environmental Impact Statement (EIS) and Record of Decision (ROD).

The Department's NEPA regulations make clear that in the absence of an applicable CE, an EA, and, in some cases, an EIS, must be prepared for the proposed Federal action. 43 C.F.R. § 46.205(a) states:

¹⁰ According to 40 C.F.R. § 1508.1, major Federal actions may include, among other things, new and continuing activities, including projects and programs entirely or partly financed, assisted, conducted, regulated, or approved by Federal agencies.

¹¹ NEPA regulations issued by the White House Council on Environmental Quality (CEQ) are found at Title 40, Parts 1500-1508 of the Code of Federal Regulations (40 C.F.R. § 1500-1508, 42 U.S.C. §§ 4371 *et seq.*).

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If a proposed action does not meet the criteria for any of the listed Departmental categorical exclusions or any of the individual bureau categorical exclusions, then the proposed action must be analyzed in an environmental assessment or environmental impact statement.

In accordance with section 8.5.2.1 of OSMRE's NEPA Handbook, State and Tribal AML programs must ensure that all connected actions, regardless of the funding source or who proposes them, are analyzed in a single NEPA document. Additionally, the impacts of a project that includes multiple phases must be reviewed in a single or programmatic NEPA document. Multi-phase projects may require subsequent additional NEPA. State and Tribal AML Programs are strongly encouraged to look closely at the NEPA analyses outlined above and refer to OSMRE's [NEPA Handbook](#) to better understand the NEPA process early and align their proposed projects accordingly.

The three potential analytical approaches under NEPA are defined below.

Categorical Exclusion

A CE is a class of actions that a Federal agency has determined, after review by CEQ, does not individually or cumulatively have a significant effect on the human environment; therefore, neither an EA nor an EIS is normally required unless an extraordinary circumstance is identified.¹² A CE is the threshold NEPA analysis for a proposed Federal action. OSMRE has created and received approval from CEQ for a CE. This CE is contained in the DOI Departmental Manual (DM), Chapter 13 [516 DM 13.5(33)].

Environmental Assessment

If a determination is made that the proposed Federal action cannot be categorically excluded from further NEPA analysis, then an EA is prepared. The EA determines whether a Federal action has the potential to cause significant environmental effects. If no significant environmental effects are found, the decision document will result in a FONSI, and the project may continue without further NEPA analysis. However, if it is determined that an action will have significant effects, then the project must go through the EIS process.

Environmental Impact Statement

For actions with significant impacts, NEPA requires Federal agencies to prepare an EIS that must assess, among other things, the potential environmental impacts of the proposal and alternatives to the proposed action. *See* 42 U.S.C. § 4332; 40 C.F.R. part 1502. Once an agency reaches a final decision on the action it wishes to take (i.e., the proposed action or an alternative), it creates a ROD, which is the conclusion of the EIS process. 40 C.F.R. § 1505.2.

X. PROJECT AUTHORIZATION

OSMRE's regulations require that, before the start of construction on any non-emergency reclamation project, States and Tribes must submit to OSMRE a request for an Authorization to Proceed (ATP) once the NEPA analysis has been completed. 30 C.F.R. §§ 885.15, 886.16. An ATP request for a reclamation project must include: confirmation that the problem area to be reclaimed has been entered into e-

¹² Extraordinary circumstances are described in the Departmental NEPA regulations at 43 C.F.R. § 46.215.

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AMLIS; all completed environmental documents, including NEPA documents and other documents demonstrating compliance with relevant environmental laws, such as the Endangered Species Act; an AML eligibility statement; and any additional documentation requested by OSMRE for that particular project.

As discussed above, State and Tribal AML programs should, in compliance with State or Tribal law, engage with other Federal, State, Tribal agencies, and local government agencies and labor and worker organizations that represent coal industry workers to identify current or former employees of the coal industry who are candidates to be employed by AML reclamation contractors consistent with the section 40701(f) prioritization and provide OSMRE with certifications of this engagement. States and Tribes should maintain sufficient records to substantiate this engagement upon request.

OSMRE will provide an ATP letter once the agency has determined that the request satisfies the guidelines for ATP issuance. The ATP letter from OSMRE provides the required approval to use BIL AML grant funding to reclaim the specific project being addressed and allows project construction to begin. Although NEPA documentation is part of the criteria required for an ATP request, the NEPA process and ATP process are two separate processes. An ATP request cannot be completed until OSMRE has completed the NEPA review process and issued a ROD, FONSI, or CE in compliance with the NEPA requirements.

XI. EMERGENCY AUTHORIZATION

According to chapter 4-120 of the Federal Assistance Manual (FAM), States and Tribes are required to submit a request for emergency declaration to OSMRE for emergency reclamation projects. The FAM requirements track the “emergency” definition at 30 C.F.R. § 700.5, identifying the proper amount of emergency reclamation as the amount necessary to stabilize the emergency aspects of the problem—eliminating the immediate danger to public health, safety, and general welfare. Any remaining reclamation should then be accomplished as part of a regular, non-emergency AML project, as necessary.

Upon receipt of a request for emergency declaration, OSMRE will review the information and ensure that the project meets all requirements of the AML emergency program. If all information contained within the request for emergency declaration is complete, OSMRE will declare an emergency by signing a Finding of Fact/ATP. The Finding of Fact certifies that the problem meets the emergency criteria and serves as the point of Federal action, authorizing the State/Tribe to proceed with reclamation work on the site. After the emergency is abated, the States and Tribes are required to comply with all applicable Federal laws and regulations, including NEPA.

XII. BIL AML PERFORMANCE MEASURES & REPORTING

OSMRE is required to submit a report to Congress within six years of the first BIL AML grant allocation to State and Tribal AML Programs. This report will detail the progress made under the BIL AML provisions in addressing outstanding reclamation needs under subsections (a) and (b) of section 403 and section 410 of SMCRA. In preparing this report, OSMRE will solicit input from State and Tribal AML Programs on the progress made in addressing outstanding coal AML problems and use the

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information provided in the annual evaluation reports each State and Tribe submits pursuant to section 405(j) of SMCRA.¹³ OSMRE intends to provide future guidance on how to prepare the information required in the report to Congress.

OSMRE is evaluating and developing the performance measures and reporting elements to be tracked to ensure accomplishments made by State and Tribal AML Programs under the BIL are captured in these annual reports. Given that AML projects are located in coalfield communities that may also be defined as disadvantaged communities, communities of color, low-income communities, or Tribal or Indigenous communities, State and Tribal AML Programs are encouraged to track and report on the types of benefits and the percentage of benefits that accrue to these communities. State and Tribal AML Programs are also encouraged to engage with stakeholders to help identify metrics that accurately reflect the benefits of BIL AML projects in their reclamation programs. In order to enable complete reporting, States and Tribes are expected to track the following types of benefits that can be measured and reported:

AML Reclamation Environmental Benefits

- Number of acres reforested
- Number of trees planted on AML sites
- Number of bat gates installed
- Number of acres of endangered species habitat re-established
- Number of tons of rare earth elements, metals, or sediment recovered for reuse
- Amount of methane emissions reduced

AMD Remediation Project Benefits

- Quantity of iron, aluminum, manganese, sulfate, etc. removed and/or recovered on annual basis by AMD water reclamation projects
- Quantity of Rare Earth Elements (REE) recovered by AMD water reclamation projects
- Number of AMD passive treatment systems built
- Number of AMD passive treatment systems operated and maintained
- Number of AMD active treatment systems built
- Number of AMD discharges abated
- Miles of waterways improved
- Estimated volume of water treated
- Number of outflows remediated

Socio-economic Benefits of BIL AML Projects

- Percent of overall benefits and types of benefits that accrue to disadvantaged communities, communities of color, low-income communities, or Tribal or Indigenous communities;
- Number of former/current employees of the coal industry employed in AML reclamation;
- Demographics/number of workers from under-represented groups, as defined by Executive Order 13985, “Advancing Racial Equity and Support for Underserved Communities Through the Federal Government”;
- Percentage of workers employed at AML sites that reside in the county in which the AML

¹³ Pursuant to section 405(j) of SMCRA, State and Tribal AML programs will be required to submit annual reports to track their progress and accomplishments in addressing outstanding reclamation needs using BIL AML grant funds.

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- project is located, or in adjacent counties;
- If there is a community benefit agreement as part of the project;
 - Number of project partners involved in AML reclamation projects;
 - Number of contract(s) awarded that aggregated projects exceeding a value of \$1 million at the time of award;
 - Number of businesses constructed on reclaimed AML sites, and number of people employed at those sites;
 - Number of job hours involved in BIL AML remediation;
 - Number of people receiving potable water after completion of water supply restoration projects;
 - Number of residents positively impacted by the restoration of previously polluted waterways; and,
 - Number of residents within one mile of a BIL-funded project.

Further, for projects or aggregated projects in excess of \$1 million, States or Tribes should require that contractors, consistent with State or Tribal applicable law, provide:

- 1) a certification that the project uses a unionized project workforce;
- 2) a certification that the project includes a project labor agreement; or
- 3) a project workforce continuity plan, detailing:
 - How the contractor ensured the project had ready access to a sufficient supply of appropriately skilled and unskilled labor to ensure high-quality construction throughout the life of the project, including a description of any required professional certifications and/or in-house training, registered apprenticeships or labor-management partnership training programs, and partnerships like unions, community colleges, or community-based groups;
 - How the contractor minimized risks of labor disputes and disruptions that would have jeopardized the timeliness and cost-effectiveness of the project;
 - How the contractor provided a safe and healthy workplace that avoids delays and costs associated with workplace illnesses, injuries, and fatalities, including descriptions of safety training, certification, and/or licensure requirements for all relevant workers (e.g., OSHA 10, OSHA 30);
 - Whether workers on the project received wages and benefits that secured an appropriately skilled workforce in the context of the local or regional labor market;
 - Whether the project had a Community Benefit Agreement, with a description of any such agreement; and
 - Whether the project prioritized local hires.

As noted in Section IV, BIL AML funds may not be used to support or oppose union organizing.

* * *

If you have any questions or need additional assistance, please contact your servicing OSMRE Field or Regional Office.

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Appendix I: Subaccounts for BIL AML Financial Assistance

Appendix II: Table for BIL AML Eligible Projects

Appendix III: BIL AML Project Flowchart

Appendix IV: Department of Labor Fact Sheet

** - Appendices to be developed as needed.

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Appendix I: Subaccounts for BIL AML Financial Assistance

I. Authorities

- The Surface Mining Control and Reclamation Act of 1977 (SMCRA), Pub. L. No. 95-87, as amended
- Infrastructure Investment and Jobs Act (IIJA), Pub. L. No. 117-58, also known as the Bipartisan Infrastructure Law (BIL)
- Office of Surface Mining Reclamation and Enforcement (OSMRE) Directive GMT-10, The Federal Assistance Manual (FAM)
- The Federal Grant and Cooperative Agreement Act of 1977, Pub. L. No. 95-224
- Title 2 C.F.R. Part 200, Uniform Administrative Requirements, Cost Principles and Audit Requirements for Federal Awards

II. Purpose

The purpose of this document is to provide guidance and to clarify the available subaccounts (i.e. cost categories) for allocating monies when submitting a BIL AML grant application and expending monies when invoices are submitted for processing through DOI's/OSMRE's financial system. This guidance document outlines the available subaccounts for BIL funds that were created in 2022. The Federal Assistance Manual (FAM) will be updated to reflect these changes.

III. Additional Information

This section contains the following information:

- BIL Subaccounts Table. (Table 1) This table provides a listing of all available subaccounts under the BIL AML Program, which is funded by moneys sourced from the U.S. Treasury.
- Fund Type Descriptions. This section describes the different types of funds listed in Table 1, which are used in the BIL AML Program.

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BIL AML Grant Subaccount Table

The table below contains a listing of standard subaccounts currently available for BIL AML Grants:

Table 1: BIL Fund Subaccounts

Subaccount	Bipartisan Infrastructure Law
01	IL
03	IL
04	IL
19	IL
21	IL
23	IL

Listed below is the fund type description.

- IL** Funds authorized by section 40701 of the BIL that are available to eligible States and Tribes.

Source: U.S. Treasury Funds

Listed below are the subaccount number definitions:

01. Non-Emergency Administrative

These are costs that cannot be tracked to individual reclamation projects and include items, such as travel, rental of vehicles, and any other administrative expenses. Project Design and Engineering costs should not be incorporated into subaccount 01.

03. Coal Project Costs (Non-Water Supply)

These are costs for actual construction, realty work, construction contracting, construction inspection, and other items allocable to a specific project in accordance with the BIL. Please note that project design and engineering coal-related costs and operation and maintenance costs related to AMD projects should not be included under subaccount 03. An engineering and design subaccount 19, as described below, has been created to track these coal-related costs. An operational and maintenance subaccount 21, as described below, has been created to track these AMD related costs.

04. Water Supply Project Costs

These costs are authorized by the BIL, and eligible States and Tribes may expend funds to protect, repair, replace, construct, or enhance facilities related to water supplies adversely affected by coal mining practices. Please note that project design and engineering coal-related costs should no longer be included under subaccount 04. A new engineering and design subaccount 19, as described below, has been created to track these coal-related costs

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19. Coal Projects Engineering & Design Costs

These are coal-related engineering and design costs associated with site investigation, public engagement, including identification and mapping of hazards; environmental sample collection and data validation; costs associated with surveying design and engineering of reclamation activities, including development of construction bid packages; costs associated with owner operator searches, eligibility determination, historic and archeological surveys, threatened and endangered species reports and consultation, document preparation related to NEPA, public meetings, and landowner agreements; and any other costs associated with project preparation before the award or initiation of a construction project.

Pursuant to section 403(c) of SMCRA, OSMRE maintains e-AMLIS, the central electronic database for housing the national inventory of unreclaimed AML problems affecting public health, safety, and the environment, and reclaimed sites, along with their associated reclamation costs. BIL funding may be used by State or Tribal AML Programs to amend their inventory of coal problems. Costs associated with the activities necessary to update a State or Tribe's inventory in e-AMLIS should be included under this subaccount.

Please note that this definition does not include construction oversight or long-term monitoring or maintenance. Any cost related to construction oversight or long-term monitoring or maintenance should be included under direct project subaccounts such as 03 and 04. Any BIL costs related to long term AMD operational and maintenance costs should be included under subaccount 21.

21. Acid Mine Drainage (AMD) Operational and Maintenance Costs

These are costs associated with the long-term operation and maintenance of AMD treatment facilities. This category was created as a result of the determination that States and Tribes receiving BIL AML funding may use the grant funds to operate and maintain AMD treatment facilities. Costs related to the construction of AMD treatment facilities should be included under direct project subaccounts such as 03 and 04. Costs related to the design of AMD treatment facilities should be included under subaccount 19.

23. BIL Emergency Projects Costs

These costs are authorized by the BIL. As defined at 30 C.F.R. § 700.5, an emergency is a sudden danger or impairment that presents a high probability of substantial physical harm to the health, safety, or general welfare of people before the danger can be abated under normal program operation procedures. Emergency project costs cover the emergency restoration, reclamation, abatement, control, or prevention of adverse effects of coal mining practices on eligible lands. Emergency projects must be pre-authorized by OSMRE, directly related to emergency hazard abatement, and are subject to availability of funds

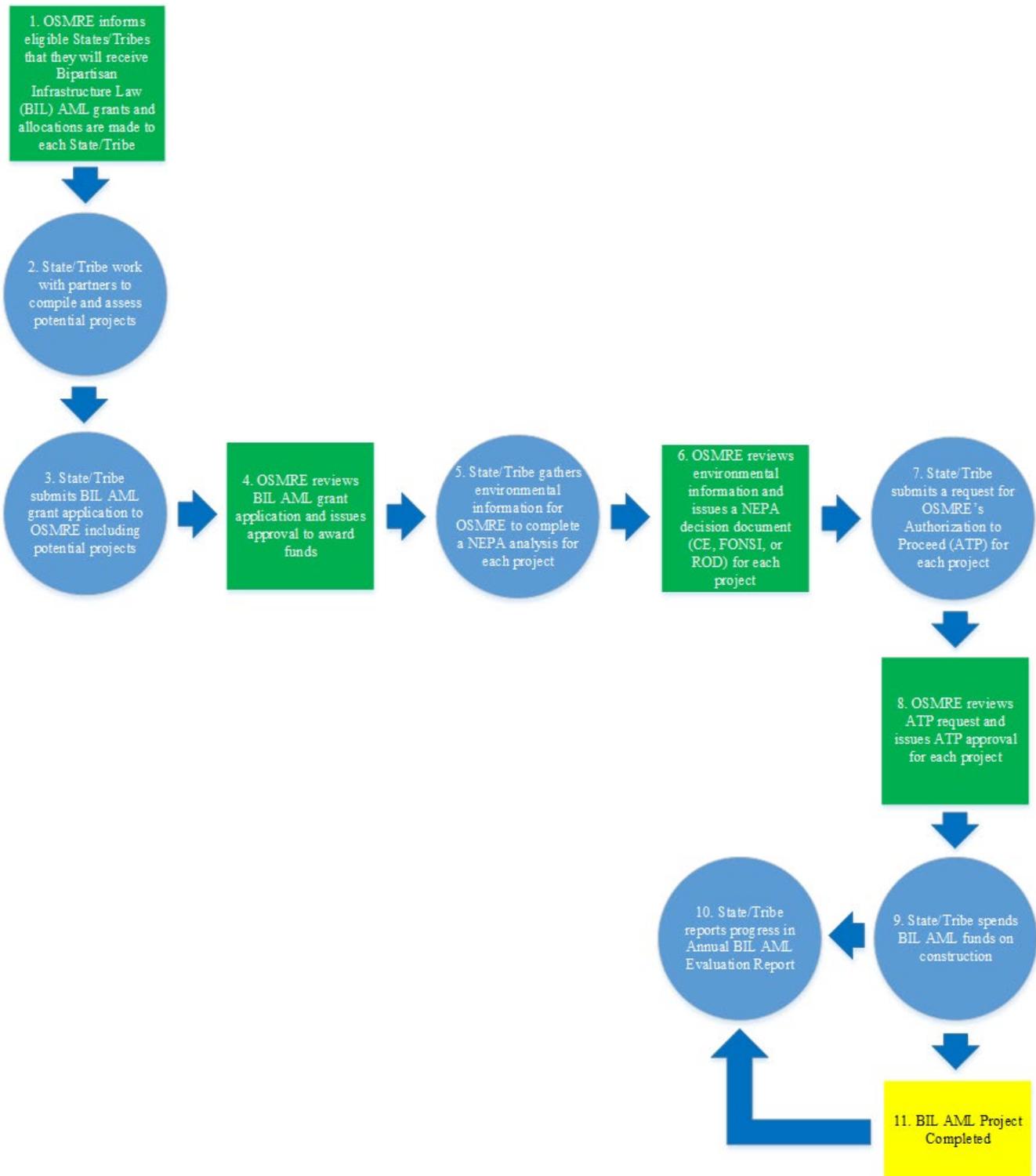
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Appendix II: Table for BIL AML Eligible Projects

The following table is an optional template for States and Tribes that choose to submit project lists with their FY22 BIL AML application.

Project or Activity	Type of Hazard	Estimated FY 20XX BIL AML Funding for Project	Schedule	Proposed Project Accomplishments
<i>Project 1 – Name of Project</i>	<i>E.g., Dangerous Highwall, Clogged Stream Lands, etc.</i>	<i>\$XXXX</i>	<i>Anticipated Start Date – Anticipated End Date</i>	<i>E.g., dangerous highwall reclaimed</i>

Appendix III: BIL AML Project Flowchart



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Appendix IV: DOL Fact Sheet #66A: Bipartisan Infrastructure Law

This fact sheet provides general information relating to Davis-Bacon requirements for construction projects funded by the Bipartisan Infrastructure Law (BIL), provided by the Department of Labor's Wage and Hour Division (WHD). The WHD administers and enforces Davis-Bacon labor standards on Federally funded and assisted construction projects, and, as such, is responsible for determining locally prevailing wage rates and ensuring those prevailing wages are paid to construction workers on covered projects.

Davis-Bacon Related Act Coverage of Bipartisan Infrastructure Law Construction Projects

The Davis-Bacon Act requires contractors and subcontractors to pay laborers and mechanics employed on federal construction contracts no less than the locally prevailing wages and fringe benefits for corresponding work on similar projects in the area. Many federal laws that authorize federal assistance for construction projects, such as through grants, loans, loan guarantees, or other similar funding mechanisms, require funding recipients to comply with the prevailing wage and labor standards requirements of the Davis-Bacon Act. Such laws are generally known as Davis-Bacon "Related Acts," or Davis-Bacon Related Acts.

The BIL, which President Biden signed on November 15, 2021, focuses on rebuilding and improving our nation's aging infrastructure through a historic investment of federal funds in state and local infrastructure construction. A vast majority of the federal funding authorized by the BIL requires the payment of Davis-Bacon prevailing wages on covered construction projects. The BIL applies Davis-Bacon labor standards to federally-funded or assisted construction projects in three different ways by:

1. adding funding to programs previously authorized by an existing Davis-Bacon Related Act (such as the Infrastructure for Rebuilding America program and the Drinking Water/Clean Water state revolving loan funds);
2. adding new programs under the umbrella of an existing Davis-Bacon Related Act (such as the new Bridge Investment program and the new Airport Terminal Improvement program); or
3. including provisions which expressly provide that Davis-Bacon labor standards apply to all construction projects receiving funding under particular programs created by or funded through the BIL. For example, construction projects assisted by funding made available under Division D or an amendment made by Division D of the BIL (Energy) are subject to Davis-Bacon requirements

Finally, while the broadband assistance programs under Division F of the BIL do not generally require the payment of Davis-Bacon prevailing wages, the agencies administering those programs may consider the payment of prevailing wages as a positive factor when allocating funding. WHD will be available to provide guidance to funding applicants and funding agencies who are considering the payment of Davis-Bacon prevailing wages as a factor in connection with funding awards under the BIL's broadband assistance programs.

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Basic Provisions/Requirements of Davis-Bacon Related Acts

Funding for construction projects authorized by the BIL requires certain actions on the part of federal funding agencies, funding recipients (such as state or local agencies), and construction contractors in order to ensure compliance with Davis-Bacon Related Acts.

Federal Funding Agencies

Among other requirements, the federal funding agency must:

- notify potential funding recipients that the Davis-Bacon labor standards are applicable to any construction projects that receive the relevant BIL funding;
- ensure that the funding recipients require the Davis-Bacon contract clauses, as set forth at 29 C.F.R. § 5.5, and applicable wage determinations be inserted into all contracts for construction projects receiving the federal funding (a wage determination is a schedule of prevailing wage rates determined by the Secretary of Labor that applies to construction subject to Davis-Bacon requirements in a particular geographic area);
- provide guidance to funding recipients as to which construction projects are covered by Davis-Bacon requirements and which wage determinations apply to those projects; and
- take steps to ensure that the Davis-Bacon requirements are met on their funded projects, including receiving and reviewing certified payrolls submitted by contractors (except to the extent that the federal agency has delegated the receipt and review of certified payrolls to the funding recipient).

Funding Recipients

Among other requirements, the funding recipients must:

- ensure that the Davis-Bacon contract clauses and applicable wage determinations are inserted into any construction contracts entered into by themselves or their sub-recipients for projects receiving any federal funding subject to Davis-Bacon labor standards (the required contract clauses are set forth at 29 C.F.R. § 5.5, and general wage determinations and guidance on their application can be found at alpha.sam.gov);
- provide guidance to sub-recipients and contractors as to Related Act coverage, wage determination applicability, and the classifications of work performed on the contract;
- conduct sufficient monitoring of sub-recipients and contractors to ensure that laborers and mechanics are being paid the applicable prevailing wages and fringe benefits;
- receive and review certified payrolls, and, where applicable, forward certified payrolls to the federal funding agency; and
- upon the written request of the Department of Labor, or on their own initiative, both the federal funding agencies and the funding recipients must withhold payments to the prime contractors in an amount sufficient to cover any unpaid prevailing wages owed to workers or suspend any further payments until violations of the Davis-Bacon labor standards have ceased.

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Failure to take these actions may result in the loss of the federal funding, in accordance with 29 C.F.R. § 5.6.

Contractors and Subcontractors

Among other requirements, contractors and subcontractors must:

- pay at least the Davis-Bacon prevailing wages listed in the applicable wage determinations included in the contract to laborers and mechanics who work on the site of work—
 - the Davis-Bacon prevailing wage is the combination of the basic hourly rate and any fringe benefits listed in a Davis-Bacon wage determination;
 - contractors can meet this obligation by paying each laborer and mechanic the applicable prevailing wage for the classification of work they perform entirely as cash wages or by a combination of cash wages and employer-provided bona fide fringe benefits;
 - contractors must pay laborers and mechanics the applicable prevailing wages for all hours worked on the site of the work on a weekly basis (except for contributions to bona fide fringe benefit plans, which must be made at least quarterly);
- maintain an accurate record of hours worked and wages paid, including fringe benefit contributions;
- submit certified payrolls to the contracting agency/funding recipient each week, within seven days of the payroll date for that workweek; and
- ensure that the required contract clauses and applicable wage determinations are incorporated into any lower-tier subcontracts.

Where to Obtain Additional Information

For additional information, visit the Wage and Hour Division website: www.dol.gov/agencies/whd or call our toll-free information and helpline, 1-866-4-USWAGE (1-866-487-9243), available 8 a.m. to 5 p.m. in your time zone. This appendix is for general information and is not to be considered in the same light as official statements of position contained in the regulations.

The contents of this appendix do not have the force and effect of law and are not meant to bind the public in any way. This appendix is intended only to provide clarity to the public regarding existing requirements under the law or agency policies.

Walker, Samuel

From: Julie Leonard <j.a.leonard@mindspring.com>
Sent: Wednesday, June 19, 2024 4:37 PM
To: LU Land Use Planner; Walker, Samuel
Subject: [EXTERNAL] Docket # LU-24-0009

As plans are finalized for work to mitigate fire danger from the coal seam fire near Hwy 119 and Hwy 93, I ask you as a resident of Marshall to make sure that plans include a water storage cistern for emergency use for any fires that may be ignited in the area, either from the coal seam fire or other causes. Since we all get our water from wells, and the electricity will likely go out in a fire situation, preventing the wells from functioning, this is especially critical to our safety and peace of mind.

Thank you,
Julie Leonard

1534 Marshall Rd
Boulder, CO 80305

Walker, Samuel

From: Heather Forrest <heatherforrest1@gmail.com>
Sent: Wednesday, June 19, 2024 9:09 PM
To: Walker, Samuel; LU Land Use Planner
Subject: [EXTERNAL] Marshall neighborhood

Hi there, I just heard that today is the last day to get our comments in. I live in Marshall. At 1303. I would definitely like to put in my plea for getting fire hydrants in our neighborhood and/or access to water to fight fires. That would really help with making sure that nothing like the Marshall fire happens again. Thank you so much please consider getting water to all of us in Marshall. It's very very important that we keep our homes, families and pets safe.

Thank you,
Heather Forrest
720-568-0300



To: Boulder County Commissioners
 Boulder County Community Planning and Permitting,
 City of Boulder Council Members,
 City of Boulder Open Space and Mountain Parks
 Rep. Joe Neguse,
 Sen. Rachel Zenzinger,
 Sen. Jeff Bridges,
 Rep. Judy Amabile,
 Rep. Kyle Brown

Date: June 19, 2024

Re: Boulder County Limited Impact Review #LU-24-0009: Limited Impact Special Use Review to permit 364,000 cubic yards of earthwork for subsurface coal fire mitigation and redevelopment of the Marshall Mesa trailhead.

The City of Boulder (City) has submitted a Limited Impact Special Use permit for review by Boulder County for reclamation of an underground coal fire and trailhead improvements at the City of Boulder Marshall Mesa Trailhead (Trailhead). Considering this proposal encompasses the “Trailhead Ignition Point” of the Marshall Fire, and considering the underground coal fire could not be ruled out as a potential cause of the Marshall Fire, it is important that the wider Marshall Fire community voice be heard during this public review process.

First, the previous Use Review for this location (SPR-06-078 – Attachment 1) included a proposal by the City to fill a 27,000 gallon cistern for a fire supply system for the town of Marshall and Eldorado Springs (Attachment 1). This proposal was never fulfilled and that cistern was empty during the Marshall Fire. We are pleased to learn Mountain View Fire Protection District will be installing a 20,000 gallon cistern as part of the current proposal at the trailhead. We encourage Boulder County Commissioners to make this a “Condition of Approval” to ensure the cistern is *installed and functions* in accordance to the proposal this time.

Secondly, the requested reclamation at the trailhead under this public review is funded by the Federal Infrastructure Investment and Jobs Act (IIJA) which has granted the State of Colorado, Department of Reclamation and Mine Safety (DRMS) an additional \$150 million to address abandoned coal mining issues in the state of Colorado. This funding prioritizes water supply to adjacent properties that are impacted by some of the very mines being reclaimed (Attachment 2). This prioritization is because the adjacent communities have not only lived with environmental and public health risks for far too long- but also, because the reclamation will be a disruption to the community’s sense of safety, peace and healing. The Marshall community and surrounding mine impacted properties deserve the support the IIJA is intending such communities to have access to.

The reclamation this Boulder County Land Use Review addresses is part of the first round of IIJA funding in Colorado in part because of the unfortunate fact that the coal fire could not be ruled out as a cause of the Marshall Fire, but also, because of the coal fire’s unique proximity to urban development including Unincorporated Boulder County (UBC), the Town of Superior and the City of Louisville. The rapid spread of the Marshall Fire proved the proximity of this site and the underground burning coal seam fire should be a concern to everyone in the vicinity of the Trailhead. To have this risk close to homes, neighborhoods and urban centers without adequate water supply is no longer acceptable.

As part of this IIJA funding, DRMS is currently evaluating impacts to water quality and options for repair/replacement for properties in the area that impacted by abandoned coal mines. Due to the extent of abandoned coal mine reclamation in this land use proposal (LU-24-0009), not only is the surrounding adjacent community a candidate for these Federal IIJA Funds, but the City of Boulder parcel under this public review is undeniably impacted and a candidate for these Federal funds as well.

Since the underground coal fire could not be ruled out as a potential cause of the Marshall Fire (a two billion dollar federally declared disaster), it is essential for the City of Boulder to work with the State of Colorado and DRMS to utilize Federal IIJA funds to supply a pressurized hydrant at the City of Boulder property. Anything less is ignoring the risks these Federal funds are intended to address and would be minimizing the destruction and loss that occurred because of the Marshall Fire and specifically, the ignition point that occurred at this very trailhead.

In support of our community,
Marshall Together

Walker, Samuel

From: Marshall Together <hello@marshalltogether.com>
Sent: Thursday, June 20, 2024 6:31 AM
To: Walker, Samuel; LU Land Use Planner
Subject: [EXTERNAL] Marshall Mesa Emergency Water
Attachments: MT Comment on Marshall Mesa LU.pdf

Hello, Please find our letter in support of UBC's need for emergency water at the Marshall Mesa trailhead attached.

Thank you for your consideration,
Marshall Together Community

--

www.marshalltogether.com

Marshall Fire Survivor community



To: Boulder County Commissioners
 Boulder County Community Planning and Permitting,
 City of Boulder Council Members,
 City of Boulder Open Space and Mountain Parks
 Rep. Joe Neguse,
 Sen. Rachel Zenzinger,
 Sen. Jeff Bridges,
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 Rep. Kyle Brown

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The reclamation this Boulder County Land Use Review addresses is part of the first round of IIJA funding in Colorado in part because of the unfortunate fact that the coal fire could not be ruled out as a cause of the Marshall Fire, but also, because of the coal fire’s unique proximity to urban development including Unincorporated Boulder County (UBC), the Town of Superior and the City of Louisville. The rapid spread of the Marshall Fire proved the proximity of this site and the underground burning coal seam fire should be a concern to everyone in the vicinity of the Trailhead. To have this risk close to homes, neighborhoods and urban centers without adequate water supply is no longer acceptable.

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In support of our community,
Marshall Together

Walker, Samuel

From: Laura Schmonsees <lkschmoo73@gmail.com>
Sent: Wednesday, June 19, 2024 2:09 PM
To: LU Land Use Planner
Subject: [EXTERNAL] Comments for reclamation area and trailhead at Marshall Mesa.

Dear Boulder County,

I am a resident of the Marshall area just North of the reclamation area, and have some comments regarding the Marshall Mesa reclamation and trailhead improvements (regarding docket: LU-24-0009):

*1- It has been brought to our attention that the Federal Infrastructure Bill is funding the reclamation of the underground burning coal fire at the City's trailhead- we understand that a priority of this funding is to repair/replace water supplies that are impacted by some of the very mines that are being reclaimed on the City's property. **We ask that the City and County support our community and the Department of Mining with the evaluation of water supplies and replacement of supplies impacted by the abandoned coal mines, aligning with the guidance of the Federal Infrastructure Bill.** Furthermore, unless the risk of surface ignition by this underground coal fire will be eliminated by the reclamation, we ask the City and County to do everything possible to ensure the safety of our community, this includes working with the Department of Mining to secure water resources for the community that is impacted.*

*2- We are aware that in the process to open the Marshall Mesa trailhead in 2006, the City of Boulder stated they would fill a 27,000 gallon cistern as a fire supply point for the Town of Marshall and Eldorado Springs. We understand that this was never completed but are pleased to hear a cistern will be installed by Mountain View Fire District under this current proposal. **We ask the County to ensure the cistern is a "condition of approval" of the City's permit to make sure the cistern is installed as proposed this time.***

3- upon looking at the proposed new trailhead plan, I believe there's not enough parking for the predicted growth of use at these trailheads. Already currently during the weekends people are parking all along the road. This is only going to increase, and since there is such an impacted area due to reclamation, there should be more parking created over this impacted site to account for future use at the trailhead as well as more shuttle driving to Eldorado Canyon.

4- The Traffic Report provided by the City states: "Due to the SSD [stopping sight distance] limitations in the eastbound direction that is not feasible to remove, it is recommended an enhanced crosswalk be evaluated, such as an RRFB [rectangular rapid flashing beacon]." (pg 35 of Mueller Report) further, the report states: 'In addition to the RRFB, it is recommended that Advanced Pedestrian Warning Signs be installed in advance of the crosswalk in both the eastbound and westbound direction.' We support the recommendations for a RRFB in addition to pedestrian warning signs at this crosswalk.

Thank you for considering these comments,

Laura Schmonsees
 Marshall Area Resident
 Sent from my iPhone

Walker, Samuel

From: STEVE JACOBS <stevejacobs83@comcast.net>
Sent: Wednesday, June 19, 2024 3:40 PM
To: LU Land Use Planner
Subject: [EXTERNAL] South Boulder Trailhead coal seam mitigation project

Dear Boulder County Planner, I would like to express my concerns about the impact on the water quality, this projects presents to homes in the vicinity of this project. Is a place plan in to provide safe water to homes adjacent to the project in the Marshall community ? Thank you for your consideration.
Steve Jacobs 1600 Marshall rd. Boulder CO 80305

Walker, Samuel

From: Brian Fuentes <brian@fuentesdesign.com>
Sent: Wednesday, June 19, 2024 10:34 PM
To: Walker, Samuel; LU Land Use Planner
Subject: [EXTERNAL] LU-24-0009 Marshall Mesa Redevelopment

Re: LU-24-009: I was at the project area today, June 19, 2024 and besides the yellow sign at the entry to the parking lot, there were no stakes of the proposed improvements that I could find. I was under the impression that LISR also required staking as part of the public process?

The transportation department of Boulder County recommends following the conclusions of the traffic study provided by the city to install a blinking safety traffic signal for pedestrian crossing, which I fully support and think is critical for public safety. However it appears the City is proposing NOT doing a lighted crosswalk?

I also support the County requiring electric car charging infrastructure per the Boulder County Transportation comments. People are taking the shuttle to Eldo from here, RTD stop etc. so this is not some remote trailhead, it's a confluence of a lot of activity and requires infrastructure to meet the demands of the proposed use.

Lastly, since my house burned next door in the Marshall fire, I absolutely support the cisterns being a condition of approval to ensure the public safety on an area where the Sheriff could not rule out the coal mines as a cause of the fire that took everything I owned. The City's 27,000 gallon cistern at the trailhead was empty yet there were burned fire hoses in my yard the day after the fire from valiant fire fighters that tried to save our historic neighborhood but lacked adequate water resources. Firefighters drove 30 min round trip to try to get water to Marshall, this is not acceptable at a heavily used trailhead. I would hope that the town of Superior and Louisville would also feel very strongly about this since they are 'downwind' of this open space area and depend on the City and County of Boulder to make reasonable, adult decisions when it comes to basic infrastructure on a site with known hazards and a history of fires including the grass fire started in 2005 by the coal fires (about a year before the trailhead was approved to open). It should also be noted for the public record that temperatures below ground at the other site recently remediated in the area by the State of Colorado across Cherryvale road were ~650 deg F (as reported by 9 news), much higher than anticipated based on preliminary subsurface evaluations. Unless the State can guarantee this coal fire won't continue to be a risk to the public, the City and County need to support water infrastructure as part of this project for the basic public safety of its local firefighters and adjoining municipal areas, not to mention our local community and the users of this open space itself. Failure to require a water supply to address the known hazards would violate the fundamental intent of the article 4 standards Boulder County, the basis for this review process.

I trust the staff and commissioners will act in good faith and protect the public safety and welfare with their review of this project under the standards.

Brian Andrew Fuentes AIA
fuentesdesign ARCHITECT-led PASSIVE-house DESIGN-build
 303.523.4654
brian@fuentesdesign.com | fuentesdesign.com
 P.O. box #3495
 boulder, co 80307