Town of Blue River
Memorandum

TO: Mayor Decicco & Members of the Board of Trustees

FROM: Town Manager Michelle Eddy;

DATE: June 4, 2024

SUBJECT: **Spruce Creek Road Project History**

Spruce Creek Road was identified in the adopted 2018 Capital Improvement plan. In 2021, the Board of Trustees requested staff begin work to review, develop, present and implement a capital improvement project. Due to the impact and high priority listed in the Capital Improvement Plan, Spruce Creek Road was chosen for evaluation. Over the course of the next four years, staff work with Muller Engineering and the Board of Trustees to develop a project that could provide some improvement to the road. In March 2024, the Board of Trustees were presented three options for a final design. The design and final approval was approved in April 2024. The project was put out to bid with low interest. Discussion of next steps will take place at the Board of Trustees meeting on June 13, 2024.

Included in this memo are is a project timeline, resident suggestions that were included in various drafts and proposals and a summary of invoices for the project. Since 2021, the project has incurred $122, 636.02. The amount equates to $30,659.01/year. Much of the expense was due to drafts, requests for changes, redrafts, additional scope added, redrafts and in some cases restarts on the project. Each time the engineers work to incorporate Trustee or resident requests that are either accepted, changed or rejected, it adds to the overall cost of the project. Overall, the project costs have remained relatively low for the design.

Excerpt from the 2018 Blue River Capital Improvement Plan.

Project ID	Name	Description
18-01	**Mountain View Trail**	Re-establish roadway and install drainage ditches along roadway draining west to Blue River.
18-02	**Wilderness Drive**	Establish drainage swales to convey water off roadway. Regrade low-point at Hinterland Court. Install culvert at Grey Squirrel Lane.
18-03	**Sherwood and Starlit Lane**	Widen roadway, establish ditches and install culverts to drain northeast along Blue Grouse Trail to Blue River
08-04	**Spruce Creek Road**	Regrade and realign intersection with Highway 9, establish ditches and culverts, potentially including culvert across Highway 9.
18-05	**Royal Drive and Regal Circle**	Widen roadway, establish ditches and culverts to convey drainage to recent Blue River Road drainage improvements to the west.
18-06	**Coronet Drive**	Address sediment build-up and erosion in ditches, evaluate washboarding improvements and safety along hairpin turn.
18-07	**Blue River Road/Hwy 9**	Install turn lanes, accel/decel lanes at Blue River Road and Highway 9.
18-08	**Leap Year Trail**	Construct roadway and drainage improvements along Leap Year Trail.
18-09	**Calle de Plata**	Install culvert, ditches to convey drainage on Calle de Plata.
18-10	**Crown Drive**	Widen and improve roadway along Crown Drive.
18-11	**Creekside Drive**	Establish ditches to convey drainage along Creekside Drive to Grey Squirrel, upsizing existing culvert.
18-12	**Dead Man's Corner**	Pursue signage, safety and/or access improvements at Dead Man's Corner (Highway 9, approximately MP 81.8).
18-13	**Timber Creek Estates**	Perform study to assess speed control signage, speed bump installation.
18-14	**Whispering Pines Entrance**	Establish ditches, install culverts to convey drainage.
18-15	**Blue River Road**	Establish drainage ditches and roadway improvements along Blue River Road.
18-16	**Breckenridge Emergency Access Route**	Provide redundant routes to Breckenridge in case of flooding or other emergencies
18-17	**Park-n-Ride/Town Parking Lot**	Provide parking lot for Town use (RV, Bus Stop, Visitor/Guest, Trailhead Parking – Indiana Creek, etc.)
18-18	**Tarn Improvements**	Providing improvements to Tarn access, Tarn amenities.
18-19	**Develop Trail Network Study**	Conduct trail network planning study for trails through Town with connections to existing trails. Includes Breckenridge to Blue River/Fairplay trail connection.

Draft scope and estimated cost to improve Spruce Creek in the 2018 Blue River Capital Improvement Plan.

18-04: Spruce Creek Road

PLANNING LEVEL ESTIMATE	DATE: November 2018
Summary of Work:	
Performing major grading to reduce the maximum grade of Spruce Creek from Highway 9 to Crown Drive. Regrading several accesses and intersections. Formalizing ditches and repairing drainage on the south side of Spruce Creek Road with ditches and driveway culverts extending from Highway 9 to Crown Drive. Additional ditch and culvert improvements on Spruce Creek Road, approximately 150-ft south of intersection with Crown Drive on the west side.	

DESCRIPTION OF ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED COST
MAJOR CONSTRUCTION ITEMS				
EARTHWORK	4700	CY	$ 38.00	$ 178,600
DITCH	380	LF	--	*(included above)*
MAJOR GRADING	4500	CY	--	*(included above)*
CDOT CLASS 6 BASE COURSE	400	CY	$ 54.00	$ 21,600
FORMALIZE ROADWAY	850	LF	--	*(included above)*
CULVERTS	150	LF	$ 100.00	$ 15,000
REMOVE CULVERT	80	LF	$ 55.00	$ 4,400
REMOVE TREE	15	EA	$ 300.00	$ 4,500
			Total Major Items	**$ 224,100**
ADDITIONAL ITEMS				
ENVIRONMENTAL/EROSION CONTROL	10%	LS	--	$ 22,410
MOBILIZATION	10%	LS	--	$ 22,410
TRAFFIC CONTROL	5%	LS	--	$ 11,205
			Total Additional Items	**$ 56,025**
			Contingency (25%)	**$ 70,031**
			Construction Subtotal	**$ 350,156**
PROGRAM ITEMS				
SURVEY	3%	LS	--	$ 10,505
EASEMENTS	10%	LS	--	$ 35,016
DESIGN	15%	LS	--	$ 52,523
CONSTRUCTION OBSERVATION	5%	LS	--	$ 17,508
TOWN INDIRECTS	5%	LS	--	$ 17,508

Total Program Items	**$ 133,059**
Total Estimate	**$ 484,000**

Notes, Assumptions, Comments:
Earthwork: Assumed a 2-ft depth V-ditch with 3:1 side slopes. **CDOT Class 6:** To establish crowns and formalize roadway template after major grading, 6" of new CDOT Class 6 material assumed for 20-ft width of roadway. **Removal of Tree:** Removal of trees quantity assumed from field visit and Google Earth imagery. Major Grading: For major earthwork, assumed 5-ft depth cut/fill with 2:1 side slopes on level surface.

Scope of Work
Town of Blue River Spruce Creek Road Design Services

Date: December 1st, 2021

Project Introduction

1. PROJECT BACKGROUND

The Town of Blue River Spruce Creek Road project will consist of designing improvements for the road based on results from a topographic survey. These alternatives include options such as regrading the road, adding pavement, and improving the CO 9 to Spruce Creek Road transition.

2. PROJECT GOALS

The primary goals for the project are as follows:

- Maintain or improve safety by improving the CO 9 and Spruce Creek Road intersection to maintain better traction during the winter.

3. PROJECT LIMITS

This project is located along Spruce Creek Road from CO 9 to Crown Drive in the Town of Blue River.

4. PROJECT COSTS

The total design cost of this project is estimated at $68,000

5. WORK DURATION

The total time for the work in this full scope is approximately 12 months, assuming to start in December 2021 to December of 2022.

6. CONSULTANT RESPONSIBILITY AND DUTIES

Throughout the entirety of this project, the Consultant will be responsible for: Survey, Preliminary Design, Final Design, and construction procurement services (amendment may be required if needed).

7. WORK PRODUCT

The work in the scope of services for this project will be contracted on an individual Task Order basis, as needed, or determined by the Town of Blue River.

Project Management and Coordination

1. BLUE RIVER CONTACT

The Contract Administrator for this project is: Michelle Eddy, Town Manager and Project Manager (PM) as referenced below.

2. PROJECT COORDINATION

Coordination will be required with the following stakeholders:

- Colorado Department of Transportation (CDOT)
- Town of Blue River
- Residents along Spruce Creek Road
- Emergency Responders
- Interest Groups

The Consultant should anticipate that a design that affects another agency needs to be accepted by that agency prior to its acceptance by the Town of Blue River. Submittals to affected agencies will be coordinated with the Town of Blue River.

Project Management and Coordination Meetings

1. PROJECT MEETINGS

All meetings except for site visits within this task order are anticipated to be held virtually.

1. Site Visit

The Consultant shall schedule and initiate a field visit to the project site during different milestones of the project. Three design team members are assumed – project manager, roadway design engineer, and hydraulics design engineer.

Design Check site visit – Spring/Summer 2022

2. Progress/Project Meetings

The Consultant shall schedule, initiate, prepare materials, facilitate, participate and provide notes and action items for the following meetings:

a. Project meetings (6 assumed)
b. As-needed check in meetings with staff (6 assumed)
c. Town Board meetings (3 assumed)

3. Public, Stakeholder Relations

The Consultant shall initiate and schedule all Public Relations efforts including setting up meetings with the internal and external stakeholders. The Consultant is also responsible for preparing appropriate presentation materials for all meetings.

a. Public/Stakeholder Meetings
    a. Three public/stakeholder meetings (3 meetings)
    b. The Consultant will coordinate additional meetings with the Town to discuss project updates, coordination required with other stakeholders, problems encountered and potential solutions as part of item 2b above.

Deliverables:

- Meeting notes in OneNote - The Consultant shall take minutes at all meetings and provide the Town Project Manager access to the project notebook where all project meetings will be documented.
- Action Items and Decision Items List in One Note - When a definable task is discussed during a meeting, the minutes will identify the "Action Items", the agency responsible for accomplishing them, and the proposed completion date. Similarly, when a definable decision is made by the Board or town, it will be identified as such in the minutes in OneNote.

2. PROJECT MANAGEMENT

This project will require close coordination and collaboration with the Town.

Project Management activities will include:

a. Overall Project Budget and Schedule

At task order initiation a project budget and schedule will be developed and submitted. These will be regarded as the baseline against which status and progress are measured and reported. The Consultant will work with the Town Project Manager to ensure that invoices contain required documentation and backup and will coordinate with the Town business office as needed or requested by the Town Project Manager.

b. Monthly Scope and Budget Updates:

The Consultant shall monitor scope and budget and report progress monthly. The Consultant will develop and implement change management procedures to manage work progress. These updates as well as change management strategies will be documented in monthly progress reports accompanying the consultant invoices.

c. Monthly Reporting and Billing

The Consultant shall submit monthly progress reports that summarize:

- Work accomplished for the month
- Task percent complete
- Task percent expended
- Work planned for the upcoming month
- Change management updates

d. General Project Management Responsibilities of Consultant

The Consultant shall develop, manage, and implement project coordination strategies including:

- Prepare for and participate in project meetings - invitations, materials, execution, and documentation
- Maintain action items, decision log, scope log, issues tracking, etc.
- Document management for file share platforms, program level cost estimates and toggle spreadsheets, and Bluebeam reviews (if requested by the Town PM)

Deliverables:

- Overall Project Budget and Schedule in Microsoft Project
- Monthly Invoice
- Monthly Progress Report
- Action Item and Decision Logs to be maintained on OneNote.

C. DEVELOP A PROJECT SCHEDULE AND ASSIGN TASKS

The Consultant will develop and maintain a project schedule with key milestones. The schedule included in the Consultant's proposal will serve as the starting point and will be re-baselined. Project schedule updates will be included in the monthly reporting as discussed in Section 5.B Project Management.

Deliverables:

- Overall Project Schedule to be maintained in Microsoft Project

D. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

1. The Consultant will conduct internal QA/QC reviews of all deliverables throughout the process in accordance with Muller's Quality Management Program (or equal).
2. Peer and interdisciplinary reviews of meeting and presentation materials will be conducted to provide consistency of project messages and communication. Quality reviews, Town reviews, Stakeholder reviews, and comment resolution periods will be incorporated into the project schedule for milestone submittals.

Deliverables:

- None

Environmental Coordination

A. PROJECT INITIATION

B. DATA COLLECTION, FIELD INVESTIGATION, MITIGATION MEASURES AND DELIVERABLES

1. **Threatened and Endangered (T&E) Species**
   a. IPaC and SWIFT Review: The team will review the Information for Planning and Consultation (IPaC) from the US Fish and Wildlife Service (USFWS) to determine applicable species and habitat to this project. Additionally, the team will use the StateWide Impact Findings Tables (SWIFT) to determine if the project will affect threatened and/or endangered species.
   b. Note: It is assumed the project will result in a "no effect". Additional scope will be required if Section 7 Consultation is needed with the U.S. Fish and Wildlife Service (USFWS).
2. **Wetland and Waters of the U.S. (WOTUS)**
   a. The project team will review NWI maps to check for the presence of wetlands. It is assumed this project will not impact nearby wetlands or WOTUS, and that delineation of wetlands will not be required.

Environmental Deliverables

- Biological Resources Report

Preliminary Design

A. PRELIMINARY DESIGN

1. **Utility Coordination**
   a. Location Maps
      i. Creation of a GIS-based utility and irrigation map book that identifies the known utilities and irrigation crossings within the project limits.
   b. Reviews and Investigations
      i. Creation of a utility and irrigation tracking spreadsheet to identify, monitor and coordinate impacts to these entities within the project limits.
   c. SUE Investigation
      i. SUE will be planned to be performed as part of preliminary design, roughly in Spring 2022 as weather allows to be in compliance with ASCE 38-02.

Utility Deliverables:

- Location Maps
- Irrigation and Utility Tracking Spreadsheet

2. **Drainage Coordination**
   a. Perform preliminary investigation of culverts and drainage ditches.

Drainage Deliverables:

- Location Map
- Preliminary plan information, assumed to be included in roadway plans

3. **Roadway Design and Roadside Development**

   All design activities will be coordinated with required Town project team staff, specialty units and other outside entities.

   a. Roadway Design
      i. Initial design validation
      ii. Roadway design criteria

   Roadway Deliverables:

   - Preliminary Roadway Typical sections, Plans and Profiles
   - Preliminary opinion of probable construction cost (OPCC)

FINAL DESIGN

1. **Utility Coordination**

   All design activities will be coordinated with required Town project team staff, specialty units and other outside entities.

   a. Utility Design
      i. Initial design validation

   Utility Deliverables:

   - Final Plans and Specifications
   - Utility clearance letter
   - SUE Plans

2. **Drainage Coordination**

   All design activities will be coordinated with required Town project team staff, specialty units and other outside entities.

   a. Drainage Design
      i. Initial design validation

   Drainage Deliverables:

   - Final Plans, specifications
   - Final drainage memorandum

3. **Roadway Design and Roadside Development**

   All design activities will be coordinated with required Town project team staff, specialty units and other outside entities.

   a. Roadway Design
      i. Finalize design plan and specifications and prepare cost estimate

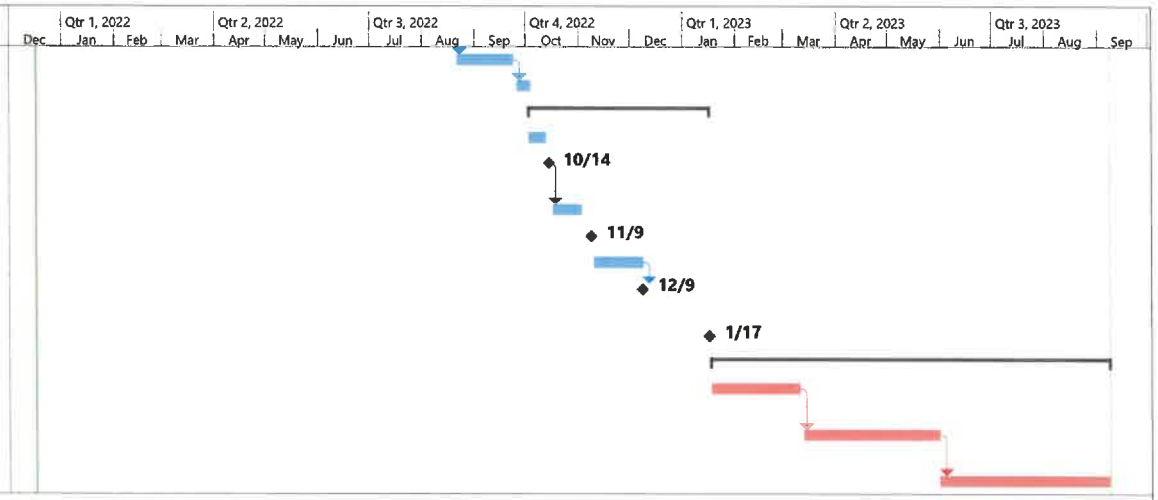
   Roadway Deliverables:

- Final Plans (removals, signing, markings will be shown on Roadway Plans), specifications
- Final OPCC
- Construction procurement documents (if necessary).

ASSUMPTIONS AND EXCLUSIONS

- Scope does not include any ROW acquisition or need for plans (General).
- Assumes no utility relocations (Utilities).
- Assumes no Section 7 Consultation is required (Environmental).
- Assumes no wetland delineation is required (Environmental).
- Assumes no construction phasing plans (Roadway)
- Assumes no approach road, driveway, or intersection details (roadway)

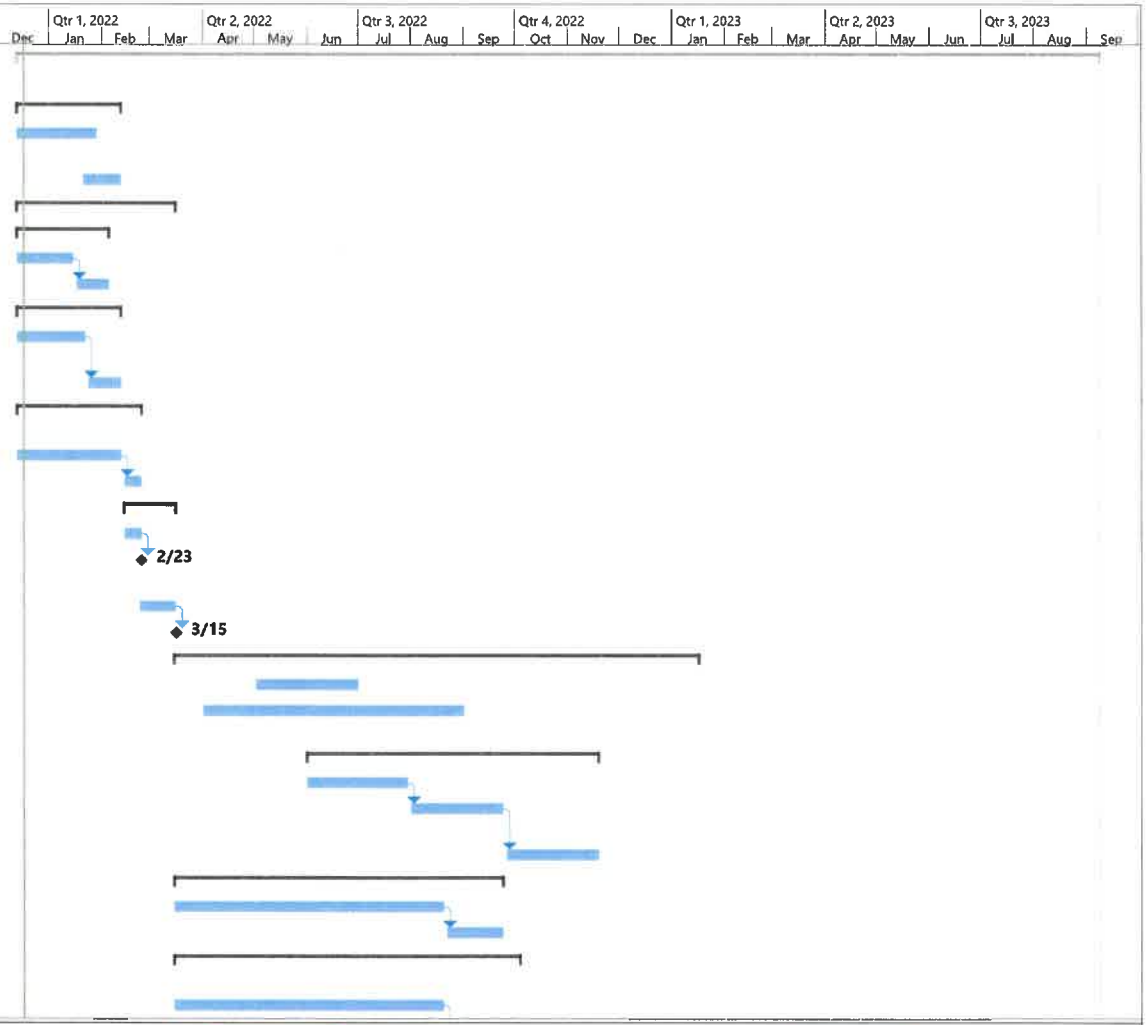
ID	Task Name	Start	Finish	Duration
31	Final Plans, Specs, Memo	Mon 8/22/22	Fri 9/23/22	25 days
32	Final OPCC	Mon 9/26/22	Mon 10/3/22	6 days
33	**Final Design Review**	**Mon 10/3/22**	**Tue 1/17/23**	**76 days**
34	Internal QA/QC	Mon 10/3/22	Wed 10/12/22	8 days
35	Send to Town, Agencies for Review	Fri 10/14/22	Fri 10/14/22	0 days
36	Town, Agencies Review	Mon 10/17/22	Wed 11/2/22	13 days
37	Comment Review Meeting	Wed 11/9/22	Wed 11/9/22	0 days
38	Address Comments	Thu 11/10/22	Thu 12/8/22	21 days
39	Final Plans, Specifications Submitted	Fri 12/9/22	Fri 12/9/22	0 days
40	Town Board Approval	Tue 1/17/23	Tue 1/17/23	0 days
41	**Construction**	**Wed 1/18/23**	**Fri 9/8/23**	**168 days**
42	Construction Procurement Documents	Wed 1/18/23	Fri 3/10/23	38 days
43	Bidding, Opening, Contractor Selection, Contracting	Mon 3/13/23	Wed 5/31/23	58 days
44	Construction Duration	Thu 6/1/23	Fri 9/8/23	72 days



Project: Spruce Creek Road Pro
Date: Fri 12/17/21

Task	Inactive Task	Manual Summary Rollup	External Milestone	Manual Progress
Split	Inactive Milestone	Manual Summary	Deadline	
Milestone	Inactive Summary	Start-only	Critical	
Summary	Manual Task	Finish-only	Critical Split	
Project Summary	Duration-only	External Tasks	Progress	

ID	Task Name	Start	Finish	Duration
0	**Spruce Creek Road Project Schedule - DRAFT**	**Mon 12/13/21**	**Fri 9/8/23**	**455 days**
1	**Environmental**	**Mon 12/13/21**	**Fri 2/11/22**	**45 days**
2	IPAC, SWIFT, NWI wetland map Review	Mon 12/13/21	Fri 1/28/22	35 days
3	Biological Resources Report	Fri 1/21/22	Fri 2/11/22	16 days
4	**Preliminary Design**	**Mon 12/13/21**	**Tue 3/15/22**	**67 days**
5	**Utility Coordination**	**Mon 12/13/21**	**Fri 2/4/22**	**40 days**
6	Utility Investigation, Tracking	Mon 12/13/21	Fri 1/14/22	25 days
7	Location Maps	Mon 1/17/22	Fri 2/4/22	15 days
8	**Drainage Coordination**	**Mon 12/13/21**	**Fri 2/11/22**	**45 days**
9	Culvert and Drainage Investigation, Hydrology	Mon 12/13/21	Fri 1/21/22	30 days
10	Drainage Concept Design	Mon 1/24/22	Fri 2/11/22	15 days
11	**Roadway Design and Roadside Development**	**Mon 12/13/21**	**Wed 2/23/22**	**53 days**
12	Roadway Design	Mon 12/13/21	Fri 2/11/22	45 days
13	Preliminary OPCC	Mon 2/14/22	Wed 2/23/22	8 days
14	**Preliminary Design Review**	**Mon 2/14/22**	**Tue 3/15/22**	**22 days**
15	Internal QA/QC	Mon 2/14/22	Wed 2/23/22	8 days
16	Send to Town, Agencies for Review	Wed 2/23/22	Wed 2/23/22	0 days
17	Town, Agencies Review	Wed 2/23/22	Tue 3/15/22	15 days
18	Comment Review Meeting	Tue 3/15/22	Tue 3/15/22	0 days
19	**Final Design**	**Tue 3/15/22**	**Tue 1/17/23**	**220 days**
20	Site Visit Window	Mon 5/2/22	Thu 6/30/22	44 days
21	Public/Stakeholder Engagement Window	Fri 4/1/22	Wed 8/31/22	109 days
22	**Utility Coordination**	**Wed 6/1/22**	**Fri 11/18/22**	**123 days**
23	SUE Survey and Plans	Wed 6/1/22	Fri 7/29/22	43 days
24	Utility Plans and Specifications	Mon 8/1/22	Fri 9/23/22	40 days
25	Utility Clearance Letters	Mon 9/26/22	Fri 11/18/22	40 days
26	**Drainage Coordination**	**Tue 3/15/22**	**Fri 9/23/22**	**139 days**
27	Final Design	Tue 3/15/22	Fri 8/19/22	114 days
28	Final Plans, Specs, Memo	Mon 8/22/22	Fri 9/23/22	25 days
29	**Roadway Design and Roadside Development**	**Tue 3/15/22**	**Mon 10/3/22**	**145 days**
30	Final Design	Tue 3/15/22	Fri 8/19/22	114 days



Project: Spruce Creek Road Pro
Date: Fri 12/17/21

Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Critical
Critical Split
Progress
Manual Progress

MULLER
ENGINEERING COMPANY

Memorandum

Project: Spruce Creek Road and Crown Drive

To: Michelle Eddy; Town of Blue River Trustees

From: Jeff Wulliman, PE
Steven Humphrey, PE

Date: January 17, 2023

Subject: Initial Opinion for Spruce Creek Road and Crown Drive

Attachment 1: Spruce Creek Road Preliminary Plan and Profile
Attachment 2: Crown Drive Profile and Cross Sections Exhibit
Attachment 3: Gold Nugget Drive Initial Profile Exhibit

This memorandum summarizes the background, initial analysis, and proposed recommended options to address observed issues at Spruce Creek Road and Crown Drive for consideration by the Town of Blue River Board Members. Attachments providing additional information regarding the existing conditions are included. The details of this memorandum and attachments will be a topic of discussion at the Board Meeting on January 31st, 2023, to discuss options the Town would like to explore. A supplementary scope of work and associated fee would then be developed to explore the shortlisted options and arrive at a final recommended design through engineering analysis, resident engagement, and stakeholder coordination.

Background:

Muller Engineering Company worked with the Town of Blue River and its residents to develop a Capital Improvement Plan in 2018 to help the Town identify, plan and program its future capital projects. Through input from the Town Residents from online surveys and public meetings, as well as through coordination with the Town Board and staff, Crown Drive and Spruce Creek Road were identified as potential projects to include in the Plan. The excerpts below are from public feedback received through the Capital Improvement Plan's development process:

- Spruce Creek Road:
    - *Much needed improvement from Crown Drive to the highway. There is nothing proposed about improving and stabilizing Spruce Creek Road upslope south to the Town limit. That section of roadway has been eroding for years and requires major work.*
    - *Spruce Creek Road Improvements - I think this is a very needed project on a heavily used portion of roadway.*

- Crown Drive:

- *Culvert needed Crown Drive and Golden Crown Lane. Run off leaves a very deep groove in the road. Been getting deeper and deeper each year. Crown subdivision should be paved. the dirt roads are extremely bumpy and dangerous. Culverts and potholes deteriorate quickly.*

In 2021, the Town selected Spruce Creek Road to be the first project to progress towards design out of the Capital Improvement Plan, with Crown Drive intended to be the next project in the following years. In December 2021, Muller Engineering Company was contracted to provide preliminary and final design, as well as utility, environmental, public, and stakeholder coordination for Spruce Creek Road.

Preliminary design for Spruce Creek Road was completed in February 2022 and reviewed with the Town Board in May 2022 following Trustee elections. The preliminary design, attached to this memo, recommended minor vertical alignment improvements, ditch grading and culverts, and minor intersection adjustments to Highway 9 and Spruce Creek Road. The preliminary design also recommended paving Spruce Creek Road. These minor adjustments were proposed to minimize impacts to adjacent residents without requiring more costly infrastructure such as wall treatments.

At the May 2022 Board Meeting, the Trustee's expressed their desire to further review the cost and impacts associated with more significant improvements at Spruce Creek Road to weigh them against the benefits of a more permanent solution. Additionally, at the meeting an idea was identified to review the implications of treating Spruce Creek Road as a One-Way access uphill (westbound), directing downhill (eastbound) traffic to access Highway 9 from Crown Drive. Following the meeting, the preliminary design was not further pursued as additional conceptual options were considered.

In July 2022, Muller Engineering Company met with Town Administrator Michelle Eddy to review potential options for Spruce Creek Road which included more significant profile adjustments, realigning Spruce Creek Road, and further pursuing the One-Way concept originally identified in May. Because potential options for Spruce Creek Road considered Crown Drive, and because Crown Drive is intended to be the subject of the Town's next project, the Town made the decision to obtain survey of Crown Drive and to combine them into one project with Spruce Creek Road. As overall access from Highway 9 to Crystal Peak Wilderness was under review, the decision was made to also obtain survey for Gold Nugget Drive.

In December 2022, Muller Engineering Company received the completed survey for Crown Drive and Gold Nugget Drive to begin reviewing existing conditions and determining available options to propose to the Town Board of Trustees.

Existing Conditions

This section summarizes the existing conditions of Spruce Creek Road, Crown Drive, and Gold Nugget Drive to provide a framework for the proposed options and issues below.

Figure 1 Vicinity Map

Spruce Creek Road from Crown Drive to Highway 9:

Roadway:

Spruce Creek Road has two steep pitches separated by a relatively flat landing near the intersection with Gold Nugget Drive. The average slope is just under 9%, though the maximum slope is over 13%. The road is narrow with steep embankment slopes on either side, including a steep slope adjacent to the property at 97 Spruce Creek Road. Key parameters are included in the table below:

Spruce Creek Road Key Roadway Parameters	
Length	800 feet
Surface Type	Gravel
Width	20+ feet, varies
Vertical Profile	9-13% with one 0.5% landing
Embankment Slopes	Steep (2:1 +)
Private accesses	Four (4)
Intersections	Highway 9 Miners Court Louis Placer Road Gold Nugget Drive Crown Drive

Highway 9 Intersection:

Spruce Creek Road's profile is over 12% leading up to its intersection with Highway 9. It connects to Highway 9 at a skew and in a location between two curves in the Highway with poor sight distance. An initial review of CDOT safety reports on Highway 9 indicate that there was one rear end crash (minor injury) at Spruce Creek Road over the last six years. Additional investigation would be required to obtain the narrative reports of the incident. CDOT safety reports do not capture unreported incidents or "near misses". There have been reports from Town staff and residents who have observed "near misses" at the intersection.

Drainage:

Runoff generally flows west to east, south to north in this location. Most runoff north of Spruce Creek Road drains away from the road. Runoff south of Spruce Creek Road is captured in an informal ditch or flows down the road. Drainage upstream of the access at 97 Spruce Creek Road flows into a pipe under the road and outfalls to a valley to the north. Further downstream, runoff flows down an informal ditch to a culvert under Highway 9, outfalling to the Tarn.

Access and Use:

Spruce Creek Road provides access to 15 properties; four on Spruce Creek Road, three through Miner Court, and eight through Louis Placer Road. Many on Crown Drive and Gold Nugget use Spruce Creek Road as access but it is not the only access.

Additionally, Spruce Creek Road provides access to popular recreation opportunities further south and experiences extremely heavy use during the summertime months. Winter recreation is growing in popularity as well.

Crown Drive from Spruce Creek Road to Highway 9:

Roadway:

From Spruce Creek Road, Crown Drive climbs to a peak at the property address 389 Crown Drive, then slopes downhill to the intersection with Highway 9. The average slope uphill is just under 9%, and the average slope from the peak to Highway 9 is also just under 9%. The maximum slope is over 13% near the property at 293 Crown Drive. The road is narrow with steep embankment slopes on either side, including a steep slope adjacent to the property at 97 Spruce Creek Road. Key parameters are included in the table below:

Crown Drive Key Roadway Parameters	
Length	2,800 feet
Surface Type	Gravel
Width	Narrow 18- 20 feet
Vertical Profile	6-13%, 0.5% at Hwy 9
Embankment Slopes	Steep (2:1 +)
Private accesses	Thirty (30)
Intersections	Highway 9 Gold Nugget Drive Golden Crown Lane Lodestone Trail Spruce Creek Road

Highway 9 Intersection:

Crown Drive's profile flattens to 0-0.5% leading up to its intersection with Highway 9. It connects to Highway 9 straight-on and in a location along a straighter section in the Highway with improved sight distance to Highway 9 and Spruce Creek Road. An initial review of CDOT safety reports on Highway 9 indicate that there was one embankment (run-off-road) and one rear end crash (both property damage only) at Crown Drive over the last six years. Additional investigation would be required to obtain the narrative reports of the incidents. CDOT safety reports do not capture unreported incidents or "near misses".

Drainage:

Runoff area contributing to Crown Drive is generally limited to the properties west of the roadway. There is a high point in Crown Drive approximately 800 lf north of the intersection with Spruce Creek Road. Runoff generally flows from the high point of Crown Drive and longitudinally down the roadway north or south. Runoff flowing south connects to Spruce Creek Road drainage. Runoff flowing north is captured in an informal ditch or flows down the road. Further north, runoff flows down an informal ditch to a culvert under Crown Drive, outfalling to the field just north of the intersection of Crown Drive and Highway 9.

It appears that larger offsite flows converge with Crown Drive approximately 200 feet southwest of the intersection with Highway 9. There are several driveways at this location. Significant improvements to Crown Drive may result in special attention to this location. Actual conditions would be verified with on-site investigation.

Access and Use:

Crown Drive provides access to approximately 37 properties; thirty on Crown Drive, and seven through Golden Crown Lane and Lodestone Trail.

Although it is not the primary recreational access, it does experience elevated traffic in the summer months as described above with Spruce Creek Road.

Gold Nugget Drive from Crown Drive to Spruce Creek Road:

Roadway:

Gold Nugget Drive's profile contains three vertical crests and two sag curves. From Spruce Creek Road, Gold Nugget Drive climbs shortly before dropping down to a low point at station 16+80, at the property on 332 Gold Nugget Drive. From there it gradually climbs to a peak before dropping to its lowest point at station 6+00, 137 Gold Nugget Drive, then climbs again to a peak before dropping down to its intersection with Crown Drive. The average slopes range from 4 to 8%, with maximum slopes occurring at the tie-in with Crown Drive at nearly 10%. The road is narrow with sections of steep embankment slopes on either side. Key parameters are included in the table below:

Gold Nugget Drive Key Roadway Parameters	
Length	2,034 feet (+920 feet Crown to Hwy 9)
Surface Type	Gravel
Width	Narrow 18- 20 feet
Vertical Profile	4-8%, max 9.7%
Embankment Slopes	Steep (2:1 +)
Private accesses	Nine (9)
Intersections	Crown Drive Nugget Lane Spruce Creek Road

Drainage:
Runoff contributing to Gold Nugget is generally from the area between Crown Drive and Gold Nugget. Overall topography slopes from west to east. There are two low points in Gold Nugget at approximately 600 feet and 1700 feet south the intersection with Crown Drive. Much of Gold Nugget drains towards the first low point at 600 feet while the low point at 1700 feet is much higher in elevation and appears to drain a smaller offsite area. From each low point, runoff will flow northeast towards Highway 9 and is controlled in roadside ditches and culverts which outfall to the Tarn. There are small informal ditches along much of the west side of Gold Nugget while the topography generally slopes away from the roadway on the east.

There is a house on the downstream side of the roadway at the location of the first low point (approx. 600 ft south of Crown Drive, 137 Gold Nugget Drive). No culverts or storm conveyance were surveyed at this location or visible from aerial imagery. Conveying drainage across Gold Nugget at this location will require special attention due to the proximity of the house, although it appears that runoff will generally spill across the roadway and away from the site before reaching this low point. Actual conditions would be verified with on-site investigation.

The second low point (approx. 1700 ft south of Crown Drive) appears to have a culvert to drain the contributing area across Gold Nugget, although the culvert was not surveyed.

Access and Use:
Crown Drive provides access to approximately 13 properties: nine on Gold Nugget Drive, and four through Nugget Lane.

Identifying the Project:

Issues to Address

The issues observed by Muller Engineering Company and Town staff that are important to address with the project scope can be defined under the larger issues of safety and maintenance.

Safety:

- Spruce Creek Road approach and intersection with Highway 9.
- Spruce Creek Road is very steep and can be hazardous in the winter.
- Crown Drive is steep and narrow in sections and can be hazardous in the winter.
- Speeding through Town streets.

Maintenance:

- Significant maintenance burden on Spruce Creek Road to address washboarding and potholes from heavy use.
- Maintenance burden on Crown Drive to manage washboarding and potholing
- Maintenance issues from rutting caused by runoff on Spruce Creek Road
- Maintenance issues from rutting caused by runoff on Crown Drive.

- Increased maintenance and road grading affect drainage and fill in culverts with road material

Project Factors

In seeking to address the issues above, the project scope needs to consider the following project factors:

- Upfront cost (capital to construct the project)
- Long-term maintenance burden
- Aesthetic feel of the Town of Blue River
- Property impacts, including ROW acquisition and access
- Public engagement and input
- Environmental impacts
- Utility conflicts and coordination

Potential Options to Evaluate

The following conceptual options have been developed based on initial assessment of the survey data and previous feedback from the Town of Blue River. There are several available options that can help address the identified issues, but each comes with its own risks or drawbacks as it relates to the overall Project Factors.

Traffic Routing-Based Options

Recreational user traffic is a major factor in this area of the Town and must be included as roadway improvements are considered. In the following options, "uphill" refers to access from Highway 9 to Crystal Peak Wilderness, and "downhill" refers to access returning from Crystal Peak Wilderness to Highway 9.

<table>
<tr><th colspan="2">Traffic Option 1: "Do Nothing"</th></tr>
<tr><td colspan="2">Description: Maintain recreation access up and down Spruce Creek Road.</td></tr>
<tr><td>Benefit:
Low impact to residents on Crown Drive and Gold Nugget Drive
Higher town maintenance burden on shorter segment of road.</td><td>Risk:
Continued use of hazardous Spruce Creek Road and Highway 9 intersection.</td></tr>
<tr><td colspan="2">Consideration: While not addressing the intersection safety with Highway 9, current recreational access impacts the shortest section of roadway today.</td></tr>
</table>

Traffic Option 2: Crown Drive Downhill	
Description: Make Spruce Creek Road one-way uphill to Crown Drive, route downhill traffic onto Crown Drive to Highway 9.	
Implementation: Re-grade Spruce Creek and Crown Drive intersection, include signage to promote through traffic onto Crown Drive. Profile changes to steep sections of Crown Drive. Anticipate some recreational and local traffic would continue to use Spruce Creek Road in the wrong direction	
Benefit: • Downhill users access Highway 9 at Crown Drive instead of Spruce Creek Road.	**Risk:** • Crown Drive increases length of unpaved roadway used by recreation traffic that the Town maintains. • Crown Drive has similarly steep slopes to Spruce Creek Road. • Adverse resident feedback on increased traffic on Crown Drive.
Consideration: Improvements to Crown Drive are needed to mitigate increased maintenance burden to the Town.	

Traffic Option 3: Gold Nugget Drive Downhill	
Description: Make Spruce Creek Road One-Way uphill to Gold Nugget Drive, route downhill traffic onto Gold Nugget Drive to Crown Drive to Highway 9.	
Implementation: Re-grade intersections with Crown Drive as well as Spruce Creek Road, signage to promote through-traffic onto Gold Nugget Drive. Anticipate local and some recreation traffic would continue to use Spruce Creek Road in the wrong direction.	
Benefit: • Downhill users access Highway 9 at Crown Drive instead of Spruce Creek Road. • Gold Nugget Drive has the most mild grades of the three roads. • Gold Nugget Drive has fewer properties and accesses than Crown Drive.	**Risk:** • Gold Nugget Drive increases length of unpaved roadway used by recreation traffic that the Town maintains. • Adverse resident feedback on increased traffic on Gold Nugget and Crown Drive.
Consideration: Improvements to Gold Nugget and Crown Drive are needed to mitigate increased maintenance burden to the Town. Long-term recreational shuttle access may benefit from a gentler profile.	

Roadway Improvement Options:

As described above, the existing roadways in the Town are narrow with steep profiles and embankment slopes. As Muller Engineering Company and the Town review improvements, the more significant the improvement, the greater the project footprint and adjacent impact becomes, which needs to be balanced against the benefit of the improvements. The information

below summarizes "lighter scope" and "heavier scope" options for the Town's consideration. The desirable traffic routing option may influence where a heavier scope option is applied.

For all options considering asphalt pavement on steep slopes: Consultation with a geotechnical engineer will be required to determine implementation and the appropriate pavement section.

For options considering walls: Consultation with a geotechnical engineer will be required to determine implementation and the appropriate foundation details. Muller Engineering Company is also compiling wall type options implemented on other projects that are relatively cost-effective, lower maintenance, and can uphold the desired aesthetic of the Town of Blue River.

These options are concept-level; those desirable to the Town can be further analyzed for feasibility following discussion on January 31st, 2023.

Spruce Creek Road (Lighter Scope) (see Preliminary Design)	
Overall Scope: Pave, perform minor roadway, drainage, and Hwy 9 intersection improvements to avoid property impacts or ROW needs.	
Implementation: • Perform profile adjustments where possible to flatten slope, especially at approach to Highway 9. • Replace culverts and install formal ditches on south side of Spruce Creek Road. • Work with CDOT on Highway 9 intersection, reducing skew and adjusting asphalt apron. • Consider asphalt pavement and appropriate pavement section.	
Benefit: • No significant environmental or resident impacts anticipated. • Gravel to pavement transition at Highway 9 addressed. • Maintenance burden to Town reduced	**Risk:** • Capital investment does not completely address the issues • Observed speeding may increase with pavement and addition of super elevations • Road may freeze-thaw, causing icy roads
Potential Limitations: • Appropriate pavement section for steep slopes.	
Project Value: • Lighter cost and impacts with proportional benefits	

Spruce Creek Road (Heavier Scope)
Overall Scope: Pave, regrade steep sections of Spruce Creek Road to extent possible without impacting houses.
Implementation: • Perform major profile adjustments to extent possible, especially at approach to Highway 9, tying into road where profile levels out.

<table>
<tr><td colspan="2">
• Determine extent of embankment slope extension, utilize walls to avoid impacts to houses.
• Regrade property accesses and intersections with Miner Court, Louis Placer Road, and Gold Nugget Drive.
• Replace culverts and install formal ditches on south side of Spruce Creek Road.
• Work with CDOT on Highway 9 intersection, reducing skew and adjusting asphalt apron.
• Consider asphalt pavement and appropriate pavement section.
</td></tr>
<tr><td>
Benefit:
• More significant adjustment to approach with Highway 9
• Road maintenance burden to Town reduced
</td><td>
Risk:
• Highway 9 intersection remains with minor improvements
• Wall installation and maintenance required
• ROW required
• Access reconstruction required
• Similar risks to lighter scope
</td></tr>
<tr><td colspan="2">
Potential Limitations:
• Embankment slope and property at 97 Spruce Creek Road are extremely close to Spruce Creek Road and may limit ability to adjust roadway profile without large wall treatments
</td></tr>
<tr><td colspan="2">
Project Value:
• Higher cost and impact, increase in benefits though all issues may not be addressed.
</td></tr>
</table>

<table>
<tr><td colspan="2">Crown Drive (Lighter Scope)</td></tr>
<tr><td colspan="2">Overall Scope: Perform minor roadway and drainage improvements to limit property impacts or ROW needs.</td></tr>
<tr><td colspan="2">
Implementation:
• Perform profile adjustments where possible to flatten slope at steeper sections.
• Replace culvert at intersection with Gold Nugget Drive
• Improve drainage conveyance down Crown Drive, including addressing offsite basin conveyance as possible.
• Consider asphalt pavement and appropriate pavement section.
</td></tr>
<tr><td>
Benefit:
• Addresses issues identified in Capital Improvement Plan
• Limits impact to adjacent properties
</td><td>
Risk:
• Increased maintenance burden if traffic is routed via Crown Drive
• Offsite drainage may not be fully addressed
</td></tr>
<tr><td colspan="2">
Potential Limitations:
• Appropriate pavement section for steep slopes
</td></tr>
<tr><td colspan="2">
Project Value:
• Lighter cost and impacts with proportional benefits
</td></tr>
</table>

Crown Drive (Heavier Scope)	
Overall Scope: Regrade steep sections of Crown Drive, consider pavement, and formalize drainage conveyance to extent possible without impacting houses.	
Implementation: • Perform major profile adjustments to address Crown Drive's peak • Determine extent of embankment slope extension, utilize walls to avoid impacts to houses. • Regrade property accesses and intersections required. • Formalize drainage conveyance with ditches and driveway culverts along Crown Drive, including offsite drainage on west side of Crown Drive. • Consider asphalt pavement and appropriate pavement section.	
Benefit: • More substantial leveling out of the profile of Crown Drive • Formal drainage conveyance to address offsite basin • Unpaved road maintenance burden to Town reduced	**Risk:** • Wall installation and maintenance required • ROW required • Access reconstruction required • Increased maintenance for drainage infrastructure possible
Potential Limitations: • Offsite drainage basin at Crown Drive may require significant drainage conveyance improvements to fully address. • Tie-in to property accesses at Crown Drive peak may limit ability to adjust slope.	
Project Value: • Higher cost and impact but addresses major concerns. Requires additional evaluation and public coordination.	

Gold Nugget Drive (Heavier Scope) – considered if traffic option 3 is selected	
Overall Scope: Pave Golden Nugget Drive and portion of Crown Drive, rebuild intersections, and formalize drainage conveyance to extent possible without impacting houses.	
Implementation: • Perform minor adjustments to Golden Nugget profile and part of Crown Drive profile. • Regrade and design intersections at Crown Drive and Gold Nugget Drive. • Determine extent of embankment slope extension, utilize walls to avoid impacts to houses. • Regrade property access tie-ins as required. • Formalize drainage conveyance with ditches and driveway culverts along Gold Nugget Drive, including low point at station 6+00, and Crown Drive, including offsite drainage on west side of Crown Drive. • Consider asphalt pavement and appropriate pavement section.	
Benefit:	**Risk:**

• Gold Nugget Drive requires less significant profile adjustments • Less use of Spruce Creek Road and Highway 9 intersection • Formal drainage conveyance to address offsite basin at Crown Drive • Unpaved road maintenance burden to Town reduced	• Intersection(s) re-design needed, ROW may be needed • Public impact for residents • Increased maintenance for drainage infrastructure possible • Addressing low-point drainage at Gold Nugget Drive
Potential Limitations: • Offsite drainage basin at Crown Drive may require significant drainage conveyance improvements to fully address. • Addressing drainage low-point at Gold Nugget Drive at station 6+00 may require offsite ditch grading outside of roadway limits	
Project Value: • Higher cost and impact but addresses major concerns. Requires additional evaluation and public coordination	

Recommendation:

We recommend the Board of Trustees review the information included in this memorandum to prepare for a discussion regarding this project at the January 31st Board Meeting. The desired outcome of the meeting is to review and identify which traffic options the Town would like Muller Engineering Company to continue to pursue for feasibility and implementation. Our recommendation on roadway improvements is to establish base design for the lighter scope options, and work with the Town to identify any opportunities to implement heavier scope items on a case by case basis. Upon confirmation of the path forward, Muller Engineering Company will develop an adjusted scope, fee, schedule, and approach to perform the analysis and engage the residents to determine the appropriate solutions for the Spruce Creek Road and Crown Drive project.

Gravel Road Treatment Comparisons

Dust Palliatives

Treatments:	Pro	Con	Cost
Magnesium Chloride	Spray and shallow mix Easy Application Fair/Good for Dust	Soluble / Tarnishes Polished Aluminum High Rain and Snow carry away Disappears with moisture over time.	$
Calcium Chloride	Spray or solid mix Spray Solution Easy Fair /Good Dust like MgCl	Soluble / Not readily Available in Colorado / Solid mixing requires Special equipment with dry process	$$
Lingosulfonate	Spray and shallow mixing Fair / Good Dust	Little History in Colorado Better in wet climates	$
Asphalt Emulsions	Spray and possibly till Good For Dust Insoluble once cured Readily Available	Easy Application (Blade Mix or till)	$$$

Stabilization

Clay in Aggregate	FHWA Req. 10-14% minus 200 Plastic Index 10 +/- Provides Cohesion Improves Drainage once compacted	Poor Dust Palliative Does not affect current Agg. gradual replacement of in-situ Agg.	<$
Bentonite	Manufactured Clay like cohesive Good adhesion	Requires pug mill mixing Fair/Poor Dust Palliative Improves Drainage and Holds Aggregate	$$$
Chlorides, Ca or Mg	Spray Application 1.5 to 2 percent by weight Fair to good Dust Palliative	Mixed 2 to 3 inch depth Bladed and Compacted Longitivity since soluble	$$
Asphalt emulsion	Very Good Dust Palliative Typically Spray Application With blade mixing or till Also will stabilize ABC	Spray on Surface	$$$
Hot Mix Pavement Min 3"	Low Dust / Long lasting Good Drainage	Initial Cost Long Term Maintenance Low Maintenance early	$$$$$$

Note:

EarthBind is a proprietary Asphalt Emulsion Treatment	Improves stabililty and surface. Cost is highest, with better durability Longer lasting compared to Chloride treatments and longevity Is also the best	?$$$
EarthBind Stabilization	Company has similar emulsion products to stabilize gravel roads Company has experts to provide recommendations for treatment, site specific. Blue Line out to Oregon also carries a complete line of treatments, including MgCl and Lignosulfonate. May have a local representative who could provide comparative treatment costs	

Could also contact local emulsion suppliers or contractors to find out who supplies similar type of treatments.

Spruce Creek Road – Ideas presented and observations from Barrie Stimson

6.14.22 Onsite meeting with Michelle (Town Manager), Jeff and Levi (Muller Engineering), Ted Slaughter (Town Trustee) and Barrie Stimson (Resident 97 Spruce Creek Rd.)

Issues in Order of Priority

1. Safety at Hwy 9 mainly entering Hwy.
2. Dust
3. Noise from wash boards
4. Speed

Possible Solutions:

Pave Spruce Creek Rd from Hwy 9 to Crown Drive

Make Spruce Creek Rd One Way from Hwy 9 to Crown Drive. Coming down the road in winter is dangerous. One Way could give more room for cars that get stuck on are spinning more room to get off to the side and people could have a better chance of getting by. People could get to Hwy 9 coming down by going down Crown Drive or Gold Nugget. Pave Rd. 1 ½ lanes wide would save money instead of 2 lanes.

Install Two Speed Humps on Spruce Creek Rd. (install one half way up from Hwy 9 and one in between Gold Nugget and Crown Drive.) Best solution for deterring speed. Humps don't imped emergency equipment or snowplows.

Two 15 Mile Per Hour signs on Spruce Creek coming up from Hwy 9. Move the one coming off highway to the telephone pole and install another one on stop sign at Gold Nugget.

The only thing I saw that got people to slow down was a cop parked on the road and the electric speed sign on the trailer.

Consider installing culvert all the way down Spruce Creek from Louise Placer Rd. This would give people even more room. Maybe line drainage all the way from Spruce Creek Rd and Crown Road intersection with rock to keep from continued erosion from runoff.

Clean culverts, under Hwy 9, Miner's Ct. under Spruce Creek Rd, between Crown Drive and Gold Nuggest Dr., under Spruce Creek Rd at Spruce Creek Rd and Crown Dr intersection, under driveway at 148 Spruce Creek.

Explore use of Camera for speed control. The revenue from ticketing could also be beneficial to Town's Budget.

Consider trying a Drywell for drainage at low spot nearing intersection of Crown Drive and Hwy 9.

info

From: Scott Jackman <sjackman4545@gmail.com>
Sent: Monday, January 30, 2023 6:35 PM
To: info
Subject: Spruce Creek Road discussion

Dear Board of Trustees,

We have reviewed the board packet for Tuesday's trustees meeting on the topic of Spruce Creek Road concerns. We believe that Option 1-No Change, is the best choice. We don't see any justifications explained for the major changes recommended in Options 2 and 3.

Thank you for your consideration.

Scott and Lara Jackman
26 Nugget Lane

info

From: dougnsue9@comcast.net
Sent: Wednesday, January 25, 2023 12:56 PM
To: info
Subject: Spruce Creek Capital Project Review Feedback for Consideration

Board of Trustees,We have reviewed the report from Muller about possible options being considered for road improvements in the Crown subdivision The overall feedback from neighbors so far is to leave the traffic patterns as is and increase maintenance and address Spruce Creek Rd and the Hwy 9/Spruce Creek entrance. Also look into more signage from CDOT on the hwy to slow down traffic. Here is a list of the homeowners that have agreed with this being the option we would like to look into. Thank You . Doug O'Brien

(Crown Dr)

Doug and Sue O'Brien 461 Crown Dr
Mike and Sasha Koons 462 Crown Dr
Adam and Jodie Willey 414 Crown D
Dick and Barbara Childs 389 Crown Dr
Brentt and Terry Johnson 164 Crown Dr

(Gold Nugget Dr)

Nathan and Michelle Ihrig 67 Gold Nugget Dr
Robert and Theresa Rust 251 Gold Nugget Dr
Mark and MJ Loufek 228 Gold Nugget Dr
Stace and Terry Green 266 Gold Nugget Dr

(Golden Crown)

Cody and Annie Graybill 61 Golden Crown
(Nugget Lane)
Scott and Lara Jackman 26 Nugget Lane
Mark and Gloria Thomas 48 Nugget Lane
(Spruce Creek Rd)
Kara Martella 143 Spruce Creek Rd

(Louise Placer)

Mark Orton 54 and 181 Louise Placer
James Wehrmacher 106 Louise Placer
Barbara Scheidegger 122 Louise Placer
Gretchen Parker 105 Louise Placer

(Miners Court)

Jerry and Donna Grant 14 Miners Ct.

Amendment 1 Scope of Work
Town of Blue River Spruce Creek Road Design Services

Revised: June 13th, 2023
(Updates to scope for Amendment 1 are shown in red)

Project Introduction

1. PROJECT BACKGROUND

The Town of Blue River Spruce Creek Road project will consist of designing improvements for Spruce Creek Road, as well as Crown Drive, and Gold Nugget Road based on results from a topographic survey. These alternatives include options such as re-grading the road, pavement, improving the CO 9 to Spruce Creek Road transition, improving the CO 9 to Crown Drive transition, reviewing potential structural elements, and analyzing options for managing speed through Town roads.

2. PROJECT GOALS

The primary goals for the project are as follows:

- Maintain or improve safety by improving the CO 9 and Spruce Creek Road intersection to maintain better traction during the winter.
- Reduce the maintenance burden to the Town by improving grade and drainage on Town roads.

3. PROJECT LIMITS

This project is located along Spruce Creek Road from CO 9 to Crown Drive, down Crown Drive to CO 9, and along Gold Nugget Road in the Town of Blue River.

4. PROJECT COSTS

The total design cost of this project is estimated at $144,459. $69,566 for the original contract and an additional $74,893 for the expanded scope in Amendment 1.

5. WORK DURATION

The total time for the work in this amendment is approximately 12 months, assuming to start in June 2023 to June 2024.

6. CONSULTANT RESPONSIBILITY AND DUTIES

Throughout the entirety of this project, the Consultant will be responsible for: Survey, Preliminary Design, Final Design, and construction procurement services (additional amendments may be required if needed).

7. WORK PRODUCT

The work in the scope of services for this project will be contracted on an individual Task Order

and amendment basis, as needed, or determined by the Town of Blue River.

Project Management and Coordination

1. BLUE RIVER CONTACT

The Contract Administrator for this project is: Michelle Eddy, Town Manager and Project Manager (PM) as referenced below.

2. PROJECT COORDINATION

Coordination will be required with the following stakeholders:

- Colorado Department of Transportation (CDOT)
- Summit County
- Town of Blue River
- Residents along Spruce Creek Road
- Emergency Responders
- Interest Groups

The Consultant should anticipate that a design that affects another agency needs to be accepted by that agency prior to its acceptance by the Town of Blue River. Submittals to affected agencies will be coordinated with the Town of Blue River.

Project Management and Coordination Meetings

1. PROJECT MEETINGS

All meetings except for site visits within this amendment are anticipated to be held virtually unless otherwise noted.

1. Site Visit

The Consultant shall schedule and initiate a field visit to the project site during different milestones of the project. Three design team members are assumed – project manager, roadway design engineer, and hydraulics design engineer.

Design Check site visit – Spring/Summer 2022

The Consultant shall schedule and initiate a field visit in 2023 to the project site to review the expanded project area and Spruce Creek Road. Five design members are assumed: project manager, environmental coordinator, roadway design engineer, geotechnical engineer, and structural engineer.

Site visit: Summer 2023

2. Progress/Project Meetings

The Consultant shall schedule, initiate, prepare materials, facilitate, participate and provide notes and action items for the following meetings:

a. Project meetings (12 assumed)

b. As-needed check in meetings with staff (12 assumed)
c. Town Board meetings (5 total assumed, 2 in person)

3. Public, Stakeholder Relations (no change in Amendment 1)

The Consultant shall initiate and schedule all Public Relations efforts including setting up meetings with the internal and external stakeholders. The Consultant is also responsible for preparing appropriate presentation materials for all meetings.

a. Public/Stakeholder Meetings
    a. Three public/stakeholder meetings (3 meetings), 2 assumed in person

The Consultant will coordinate additional meetings with the Town to discuss project updates, coordination required with other stakeholders, problems encountered and potential solutions as part of item 2b above.

Deliverables:

- Meeting notes in OneNote - The Consultant shall take minutes at all meetings and provide the Town Project Manager access to the project notebook where all project meetings will be documented.
- Action Items and Decision Items List in One Note - When a definable task is discussed during a meeting, the minutes will identify the "Action Items", the agency responsible for accomplishing them, and the proposed completion date. Similarly, when a definable decision is made by the Board or town, it will be identified as such in the minutes in OneNote.

2. PROJECT MANAGEMENT

This project will require close coordination and collaboration with the Town.

Project Management activities will include:

a. Overall Project Budget and Schedule

An updated project budget and schedule has been developed and will be submitted. These will be regarded as the updated baseline against which status and progress are measured and reported. The Consultant will work with the Town Project Manager to ensure that invoices contain required documentation and backup and will coordinate with the Town business office as needed or requested by the Town Project Manager.

b. Monthly Scope and Budget Updates:

The Consultant shall monitor scope and budget and report progress monthly. The Consultant will develop and implement change management procedures to manage work progress. These updates as well as change management strategies will be documented in monthly progress reports accompanying the consultant invoices.

c. Monthly Reporting and Billing

The Consultant shall submit monthly progress reports that summarize:

- Work accomplished for the month
- Task percent complete
- Task percent expended
- Work planned for the upcoming month
- Change management updates

d. General Project Management Responsibilities of Consultant

The Consultant shall develop, manage, and implement project coordination strategies including:

- Prepare for and participate in project meetings - invitations, materials, execution, and documentation
- Maintain action items, decision log, scope log, issues tracking, etc.
- Document management for file share platforms, program level cost estimates and toggle spreadsheets, and Bluebeam reviews (if requested by the Town PM)

Deliverables:

- Monthly Invoice
- Monthly Progress Report
- Action Item and Decision Logs to be maintained on OneNote.

C. DEVELOP A PROJECT SCHEDULE AND ASSIGN TASKS

The Consultant will maintain a project schedule with key milestones. The schedule included in the Consultant's amendment will be re-baselined as needed. Project schedule updates will be included in the monthly reporting as discussed in Section 5.B Project Management.

Deliverables:

- Overall Project Schedule to be maintained in Microsoft Project

D. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

1. The Consultant will conduct internal QA/QC reviews of all deliverables throughout the process in accordance with Muller's Quality Management Program (or equal).
2. Peer and interdisciplinary reviews of meeting and presentation materials will be conducted to provide consistency of project messages and communication. Quality reviews, Town reviews, Stakeholder reviews, and comment resolution periods will be incorporated into the project schedule for milestone submittals.

Deliverables:

- None

Environmental Coordination

A. PROJECT INITIATION

Project initiation has been covered in the original task order.

B. DATA COLLECTION, FIELD INVESTIGATION, MITIGATION MEASURES AND DELIVERABLES

Prepare an Environmental Resources Memo to identify sensitive environmental resources and determine potential next steps. Resources to be investigated further:

1. **Threatened and Endangered (T&E) Species**
   a. IPaC Review of updated project study area: The team will review the Information for Planning and Consultation (IPaC) from the US Fish and Wildlife Service (USFWS) to determine applicable species and habitat to this project.
   b. Migratory birds and raptors will be considered for potential impacts to nests.
   c. A tree inventory will be taken during the site visit to document existing conditions.
   d. Note: It is assumed the project will result in a "no effect". Additional scope will be required if Section 7 Consultation is needed with the U.S. Fish and Wildlife Service (USFWS).
2. **Wetland and Waters of the U.S. (WOTUS)**
   a. The project team will review NWI maps to check for the presence of wetlands. It is assumed this project will not impact nearby wetlands or WOTUS, and that delineation of wetlands will not be required. [Included in previous scope efforts]
3. **Vegetation**
   a. Identify vegetation within the study area including tree locations.
4. **Section 6(f) Properties**
   a. Identify and properties improved with Land and Water Conservation Funds.
5. **Historic Properties**
   a. The project team will review assessors data to locate any potentially historic properties.

Environmental Deliverables

- Environmental Resource Memo

Preliminary Design

A. PRELIMINARY DESIGN

1. **Utility Coordination**
   a. Location Maps
      i. Creation of a GIS-based utility map book that identifies the known utilities and irrigation crossings within the project limits.
   b. Reviews and Investigations
      i. Creation of a utility tracking spreadsheet to identify, monitor and coordinate

impacts to these entities within the project limits.

c. SUE Investigation
   i. SUE will be planned to be performed following preliminary design as weather allows to be in compliance with ASCE 38-02.

Utility Deliverables:

- Location Maps as received from providers.
- Utility Tracking Spreadsheet

2. Drainage Coordination

a. Update layout of culverts and drainage ditches for alternative on Spruce Creek Road.

b. Perform site visit and preliminary scoping investigation of culverts and drainage ditches on Crown Drive.
   i. Provide preliminary layout of drainage improvements identified during site investigation.

Drainage Deliverables:

- Location Map
- Preliminary plan information, assumed to be included in roadway plans
- Preliminary opinion of probable construction cost (OPCC), assumed to be included in roadway OPCC.

3. Roadway Design and Roadside Development

All design activities will be coordinated with required Town project team staff, specialty units and other outside entities.

a. Initial design validation

b. Roadway design criteria

c. Spruce Creek Road Improvements Assessment
   i. Review survey for Crown Drive, Gold Nugget, and Spruce Creek Road to determine initial list of options, including one-way traffic routing (Dec/Jan 2023)
   ii. Analyze and layout preliminary design options on Spruce Creek Road that significantly improve road grade at approach with Hwy 9 while minimizing adjacent impacts. Two options are assumed to be included in the assessment in addition to a "do nothing" option.
   iii. Develop evaluation matrix and concept-level relative cost estimates for each option with recommended solution for Town consideration.
   iv. Develop preliminary plans, profile, typical section and engineer's estimate for recommended option.

d. Crown Drive Improvements
   i. Identify and provide concept design for baseline improvements to Crown Drive to address identified issues.

Roadway Deliverables:

- Preliminary Roadway Typical sections, Plans and Profiles
- Preliminary opinion of probable construction cost (OPCC)

6. Structural Analysis

a. The Consultant will analyze feasibility and structure types for walls as identified through the Spruce Creek Road Assessment, providing structural selection recommendation and concept wall layouts.

Structural Analysis Deliverables:

- Structural selection memo and concept-level cost estimates.
- Structural general notes sheet.
- Plan and profile sheet for each retaining wall.
- Typical section of retaining wall with a design table.
- Structural details sheet.

5. Geotechnical Analysis

a. The Consultant will coordinate with a geotechnical engineering firm Yeh & Associates for this scope.
   i. Site assessment and onboarding: an initial meeting with Yeh pavement engineer and geotechnical engineer to introduce and onboard them to the project.
   ii. Road surface type assessment: review the existing conditions of Spruce Creek Road, perform research and provide input and considerations for appropriate road surface types for the Town, including pavement and gravel options. Findings, recommendations, and preliminary cost estimates will be summarized in a memorandum.
   iii. Preliminary embankment and structural investigation: the Consultant will provide initial review of existing slopes to provide preliminary embankment options and preliminary structural design parameters of any walls found to be required for options. No geotechnical subsurface data collection is anticipated as part of this scope. Findings, recommendations, and preliminary cost estimates will be summarized in a memorandum.

Geotechnical Analysis Deliverables:

- Road Surface Type Memorandum
- Preliminary Geotechnical Memorandum

6. **Traffic Analysis**
   b. Identify potential options to address speeding issue identified by residents.
   c. Develop design memorandum identifying options and summarizing the opportunities and challenges to their implementation on Spruce Creek Road and Crown Drive.

Traffic Deliverables:

- Design memorandum identifying options for speed control on Town streets.

FINAL DESIGN (not included in current scope)

1. ~~**Utility Coordination**~~

~~All design activities will be coordinated with required Town project team staff, specialty units and other outside entities.~~

~~a. Utility Design~~

~~i. Initial design validation~~

~~b. Utility Coordination~~

~~i. Coordination with utility providers to assess feasibility of undergrounding utilities.~~

~~**Utility Deliverables:**~~

- ~~Final Plans and Specifications~~
- ~~Utility clearance letter~~
- ~~SUE Plans as applicable~~

~~2. **Drainage Coordination**~~

~~All design activities will be coordinated with required Town project team staff, specialty units and other outside entities.~~

~~a. Drainage Design~~

~~i. Initial design validation~~

~~**Drainage Deliverables:**~~

- ~~Final Plans, specifications~~
- ~~Final Drainage Memorandum~~

~~3. **Roadway Design and Roadside Development**~~

~~All design activities will be coordinated with required Town project team staff, specialty units and other outside entities.~~

~~a. Roadway Design~~

~~i. Finalize design plan and specifications and prepare cost estimate for selected option.~~

~~**Roadway Deliverables:**~~

- ~~Final Plans (removals, signing, markings will be shown on Roadway Plans), specifications~~
- ~~Final OPCC~~
- ~~Construction procurement documents (if necessary).~~

ASSUMPTIONS AND EXCLUSIONS

- Scope does not include any ROW acquisition or need for plans (General).
- Assumes no utility relocations (Utilities).
- Environmental Resources not Investigated:
  - Air Quality
  - Noise Analysis
  - Hazmat
  - ~~Historic Resources~~
  - ~~Section 4(f)~~
- Assumes no Section 7 Consultation (Environmental).
- Assumes no wetland delineation (Environmental).
- Assumes no construction phasing plans (Roadway).
- A Drainage Letter is not included with this current scope.
- All walls will be of the same structure type.
- Preliminary engineering plans and concept validation is included in Amendment 1.
- Final design will be included in future amendments when the project scope is fully defined.

MULLER ENGINEERING COMPANY
PROJECT FEE ESTIMATE

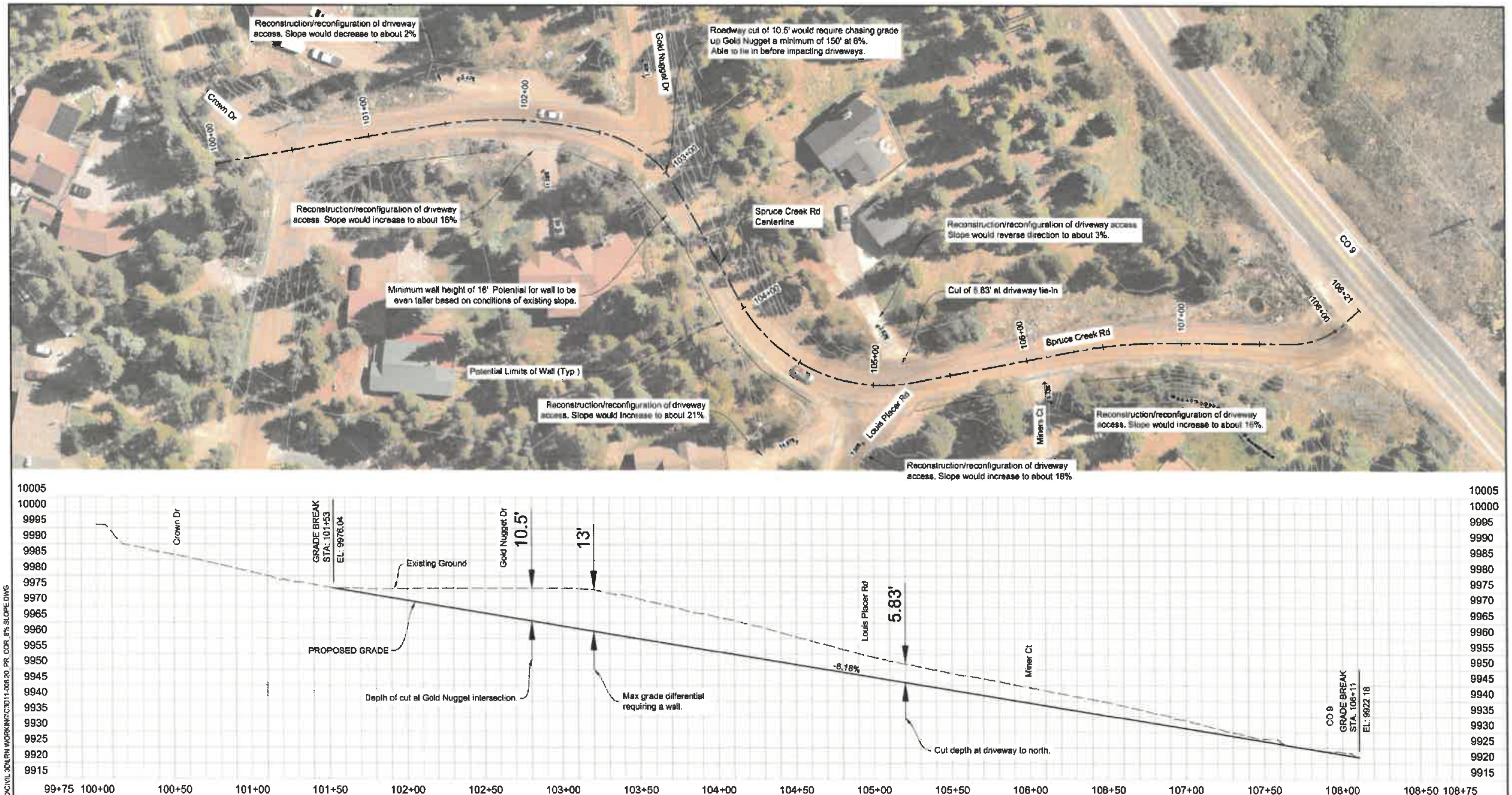
CLIENT:
Town of Blue River

PROJECT:
Spruce Creek Road Amendment 1

PROPOSAL NO.: NA | PROJECT NO.: 11-008.20
PREPARED BY: JHW | DATE: 6/13/2023
CHECKED BY: NJL | **PROPOSED FEE: $ 74,893**

TASK NO.	TASK DESCRIPTION	STAFF											EXPENSES		TOTALS			
		ENVIRONMENTAL PLANNING MANAGER 7	PROJECT MANAGER 6 (STRUCTURAL)	PROJECT MANAGER 6 (TRAFFIC)	PROJECT ENGINEER 5 (HYDRAULICS)	DESIGN ENGINEER 3 (STRUCTURAL)	DESIGN ENGINEER 3 (ROADWAY)	ENVIRONMENTAL PLANNER 1	CAD 2	YEH PRINCIPAL ENGINEER (GEOTECHNICAL ENGINEER)	YEH SR. PROJECT MANAGER (PAVEMENT ENGINEER)	YEH SR. PROJECT MANAGER (GEOTECHNICAL ENGINEER)	OUTSIDE SERVICES (Baseline)	MILEAGE	TIME (HOURS)	LABOR COST	EXPENSES	SUBTOTAL
	Billing Rate >>>	$219	$198	$198	$178	$140	$140	$113	$101	$220	$210	$210		$.575/mi				
1	**Project Management and Coordination Meetings**																	
1.1	Project Meetings													$ 120			$ 120	$ 120
1.1.1	Site Visit		8		8		8	8							32	$ 5,032		$ 5,032
1.1.2	Progress/Project Meetings	4	4	4	4		4	4							24	$ 4,184		$ 4,184
1.1.3	Public, Stakeholder Meetings																	
1.2	Project Management																	
1.3	Project Schedule																	
1.4	Quality Assurance / Quality Control																	
	SUBTOTAL	*4*	*12*	*4*	*12*	*0*	*12*	*12*	*0*	*0*	*0*	*0*						
2	**Environmental Coordination**																	
2.1	Project Initiation																	
2.2	Data Collection and Deliverables	5						20							25	$ 3,355		$ 3,355
	SUBTOTAL	*5*	*0*	*0*	*0*	*0*	*0*	*20*	*0*									
3	**Preliminary Design**																	
3.1	**Preliminary Design - Utility Coordination**																	
	SUBTOTAL	*0*	*0*		*0*	*0*	*0*	*0*	*0*									
3.2	**Preliminary Design - Drainage**																	
	Spruce Creek Road - update ditch and culvert design for high impact alternative. Designer hours (Levi) to incoporate ditches into corridor. Update typical sections. Redlines for CAD.				10		4								14	$ 2,340		$ 2,340
	Crown Drive - Layout preliminary ditch and culvert improvements. Levi hours for alignement of Crown drive, corridor for ditch only, and coordinating sheet setup. Typical section. Redlines for CAD				8		8								16	$ 2,544		$ 2,544
	Crown Drive - Hydrology analysis for drainage improvements				6										6	$ 1,068		$ 1,068
	Qtys/Cost for Crown Drive and Spruce creek				4										4	$ 712		$ 712
	QC	1													1	$ 219		$ 219
	SUBTOTAL	*1*	*0*	*0*	*28*	*0*	*12*	*0*	*0*	*0*	*0*	*0*						
3.3	**Roadway Design and Roadside Development**																	
	Review survey, One-Way Assessment (Dec/Jan 2023)																	
	Analyze and layout preliminary options (three assumed)						25								25	$ 3,500		$ 3,500
	Option evaluation, assessment, concept costs						14	8							22	$ 2,864		$ 2,864
	Preliminary Plans, Profile, Typ Section						25		65						90	$ 10,065		$ 10,065
	Engineer's estimate for recommended option						4								4	$ 560		$ 560
	SUBTOTAL	*0*	*0*	*0*	*0*	*0*	*68*	*8*	*65*	*0*	*0*	*0*						
3.4	**Preliminary Design - Structural**																	
	Structure Selection Memo (1 memo to discuss both walls)		6			40									46	$ 6,788		$ 6,788
	Typical Section (1 sheet with table for all design heights)		4			20			10						34	$ 4,602		$ 4,602
	Quantities and Cost Estimate		4			30									34	$ 4,992		$ 4,992
	SUBTOTAL	*0*	*14*	*0*	*0*	*90*	*0*	*0*	*10*	*0*	*0*	*0*						
3.5	**Preliminary Design - Geotechnical Analysis**																	
	Site Assessment, Onboarding									4	8	8			20	$ 4,240		$ 4,240
	Road surface type research, memorandum									2	24				26	$ 5,480		$ 5,480

TASK NO.	TASK DESCRIPTION	STAFF											EXPENSES		TOTALS			
		ENVIRONMENTAL PLANNING MANAGER 7	PROJECT MANAGER 6 (STRUCTURAL)	PROJECT MANAGER 6 (TRAFFIC)	PROJECT ENGINEER 5 (HYDRAULICS)	DESIGN ENGINEER 3 (STRUCTURAL)	DESIGN ENGINEER 3 (ROADWAY)	ENVIRONMENTAL PLANNER 1	CAD 2	YEH PRINCIPAL ENGINEER (GEOTECHNICAL ENGINEER)	YEH SR. PROJECT MANAGER (PAVEMENT ENGINEER)	YEH SR. PROJECT MANAGER (GEOTECHNICAL ENGINEER)	OUTSIDE SERVICES (Baseline)	MILEAGE	TIME (HOURS)	LABOR COST	EXPENSES	SUBTOTAL
	Billing Rate >>>	$219	$198	$198	$178	$140	$140	$113	$101	$220	$210	$210		$.575/mi				
	Concept structural foundation investigation									2		24			26	$ 5,480		$ 5,480
	SUBTOTAL	*0*	*0*		*0*	*0*	*0*	*0*	*0*	*8*	*32*	*32*						
3.6	**Preliminary Design - Traffic Analysis**																	
	Speed management review and options development		16												16	$ 3,168		$ 3,168
	Speed management options memorandum		8												8	$ 1,584		$ 1,584
	Option - Speed Survey (Spruce Creek Rd. & Crown Dr.)		*2*										*$ 1,600*		*2*	*$ 396*	*$ 1,600*	*$ 1,996*
	SUBTOTAL	*0*	*26*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*						
4	**Final Design (Not included at this time)**																	
	TOTAL HOURS	10	52	4	40	90	92	40	75	8	32	32			475			
	TOTAL LABOR	$ 2,190	$ 10,296	$ 792	$ 7,120	$ 12,600	$ 12,880	$ 4,520	$ 7,575	$ 1,760	$ 6,720	$ 6,720				$ 73,173		
	TOTAL EXPENSES												$ 1,600	$ 120			$ 1,720	
	TOTAL NEW TASK ORDER FEE (AMENDMENT 1)																	$ 74,893
	ORIGINAL FEE																	$ 69,566
	NEW TOTAL																	**$ 144,459**



811 Know what's below. Call before you dig.

PLOTTED: 6/14/2023 11:53:14 AM
NAME: P:\11-008.20 BLUE RIVER - SPRUCE CREEK ROAD\CAD\CIVIL 3D\LRN WORKING\C1011-008.20_PR_COR_8% SLOPE.DWG

PREPARED UNDER THE SUPERVISION OF	DESIGNED.	SPRUCE CREEK RD P&P EXHIBIT
	DRAWN	
	CHECKED.	PROJECT NO.

SHEET REVISIONS

NO	DATE	DESCRIPTION	BY

MULLER ENGINEERING COMPANY
777 S. WADSWORTH BLVD. 4-100 LAKEWOOD, COLORADO 80226

TOWN OF BLUE RIVER

SPRUCE CREEK ROAD IMPROVEMENTS PROJECT

DATE

DRAWING NO.

SHEET NO ___ OF ___

MULLER ENGINEERING COMPANY

Memorandum

Project: Spruce Creek Road

To: Michelle Eddy, Town Manager

From: Jeff Wulliman, PE
Bob LaForce, PE – Yeh and Associates
Levi Niesen, EI

Date: March 7, 2024

Subject: Spruce Creek Road Design Recommendation Memorandum

This memorandum is provided to solicit a decision on the pavement type and limits for Spruce Creek Road in the Town of Blue River.

Background:

The purpose of the Spruce Creek Road Project is to address and improve upon the following issues observed by the Town and nearby residents.

- Safety
  - Highway 9 Intersection, Approach
- Maintenance
  - Reducing maintenance burden and cost to the Town.
  - Improving condition of Spruce Creek Road
- Dust Control
  - Noted issue from nearby residents
- Speeding
  - Noted issue from nearby residents
  - Speed capture information from September 2023 indicate the 85% percentile speed was 22 mi/hr.

Alternative Improvements

The following options are considered for improvement type and limits. All options include the approach to CO 9 intersection grading improvements previously reviewed with the Town.

- Asphalt Pavement
  - Spruce Creek Road to Crown Drive
  - Spruce Creek Road to Gold Nugget Drive
  - Pave CO 9 Approach Only
- Continued MgCl and emulsified asphalt treatment (Earthbind)

Assessment:

The benefits and drawbacks of the various options are included below. This assessment references the memorandum titled *Discussion of Paving with HMA Versus Annual Treatment with Magnesium Chloride* by Yeh and Associates, attached.

For Asphalt Pavement Options:

These options assume a 4" thick pavement on 4" of base course. Annual costs are based on an expected 14-year service life of the asphalt prior to an overlay. The preliminary level cost estimates attached to this memo are coarse and should be taken for discussion between the options. Cost estimates can be refined with final design and quantities.

Design concept exhibits for each paving alternative are also attached to this memo.

Alternative 1: Pave to Crown Drive

Scope Description: Asphalt pavement on Spruce Creek Road to Crown Drive	
Cost: $400,000	Annualized Cost*: $29,000 / year
Pros: • Minimal annual maintenance • Dust Elimination	Cons: • Most expensive option • Gravel/pavement transition on slope • Higher speeds • Replacement cost • Snow and ice control
In Summary: Not Recommended Paving all the way up to Crown will reduce dust along the entire stretch of Spruce Creek Road, but comes with additional cost. The transition between gravel and pavement is not in a flat location, which can cause issues with rutting and vehicles kicking up gravel onto the asphalt. Addressing cons: Revisions may be needed (e.g. sand, salt) to winter maintenance practices to prevent ice and packed ice along with plowing.	

*Assumes 14-yr service life (2024 Dollars)

Alternative 2: Pave to Gold Nugget Drive

Scope Description: Asphalt pavement on Spruce Creek Road from CO 9 to Gold Nugget.	
Cost: $320,000	Annualized Cost*: $23,000 / year
Pros: • Minimal annual maintenance • Dust Reduction • Gravel to pavement transition where the road is flat • Reduced pavement cost	Cons: • Higher speeds • Replacement cost • Snow and ice control
In Summary: Recommended Asphalt Pavement Option This option reduces gravel on the roadway, dust kick-up, and annual maintenance from the Town. The transition from gravel to pavement is on the flat section of roadway, which is the most ideal for reducing gravel-on-asphalt issues. Speeding may increase on asphalt, and there are long-term replacement costs that will be necessary. Addressing cons: Revisions may be needed (e.g. sand, salt) to winter maintenance practices to prevent ice and packed ice along with plowing.	

*Assumes 14-yr service life (2024 Dollars)

Alternative 3: Pave Approach Only

Scope Description: Pave approximately 70-ft up Spruce Creek Road from CO 9	
Cost: $110,000	Annualized Cost*: $8,000 / year
Pros: • Most inexpensive option • Reduces gravel build-up on asphalt roadway at CO 9 • Meets CDOT access standards (50ft pavement minimum)	Cons: • Pavement to gravel transition is on steep section • Gravel anticipated to be kicked onto asphalt from uphill drivers which could affect traction on steep section • Differential rutting at transition area may affect road condition without maintenance attention • Does not address dust issue. • Does not address maintenance issue
In Summary: Recommended if Alternative 2 not selected. While this option reduces gravel on the roadway at CO 9, the transition from gravel to pavement on the steep grade may cause other issues. Drivers may kick more gravel onto the roadway higher up the road, affecting traction on the steep section during dry months. A rut may also form between asphalt and gravel which may worsen travel down to CO 9 if not maintained.	

*Assumes 14-yr service life (2024 Dollars)

Alternative 4: Profile Improvements and Continued MgCl Treatment & Emulsified Asphalt Treatment (e.g. Earthbind)

<table>
<tr><td colspan="2">Scope Description: Continue current road maintenance and treatment practices.</td></tr>
<tr><td>Cost: $70,000</td><td>Annualized Cost*:
• Construction: $5,000 / year
• MgCl/Earthbind: ~$8,000 / year
o (Per G&G)</td></tr>
<tr><td>Pros:
• Low cost of initial treatment
• Fair to good dust control</td><td>Cons:
• Limited improvement to Spruce Creek Road
• Annual treatment required
• Dust, loss of aggregate, washboarding</td></tr>
<tr><td colspan="2">In Summary: Not recommended.
This option improves the intersection with CO 9 at the lowest initial cost, though the improvements may have a shorter life span than asphalt. Previous improvements have regraded the profile of Spruce Creek, however, heavy traffic volumes, plowing, and maintenance over the years has seen the issues rapidly re-emerge. This alternative is likely to follow similar patterns and only serve as a temporary measure.</td></tr>
</table>

*Assumes 14-yr service life (2024 Dollars)

Recommendation:

We recommend installing asphalt pavement and the associated grading and drainage improvements on Spruce Creek Road from CO 9 to Gold Nugget Drive.

Attachment 1: Discussion of Paving with HMA Versus Annual Treatment with Magnesium Chloride

Attachment 2: Preliminary Cost Estimates

Attachment 3: Design Alternative Exhibits

Yeh and Associates, Inc.
Geotechnical • Geological • Construction Services

2000 Clay Street, Ste 200
Denver, CO 80211
303-781-9590 • www.yeh-eng.com

March 7, 2024

Project No. 223-108

Jeff Wulliman, PE
Project Manager
Muller Engineering Company
7245 W. Alaska Driver, Suite 300
Lakewood, Colorado 80226

Re: Spruce Creek Road in Blue River, Colorado
Discussion on Paving with HMA Versus Annual Treatment with Magnesium Chloride

Dear Jeff:

Yeh and Associates have been asked to provide information and discussion addressing different possible treatments for the gravel road section of Spruce Creek Road between Colorado State Highway 9 (CO 9) and Crown Drive. This section of road is constructed with grades of up to 10 or 12 percent and the current practice of maintaining this section is grading as needed and an annual treatment of Magnesium Chloride (MgCl). We believe that the steep grade on this section of Spruce Creek Road causes a greater loss of aggregate on a regular basis from traffic accelerating up the steep grade and braking downhill on the approach to CO 9 than is experienced on more level roadway sections. We believe the uphill and downhill traffic also cause wash boarding to occur sooner than on level roads.

Site Reconnaissance

We inspected the section of road on October 17, 2023 after a recent treatment with MgCl and the road was observed to be in good condition and ready for winter. During the site visit, we also took soil samples of the subgrade adjacent to the road. The trip report is presented in Attachment A.

Aggregate Surface Treatment Options

Attachment B presents a review of numerous aggregate treatments that could be considered as alternatives to the current MgCl treatment. Following is a summary of the most likely treatments presented.

MgCl treatment is the treatment currently used and stabilizes the roadway and binds fine particles to prevent dust. The treatment may also help during winter to prevent the formation of ice pack. This section of roadway is currently treated on an annual basis with the application of MgCl and additional aggregate, as needed. Some of the advantages and disadvantages of the MgCl treatment are presented below.

Magnesium Chloride

Advantages:
Relatively low cost of Initial Treatment
MgCl prevents ice pack for easy plowing
Fair to good for dust control

Disadvantages:
Dust in warm weather prior to winter
Annual Treatment Required
Traffic disruption for treatment
MgCl pollution in drainage runoff

	Loss of aggregate and wash boarding because of traffic accelerating uphill or braking down the slope

An emulsified asphalt treatment such as Earthbind would similarily help prevent dust and stabilize the existing roadway. Since the asphalt is not soluble, there would be little additional help with snowpack formation, but there would be less erosion of fines from rain and snowmelt. This type of treatment should last several years. One problem with this type of treatment is that in later years, as the asphalt treated aggregate stiffens over time, failures resemble potholes and patching these potholes requires similar effort to patching Hot Mix Asphalt pavement. Some comments on this treatment are as follows:

Emulsified Asphalt Treatment

Advantages:	Disadvantages:
Relatively low cost of Initial Treatment	Patching pothole failures problematic
Good for dust control	Failures tend to form potholes.

We do not recommend the use of Bentonite, because while it will help retain the larger gravel particles, it will not perform as well as the MgCl or emulsified asphalt. It is merely an aggregate treatment to provide cohesive fines to retain the larger aggregate. We believe the cost for this section would be too high to justify the treatment and would still have dust problems.

Hot Mix Asphalt (HMA) Option

If Spruce Creek Road is to be paved with HMA, we recommend that it be treated as a Local Access Road in accordance with the Summit County Standards which call for 4 inches of HMA over 4 inches of aggregate base course (ABC). The standards are presented in Attachment C. To verify the 4 inch recommendation, a pavement design following the AASHTO 1993 Pavement Design Guide is presented in Attachment D.

To address the subgrade and aggregate base course, we recommend following CDOT Specifications. We recommend the HMA mix meeting the CDOT requirements for SX(75) with asphalt binder PG 58-28 and that the new HMA be placed in two 2-inch lifts. We also recommend that the existing aggregate surface be reused as ABC with additional ABC imported, as needed. Sample specifications for imported subgrade soil and ABC are presented in Attachment D following the pavement design program printout.

Following is a summary of some advantages and disadvantages of HMA.

Hot Mix Asphalt

Advantages:	Disadvantages:
Minimal Annual Maintenance	Higher Speeds
Dust Elimination	Replacement Cost
SH 9 Intersection improvement	Snow & Ice Control*
No aggregate thrown by traffic.	

*We do not know what the current arrangements for snow removal in Blue River are, however, with paved roads, cities and CDOT routinely use some type of agent (Sand / Salt / MgCl) to prevent ice and packed ice formation along with plowing. Because of the steep slope of Spruce Creek Road, we anticipate that some type of treatment will be periodically required in winter.

Cost Comparison of HMA and MgCl

The following is a very coarse comparison of the cost of treatment with MgCl and paving with HMA. The cost comparison is based on an expected 14 year service life of an HMA pavement prior to the need for an overlay. This is the time often used by CDOT for HMA performance before needing major structural improvements. With paving, there will also be required improvements along the ditches and at the intersection with CO 9, which are not included in our cost comparison.

The section of Spruce Creek Road between CO 9 and Crown Drive is approximately 800 feet long and is constructed at a steep grade. The width varies from 19 feet to 25 feet with an average width of approximately 23 feet. Our cost estimates are based on 2,250 square yards of pavement. Based on this area of pavement, we calculated costs based on the new pavement consisting of 4 inches of hot mix asphalt (HMA) placed over a minimum of 4 inches of aggregate base course (ABC). The existing aggregate will be reused to lower the cost for the new aggregate base course (ABC).

This pavement section will require about 500 tons of HMA for the surface and 100 cubic yards of additional ABC to address grading, leveling and improvements at the intersection with CO 9. Using these quantities and a high cost for HMA, $300/ton, the total initial cost for pavement would be approximately $160,000. We calculated the annual cost for the 4 inch HMA and ABC pavement to be approximately $11,500 over the 14-year period.

Using the rates and treatment information from G & G Services for MgCl treatments, we estimate the annual cost is approximately $8,000. Over the same 14-year design life as HMA, the total cost for MgCl is $112,000.

These estimates are coarse and should be taken for discussion only. It could be said that the Annual Costs of HMA and MgCl treatments are of the same order of magnitude.

The major factor in the comparison is the initial cost for HMA. It should be noted that the cost of HMA is quite sensitive for small quantities. A review of the CDOT bids has shown the cost ranging from $120/ton to $300/ton. We used the initial cost is $300/ton as a conservative estimate.

Recommendations

If paving is chosen, the client has requested recommendations for the limits of paving. We recommend that if the entire section is to be paved, that the HMA be carried across the width of Crown Drive. If the entire intersection is paved, vehicles coming from the gravel road will come on the pavement on a relatively level surface to make the turn onto Spruce Drive and would carry less aggregate onto the paved section than if the transition is done on a slope.

If the cost to pave the entire segment is not possible, we recommend that the road be paved from CO 9 to across Gold Nugget Drive since that is the most level spot on the remaining section. That will

also let cross traffic enter the paved section at the most level section to prevent tracking gravel onto the pavement.

Another item requested was to recommend other treatments that could be tried on an experimental basis to obtain performance information. We would recommend that the emulsified asphalt treatment be tested if evaluation of another option is desired. It will control dust and should last longer than the current MgCl treatment. We recommend that you use the proprietary treatment mentioned above if the evaluation is to be constructed.

Please contact us if you have any questions or need more information.

Sincerely,

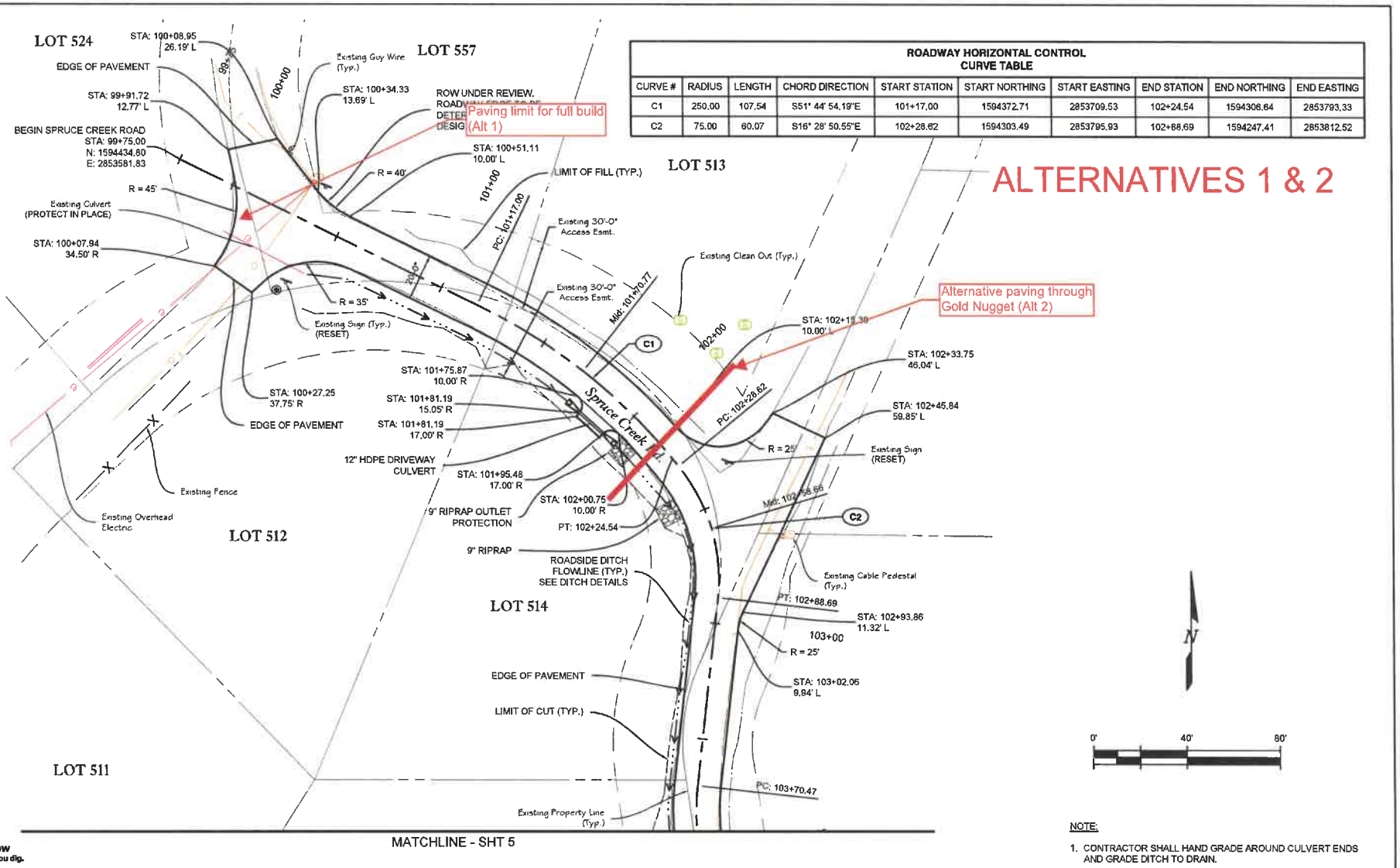
Yeh and Associates, Inc.

Robert F. LaForce

Robert F. LaForce, P.E.
Senior Project Manager

Reviewed by:
Todd Schlittenhart, PE
Principal Engineer

Attachments:
Attachment A – Field Trip Report
Attachment B – Various Treatment Discussion
Attachment C – Summit County Standards
Attachment D – Pavement Design



ROADWAY HORIZONTAL CONTROL
CURVE TABLE

CURVE #	RADIUS	LENGTH	CHORD DIRECTION	START STATION	START NORTHING	START EASTING	END STATION	END NORTHING	END EASTING
C1	250.00	107.54	S51° 44' 54.19"E	101+17.00	1594372.71	2853709.53	102+24.54	1594306.64	2853793.33
C2	75.00	60.07	S16° 28' 50.55"E	102+28.62	1594303.49	2853795.93	102+88.69	1594247.41	2853812.52

NOTE:

1. CONTRACTOR SHALL HAND GRADE AROUND CULVERT ENDS AND GRADE DITCH TO DRAIN.

Know what's below Call before you dig.

PLOTTED: 2/25/2022 10:41:37 AM
NAME: P:\1-FOR_20 BLUE RIVER - SPRUCE CREEK ROAD\CAD\DRAWINGS\11-FOR_20_ROAD PLANS.DWG

PREPARED UNDER THE SUPERVISION OF	DESIGNED	DRAWN	CHECKED
	LRN/WMG	LRN/WMG	NJL

PRELIMINARY PLANS

PROJECT NO.

SHEET REVISIONS

NO.	DATE	DESCRIPTION	BY

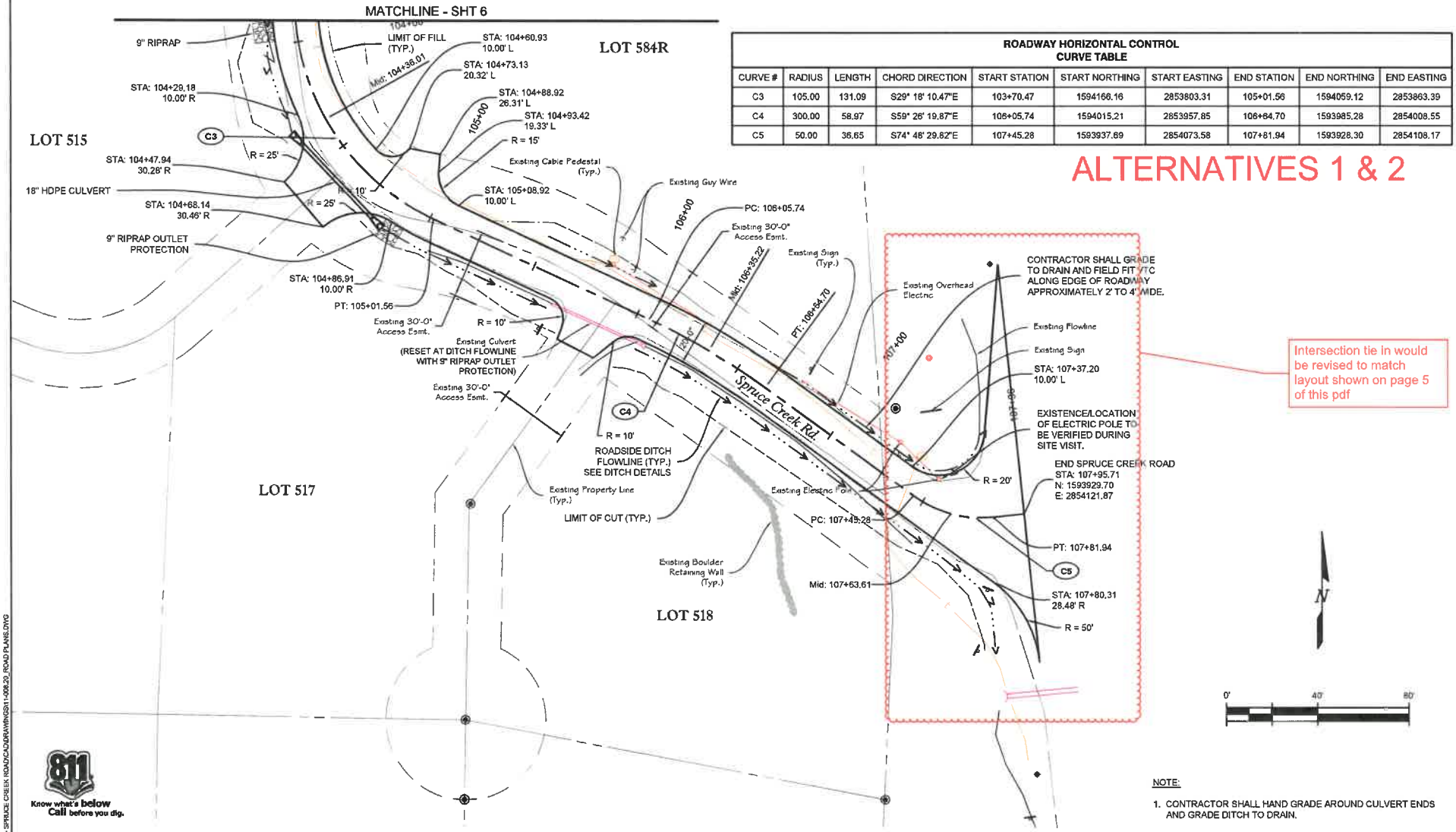
MULLER ENGINEERING COMPANY
777 S. WADSWORTH BLVD. 4-100 LAKEWOOD, COLORADO 80226

TOWN OF BLUE RIVER

SPRUCE CREEK ROAD IMPROVEMENTS PROJECT

ROADWAY PLANS

DATE: 2/25/2022
DRAWING NO.: C-7
SHEET NO.: 7 OF 10



ROADWAY HORIZONTAL CONTROL CURVE TABLE									
CURVE #	RADIUS	LENGTH	CHORD DIRECTION	START STATION	START NORTHING	START EASTING	END STATION	END NORTHING	END EASTING
C3	105.00	131.09	S29° 18' 10.47"E	103+70.47	1594166.16	2853803.31	105+01.56	1594059.12	2853863.39
C4	300.00	58.97	S59° 26' 19.87"E	106+05.74	1594015.21	2853957.85	106+84.70	1593985.28	2854008.55
C5	50.00	36.65	S74° 46' 29.82"E	107+45.28	1593937.69	2854073.58	107+81.94	1593928.30	2854108.17

ALTERNATIVES 1 & 2

NOTE:

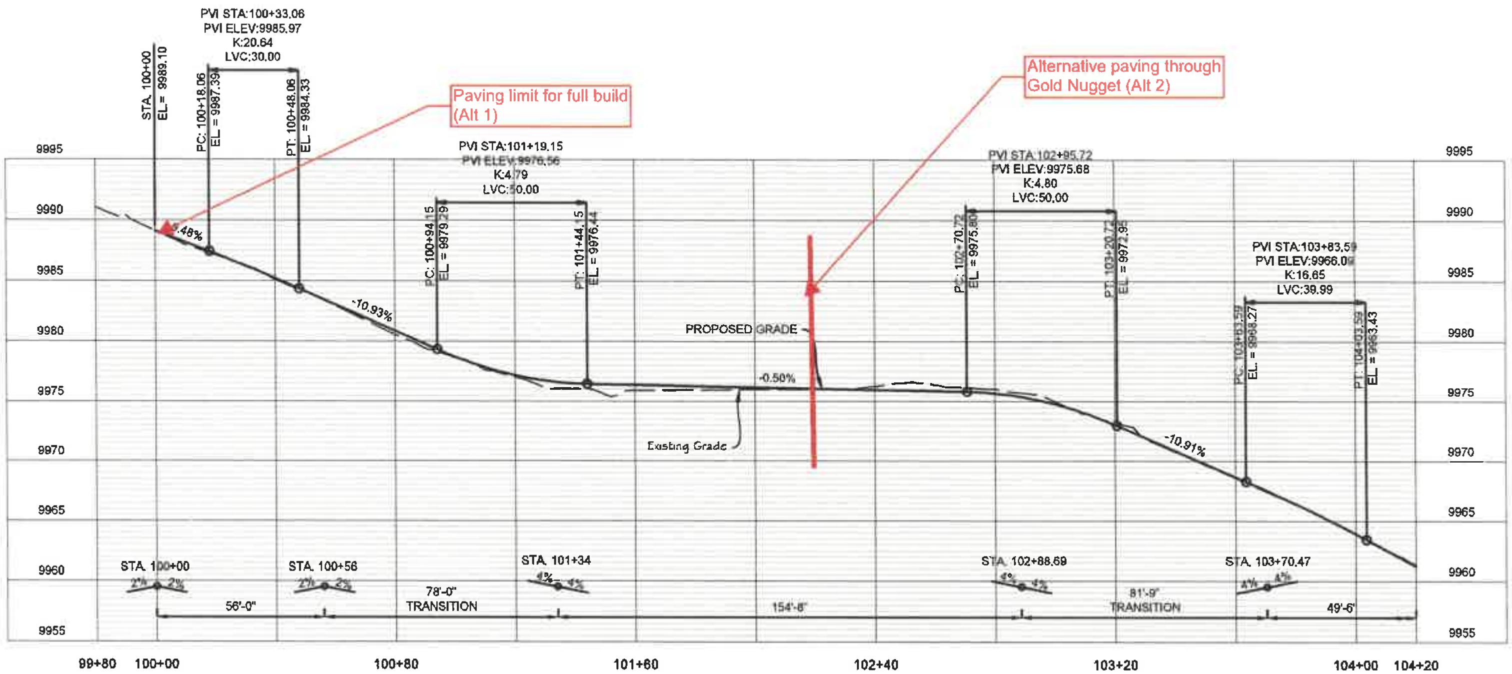
1. CONTRACTOR SHALL HAND GRADE AROUND CULVERT ENDS AND GRADE DITCH TO DRAIN.

811 Know what's below Call before you dig.

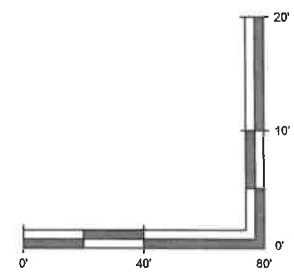
PLOTTED: 2/25/2022 10:42:26 AM
NAME: P:\11-008.20 BLUE RIVER - SPRUCE CREEK ROAD\CAD\DRAWINGS\11-008.20_ROAD PLANS.DWG

PREPARED UNDER THE SUPERVISION OF	DESIGNED: LRN/WMG	PRELIMINARY PLANS	SHEET REVISIONS: NO. / DATE / DESCRIPTION / BY	MULLER ENGINEERING COMPANY, 777 S. WADSWORTH BLVD, 4-100 LAKEWOOD, COLORADO 80226	TOWN OF BLUE RIVER	SPRUCE CREEK ROAD IMPROVEMENTS PROJECT	DATE: 2/25/2022
	DRAWN: LRN/WMG					ROADWAY PLANS	DRAWING NO.: C-8
	CHECKED: NJL	PROJECT NO.					SHEET NO.: 8 OF 10

ALTERNATIVES 1 & 2



SPRUCE CREEK ROAD CENTERLINE ALIGNMENT



Know what's below. Call before you dig.

PREPARED UNDER THE SUPERVISION OF	DESIGNED LRN / DRAWN MJS / CHECKED NJL	PRELIMINARY PLANS	PROJECT NO.

SHEET REVISIONS

NO.	DATE	DESCRIPTION	BY

MULLER ENGINEERING COMPANY
777 S. WADSWORTH BLVD, 4-100 LAKEWOOD, COLORADO 80226

TOWN OF BLUE RIVER

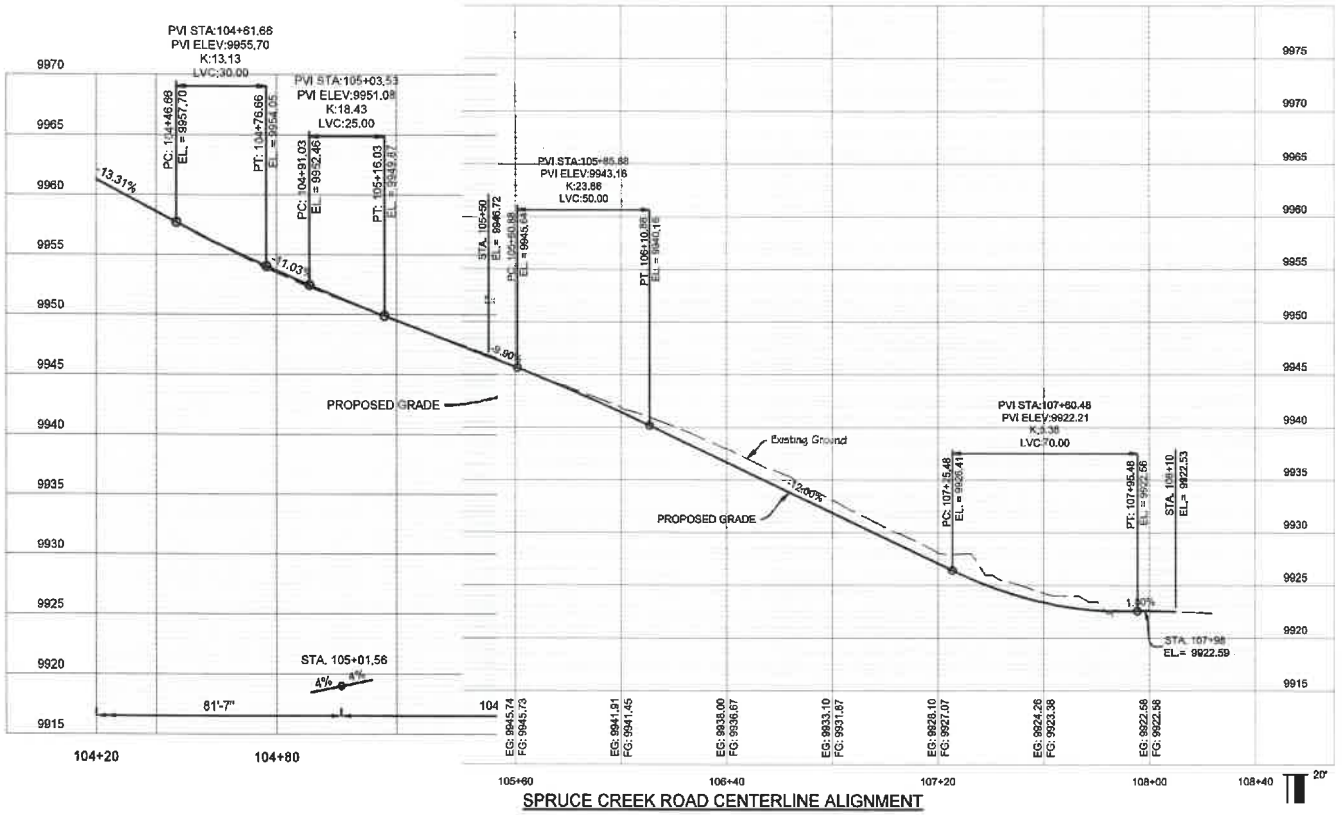
SPRUCE CREEK ROAD IMPROVEMENTS PROJECT

ROADWAY PROFILE

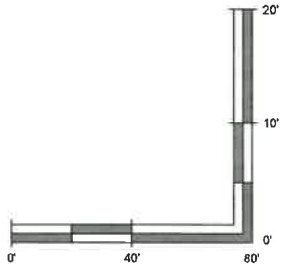
DATE 2/24/2022
DRAWING NO. C-9
SHEET NO. 9 OF 10

PLOTTED: 2/24/2022 11:20:49 AM
NAME: P:\11-006.20 BLUE RIVER - SPRUCE CREEK ROAD\CAD\DRAWINGS\11-006.20_ROADWAY PROFILES.DWG

ALTERNATIVES 1 & 2



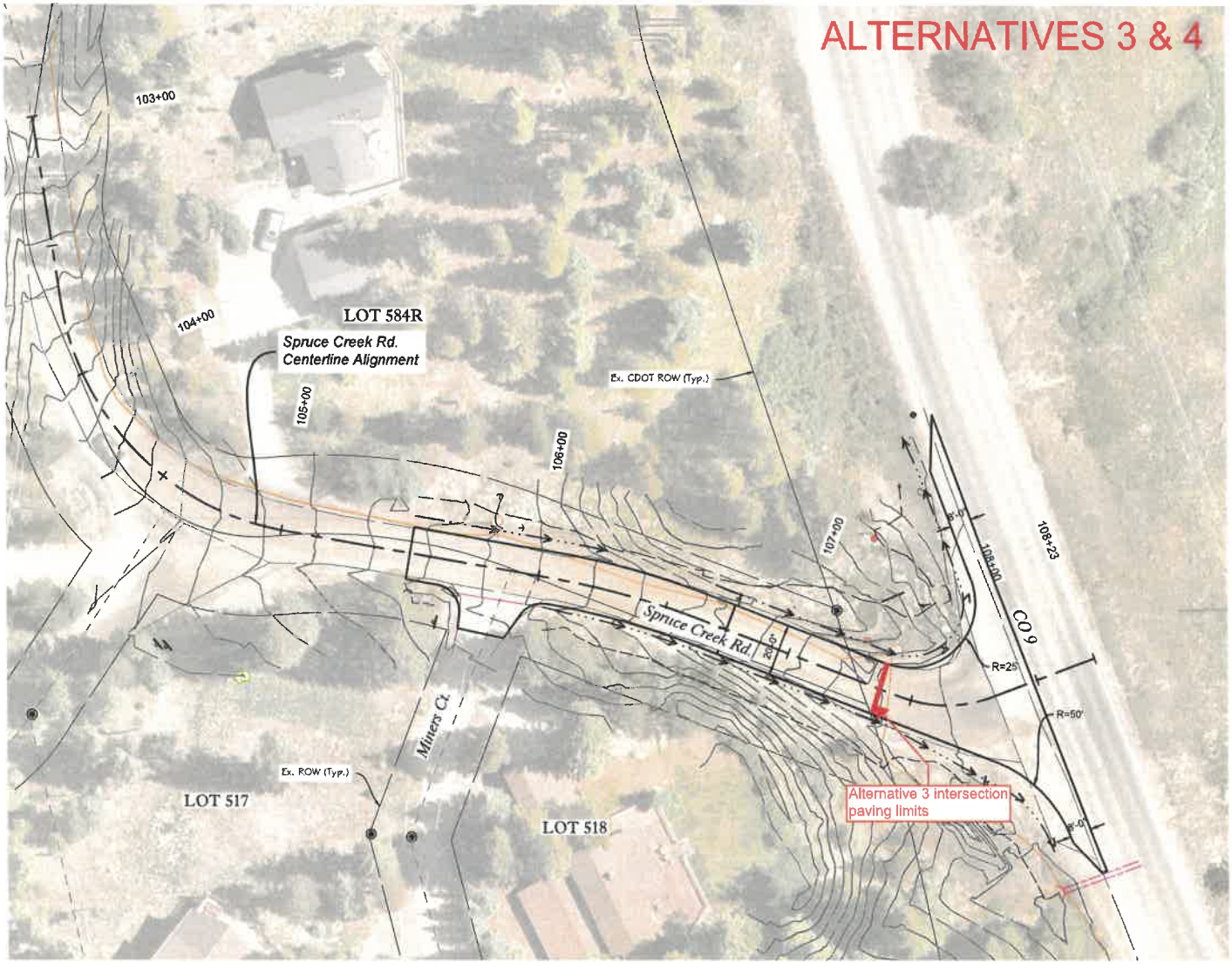
SPRUCE CREEK ROAD CENTERLINE ALIGNMENT



811 Know what's below Call before you dig.

PLOTTED: 2/24/2022 11:21:26 AM
NAME: P:\1-008.20 BLUE RIVER - SPRUCE CREEK ROAD\CAD\DRAWINGS\1-008.20_ROADWAY PROFILES.DWG

PREPARED UNDER THE SUPERVISION OF	DESIGNED LRN DRAWN MJS CHECKED NJL	**PRELIMINARY PLANS** PROJECT NO.	SHEET REVISIONS NO. / DATE / DESCRIPTION / BY	MULLER ENGINEERING COMPANY 777 S. WADSWORTH BLVD, 4-100 LAKEWOOD, COLORADO 80226	**TOWN OF BLUE RIVER**	SPRUCE CREEK ROAD IMPROVEMENTS PROJECT **ROADWAY PROFILE**	DATE 2/24/2022 DRAWING NO. C-10 SHEET NO. 10 OF 10



Know what's below Call before you dig.

PLOTTED: 1/31/2024 11:24:46 AM
NAME: P:\11-008.20 BLUE RIVER - SPRUCE CREEK ROAD\CAD\EXHIBITS\11-008.20_ACCESS PERMIT.DWG

PREPARED UNDER THE SUPERVISION OF	DESIGNED	DRAWN	CHECKED
	LRN/WMG	LRN/WMG	NJL

SPRUCE CREEK RD EXHIBIT

PROJECT NO.

SHEET REVISIONS			
NO.	DATE	DESCRIPTION	BY

MULLER ENGINEERING COMPANY
777 S. WADSWORTH BLVD. 4-106 LAKEWOOD, COLORADO 80226

TOWN OF BLUE RIVER

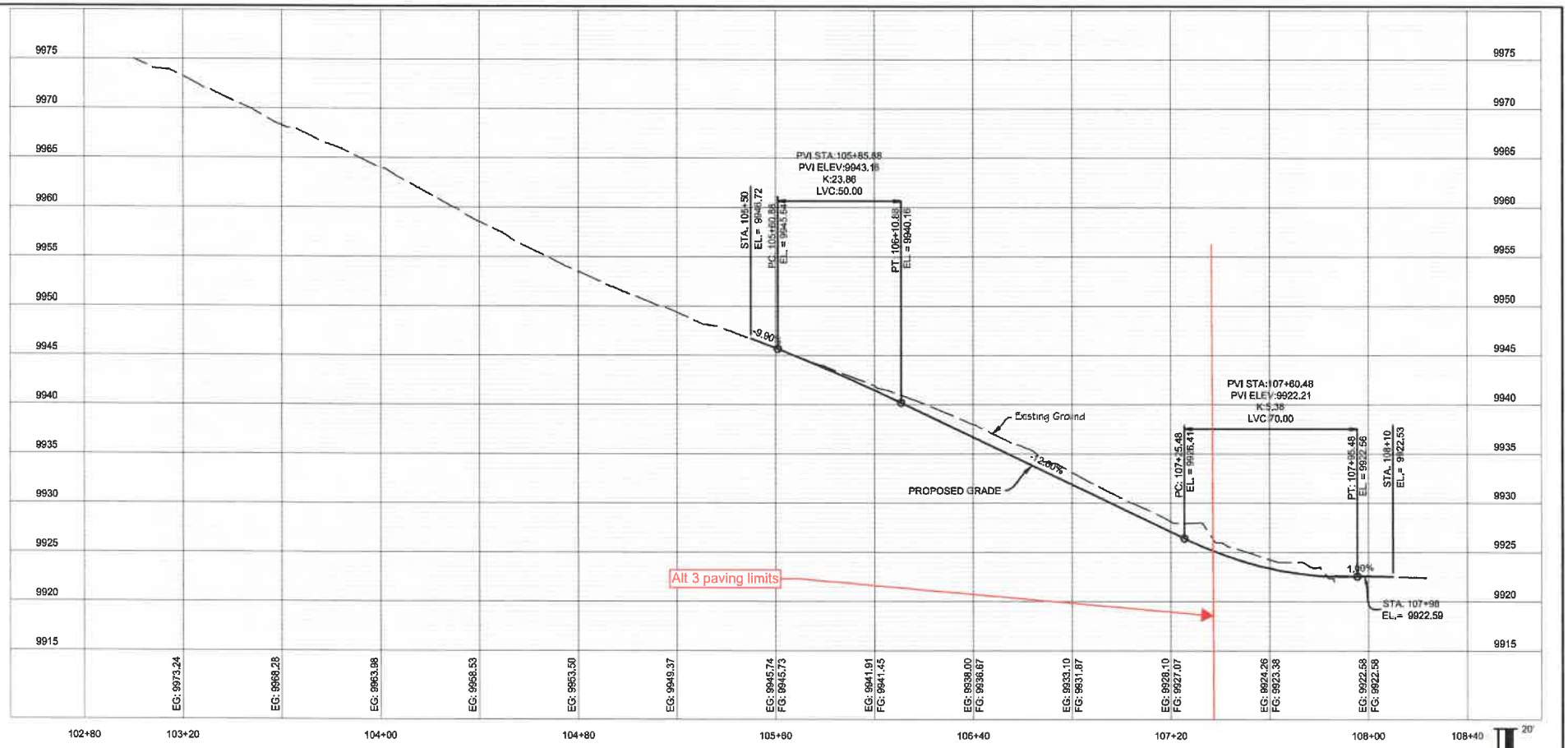
SPRUCE CREEK ROAD IMPROVEMENTS PROJECT

ACCESS PERMIT EXHIBIT

DATE: 1/31/2024

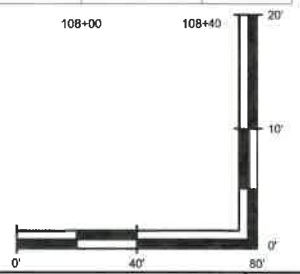
DRAWING NO.

SHEET NO. 1 OF 1



SPRUCE CREEK ROAD CENTERLINE ALIGNMENT

ALTERNATIVES 3 & 4



811 Know what's below Call before you dig.

PLOTTED: 1/4/2024 4:38:47 PM
NAME: P:\11-000,20 BLUE RIVER - SPRUCE CREEK ROAD\CAD\DRAWINGS\11-000,20_ROADWAY PROFILES.DWG

PREPARED UNDER THE SUPERVISION OF	DESIGNED: ###	**PRELIMINARY PLANS**	SHEET REVISIONS	MULLER ENGINEERING COMPANY	TOWN OF BLUE RIVER	SPRUCE CREEK ROAD IMPROVEMENTS PROJECT	DATE: 1/4/2024
	DRAWN: ###		NO. / DATE / DESCRIPTION / BY	777 S. WADSWORTH BLVD. 4-100 LAKEWOOD, COLORADO 80226		**ROADWAY PROFILE**	DRAWING NO.: C-8
	CHECKED: NJL	PROJECT NO.					SHEET NO.: 8 OF 8

BLUE RIVER: SPRUCE CREEK RD ALTERNATIVE 1 (PAVING TO CROWN DR)

PRELIMINARY-LEVEL ENGINEERS OPINION OF PROBABLE CONSTRUCTION COST

PREPARED BY

MULLER ENGINEERING COMPANY, INC.

March 6, 2024

			PROJECT TOTALS		
ITEM NUMBER	MAJOR CONSTRUCTION ITEMS	UNIT	TOTAL QUANTITY	UNIT PRICE	COST
203-00010	UNCLASSIFIED EXCAVATION (COMPLETE IN PLACE)	CY	1,168	$30.00	$35,040.00
203-01100	PROOF ROLLING	HOUR	20	$150.00	$3,000.00
203-01597	POTHOLING	HOUR	20	$225.00	$4,500.00
206-00000	STRUCTURAL EXCAVATION	CY	23	$50.00	$1,150.00
207-00205	TOPSOIL	CY	274	$60.00	$16,440.00
210-00810	RESET GROUND SIGN	EACH	2	$350.00	$700.00
210-02018	RELAY PIPE (18 INCH)	LF	45	$100.00	$4,500.00
212-00006	SEEDING (NATIVE)	ACRE	0.34	$5,000.00	$1,700.00
213-00000	MULCHING	ACRE	0.34	$5,000.00	$1,700.00
304-06000	AGGREGATE BASE COURSE (CLASS 6)	TON	135	$40.00	$5,400.00
403-34721	HOT MIX ASPHALT (GRADING SX) (75) (PG 58-28)	TON	742	$200.00	$148,400.00
411-10255	EMULSIFIED ASPHALT (SLOW SETTING)	GAL	133	$4.00	$532.00
506-00209	RIPRAP (9 INCH)	CY	23	$200.00	$4,600.00
603-30012	12 INCH STEEL END SECTION	EACH	2	$300.00	$600.00
603-30018	18 INCH STEEL END SECTION	EACH	2	$400.00	$800.00
603-50012	12 INCH PLASTIC PIPE	LF	26	$75.00	$1,950.00
603-50018	18 INCH PLASTIC PIPE	LF	50	$115.00	$5,750.00
SUBTOTAL OF MAJOR CONSTRUCTION ITEMS					**$236,762**
MINOR CONSTRUCTION ITEMS (45%) (Clearing and Grubbing, Traffic Control, Mobilization, Survey, etc.)					**$106,543**
CONSTRUCTION ENGINEERING (15%)					**$51,496**
TOTAL CONSTRUCTION COST					**$394,801**
TOTAL CONSTRUCTION COST (ROUNDED)					**$400,000**

NOTE: AGGREGATE BASE COURSE QUANTITY ASSUMES EXISTING ROADWAY MATERIAL CAN BE REUSED. ASSUME 1" OF MATERIAL REQUIRED.

BLUE RIVER: SPRUCE CREEK RD ALTERNATIVE 2 (PAVING THROUGH GOLD NUGGET)

PRELIMINARY-LEVEL ENGINEERS OPINION OF PROBABLE CONSTRUCTION COST

PREPARED BY

MULLER ENGINEERING COMPANY, INC.

March 6, 2024

			PROJECT TOTALS		
ITEM NUMBER	MAJOR CONSTRUCTION ITEMS	UNIT	TOTAL QUANTITY	UNIT PRICE	COST
203-00010	UNCLASSIFIED EXCAVATION (COMPLETE IN PLACE)	CY	987	$30.00	$29,610.00
203-01100	PROOF ROLLING	HOUR	17	$150.00	$2,550.00
203-01597	POTHOLING	HOUR	20	$225.00	$4,500.00
206-00000	STRUCTURAL EXCAVATION	CY	15	$50.00	$750.00
207-00205	TOPSOIL	CY	226	$60.00	$13,560.00
210-00810	RESET GROUND SIGN	EACH	2	$350.00	$700.00
210-02018	RELAY PIPE (18 INCH)	LF	45	$100.00	$4,500.00
212-00006	SEEDING (NATIVE)	ACRE	0.28	$5,000.00	$1,400.00
213-00000	MULCHING	ACRE	0.28	$5,000.00	$1,400.00
304-06000	AGGREGATE BASE COURSE (CLASS 6)	TON	103	$40.00	$4,120.00
403-34721	HOT MIX ASPHALT (GRADING SX) (75) (PG 58-28)	TON	566	$200.00	$113,200.00
411-10255	EMULSIFIED ASPHALT (SLOW SETTING)	GAL	103	$4.00	$412.00
506-00209	RIPRAP (9 INCH)	CY	15	$200.00	$3,000.00
603-30018	18 INCH STEEL END SECTION	EACH	2	$400.00	$800.00
603-50018	18 INCH PLASTIC PIPE	LF	50	$115.00	$5,750.00
SUBTOTAL OF MAJOR CONSTRUCTION ITEMS					**$186,252**
MINOR CONSTRUCTION ITEMS (45%) (Clearing and Grubbing, Traffic Control, Mobilization, Survey, etc.)					**$83,813**
CONSTRUCTION ENGINEERING (15%)					**$40,510**
TOTAL CONSTRUCTION COST					**$310,575**
TOTAL CONSTRUCTION COST (ROUNDED)					**$320,000**

NOTE: AGGREGATE BASE COURSE QUANTITY ASSUMES EXISTING ROADWAY MATERIAL CAN BE REUSED. ASSUME 1" OF MATERIAL REQUIRED.

BLUE RIVER: SPRUCE CREEK RD ALTERNATIVE 3 (INTERSECTION PAVING ONLY, IMPROVEMENTS THROUGH MINERS CT)

PRELIMINARY-LEVEL ENGINEERS OPINION OF PROBABLE CONSTRUCTION COST

PREPARED BY

MULLER ENGINEERING COMPANY, INC.

March 6, 2024

			PROJECT TOTALS		
ITEM NUMBER	MAJOR CONSTRUCTION ITEMS	UNIT	TOTAL QUANTITY	UNIT PRICE	COST
203-00010	UNCLASSIFIED EXCAVATION (COMPLETE IN PLACE)	CY	637	$30.00	$19,110.00
203-01100	PROOF ROLLING	HOUR	10	$150.00	$1,500.00
203-01597	POTHOLING	HOUR	20	$225.00	$4,500.00
207-00205	TOPSOIL	CY	137	$60.00	$8,228.00
210-00810	RESET GROUND SIGN	EACH	2	$350.00	$700.00
210-02018	RELAY PIPE (18 INCH)	LF	45	$100.00	$4,500.00
212-00006	SEEDING (NATIVE)	ACRE	0.17	$5,000.00	$850.00
213-00000	MULCHING	ACRE	0.17	$5,000.00	$850.00
304-06000	AGGREGATE BASE COURSE (CLASS 6)	TON	44	$40.00	$1,760.00
403-34721	HOT MIX ASPHALT (GRADING SX) (75) (PG 58-28)	TON	110	$200.00	$22,000.00
411-10255	EMULSIFIED ASPHALT (SLOW SETTING)	GAL	20	$4.00	$80.00
SUBTOTAL OF MAJOR CONSTRUCTION ITEMS					**$64,078**
MINOR CONSTRUCTION ITEMS (45%) (Clearing and Grubbing, Traffic Control, Mobilization, Survey, etc.)					**$28,835**
CONSTRUCTION ENGINEERING (15%)					**$13,937**
TOTAL CONSTRUCTION COST					**$106,850**
TOTAL CONSTRUCTION COST (ROUNDED)					**$110,000**

NOTE: AGGREGATE BASE COURSE QUANTITY ASSUMES EXISTING ROADWAY MATERIAL CAN BE REUSED. ASSUME 1" OF MATERIAL REQUIRED.

BLUE RIVER: SPRUCE CREEK RD ALTERNATIVE 3 (INTERSECTION GRADING ONLY)

PRELIMINARY-LEVEL ENGINEERS OPINION OF PROBABLE CONSTRUCTION COST

PREPARED BY
MULLER ENGINEERING COMPANY, INC.
March 6, 2024

			PROJECT TOTALS		
ITEM NUMBER	MAJOR CONSTRUCTION ITEMS	UNIT	TOTAL QUANTITY	UNIT PRICE	COST
203-00010	UNCLASSIFIED EXCAVATION (COMPLETE IN PLACE)	CY	546	$30.00	$16,380.00
203-01100	PROOF ROLLING	HOUR	10	$150.00	$1,500.00
203-01597	POTHOLING	HOUR	20	$225.00	$4,500.00
207-00205	TOPSOIL	CY	137	$60.00	$8,228.00
210-00810	RESET GROUND SIGN	EACH	2	$350.00	$700.00
210-02018	RELAY PIPE (18 INCH)	LF	45	$100.00	$4,500.00
212-00006	SEEDING (NATIVE)	ACRE	0.17	$5,000.00	$850.00
213-00000	MULCHING	ACRE	0.17	$5,000.00	$850.00
304-06000	AGGREGATE BASE COURSE (CLASS 6)	TON	44	$40.00	$1,760.00
SUBTOTAL OF MAJOR CONSTRUCTION ITEMS					**$39,268**
MINOR CONSTRUCTION ITEMS (45%) (Clearing and Grubbing, Traffic Control, Mobilization, Survey, etc.)					**$17,671**
CONSTRUCTION ENGINEERING (15%)					**$8,541**
TOTAL CONSTRUCTION COST					**$65,479**
TOTAL CONSTRUCTION COST (ROUNDED)					**$70,000**

NOTE: AGGREGATE BASE COURSE QUANTITY ASSUMES EXISTING ROADWAY MATERIAL CAN BE REUSED. ASSUME 1" OF MATERIAL REQUIRED.

Attachment A – Field Trip Report

Blue River – Spruce Creek Road Site Visit 10/17/2023

On October 17, 2023, Bob LaForce with Yeh and Associates visited the section of Spruce Creek Road between SH 9 and Crown Drive to inspect the condition of the road and become familiar with the project site before winter snows cover the area.

Figure 1 - Typical Surface Condition

The aggregate surface had recently been treated with magnesium chloride to retain aggregate and help promote drainage off the roadway surface. As noted in the above photos, the surfacing was very uniform and is providing a smooth travelling surface. The roadway was inspected from SH 9 to Crown Drive and the treatment appears to be very uniform for the length of the section.

Figure 2 – Surface Texture

The texture of the surface was uniform for most of the area inspected with only one small area near SH 9 showing larger aggregate exposed through the compacted fine aggregate. These areas may be reviewed

after the spring snow melts to determine if this was a segregated spot, or just a slight variation in the surfacing aggregate gradation.

In addition to the surfacing the ditches were inspected to determine if longitudinal drainage is causing extensive erosion and deterioration of the road. The following photo shows the area immediately above of SH 9 where the ditch is armored from past drainage. The second photo shows a section on a flatter section of roadway that at present only surfacing aggregate in the ditch. These areas will also be checked again in the spring.

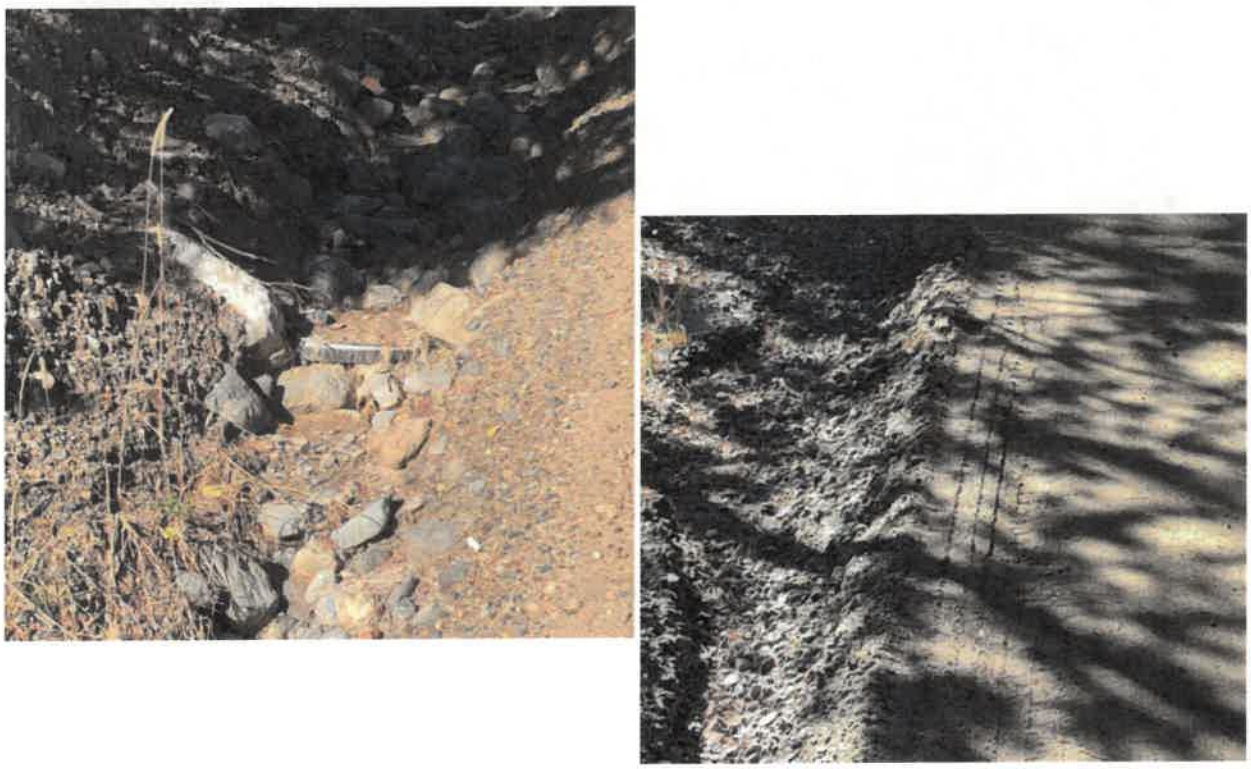


Figure 3 – Longitudinal Drainage Conditions

Soils samples believed to be representative of the roadway subgrade were also taken. Sample YA-B1 was taken to the north of the entrance near the SH 9 ROW and sample YA-B2 was taken south of Louise Placer Road. The soil was sampled from approximately 1 foot to 2+ feet. The holes were filled with surrounding soil for each boring. These soils samples will be tested for gradation, classification and maybe R-value which would provide a strength value for a pavement design if needed.

Blue River – Spruce Creek Road Site Visit 10/17/2023

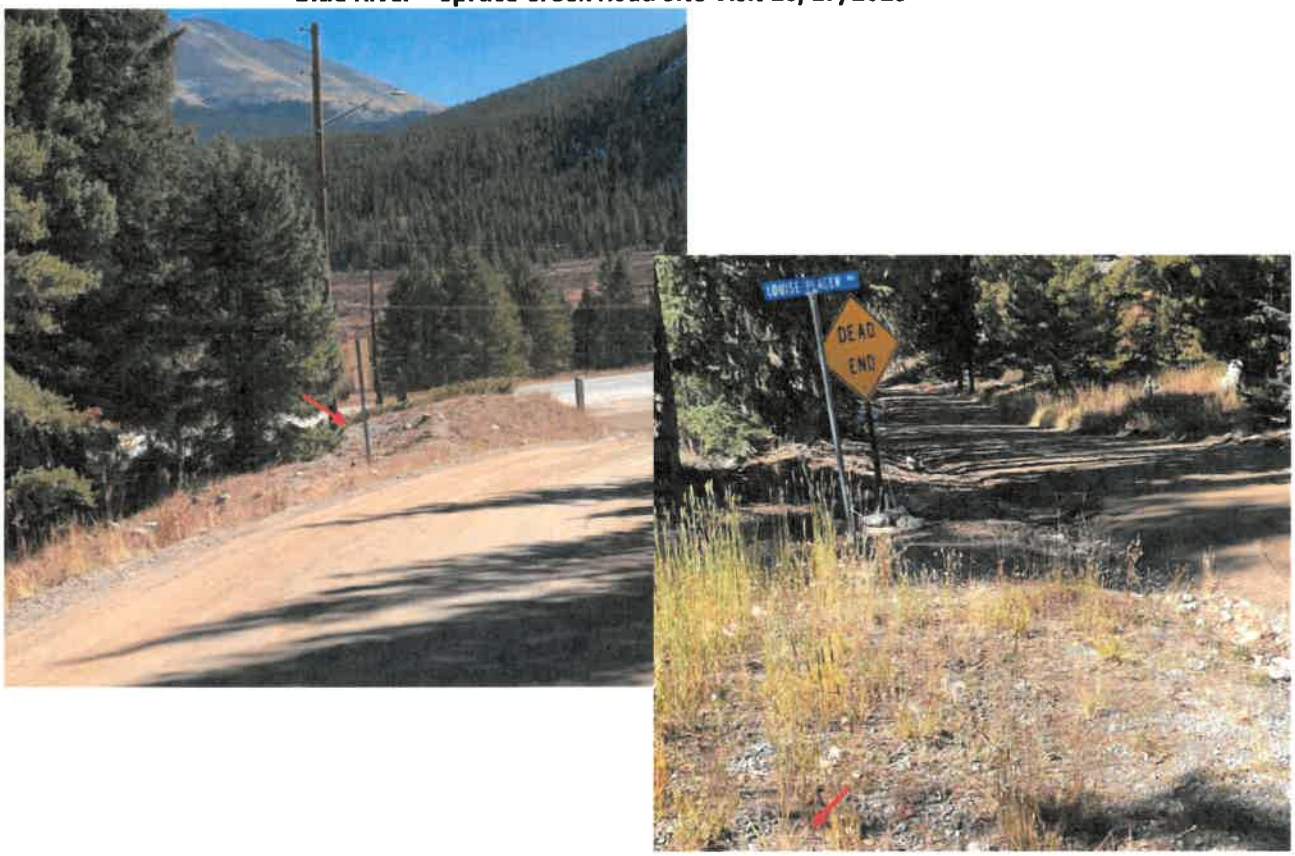


Figure 4 – Approximate Soil Sample Locations

The roadway surfacing will be inspected next spring to determine how well the treatment has performed over the winter.

Attachment B – Various Treatment Discussion

Aggregate Surfacing Options

Discussion: Pros and cons for various aggregate treatments

Gravel (Aggregate Surfaced) Roads are very common throughout the US and in Summit County, CO.
FHWA and other agencies require 10-14% minus 200 and PI 10 +/- 3 for surfacing aggregate.
The plasticity (PI) in the aggregate helps retain aggregate by bonding the fine particles together, holding the larger aggregate in place. A lack of cohesive surface aggregate results in loss of large gravel from traffic. Traffic throws larger aggregates off the roadway and causes dust from loss of finer aggregate particles.

Dust Palliative – Caused fines to adhere to larger particles to prevent dust.
Usually a spray treatment

Some typical treatments often used to control dust and stabilize the surfacing to prevent loss of large aggregate.
Calcium Chloride / Magnesium Chloride / Lignosulfonate
Method 1 – top 2 inches wet, spray process smooth and compact
Method 2 – top 3 inches wet, spray process, second application process & compact

MgCl treatment is currently done once per year. Controls dust stabilizes roadway and helps with ice/snow control.

Stabilization - Requires treatment at depth and will require mixing.

Calcium Chloride is a dry product distributed on surface with water and mixed to full depth of aggregate.
Magnesium Chloride is usually applied as a concentrated liquid tilled into the top 2-4 inches of the roadway. Annual treatment is done once per year and periodically requires that additional aggregate to make up for loss from traffic whipping large aggregate off the road and generating dust from small aggregate particles.

Mix in Pugmill

Bentonite – requires pugmill mixing. – extreme example of mixing highly plastic clay to cause aggregate to closely adhere providing extended life.
This treatment increases the cost of aggregate by an approximate factor of 3.
In the area, ABC costs about $\$90/yd^3$, so treated aggregate would be approximately $\$300/yd^2$.

RAP - can be used to create a surface almost like a cold mix pavement – works well, but if it starts to fail, it requires patching much like a thin asphalt lift.
RAP mixed with ABC at 50 +/- percent acts like aggregate but has more cohesion and may help retain aggregate. - This treatment was used on some approaches to US 285 east of Bailey and has worked for low volume roads.

Aggregate Surfacing Options

References:

Surface Aggregate Stabilization with Chloride Materials, US Dept. of Agriculture, Dec. 2006
MgCL2 & CaCL2 – 39 treated and 40 untreated sections on 12 projects – 1.5% – 2% by weight of aggregate, 2 inches- monitored for 2 years. – MG & CA had similar results – reduced blading - Cost - $8K to 10-K per mile – Savings $3,300 /mile. – up to 8 times longer than untreated sections estimated after years monitoring. – eastern Wash. And Ore plus Montana. – Drainage 4% cross slope – moderately dry climates less than 250 ADT. – untreated sections required blading after 3,200 passes, treated sections required blading after 25,500 vehicle passes. – 90% dust reduction. - <2% grades

Gravel Roads, Maintenance and Design Manual – USDOT FHWA, Nov. 2000
So. Dakota Local Transportation Assistance Program (SD LAP)

Usually Chloride, MgCL2 and CA CL2 – Resins, Lignin Sulfonate - Asphalts (cutbacks, solvents, emulsions, special equipment), note: ADT = 200 equates to loss of 200 tons /year per mile – treatment allows reduced maintenance.

Attachment C – Summit County Standards

TABLE 5-3 Minimum Structural Sections

Road Class	Gravel	Paved
Primitive	Natural surface	Not Applicable
Low Volume	3" Base Course	3"Asphalt 3"Base course
Local Access	4" Base Course	4"Asphalt 4"Base course
Collector	Not Applicable	5"Asphalt 6" Base Course
Arterial	Not Applicable	6" Asphalt 6" Base Course
Shared Use Path/Trail	Not Applicable	3"Asphalt 4"Base Course
• Full depth asphalt or concrete designs will be considered and may be used with approval of the County Engineer • Sub base may be substituted with road base with prior approval		

TABLE 5-4 Coefficient of Runoff

Type of Surface	Vegetation Density	Value of C= (Rainfall)
Roofs		.97
Pavements		
Concrete or Asphalt		.97
Gravel from clean and loose, to clayey and compact		.60
Earth Surfaces		
Sand from uniform grain size, no fines to well graded, some, clay or silt	Bare	.60
	Light Vegetation	.45
	Dense Vegetation	.35
Clay, from coarse sandy or silty, to pure colloidal clay	Bare	.70
	Light Vegetation	.50
	Dense Vegetation	.40

TABLE 5-5 Prescribed Manning's "n" Values

Channel Material	"n"	Max Velocity (feet/sec)
Lines or well established grass	.05	5
Bunched grasses with exposed soil	.04	3
Fine sand or silt	.02	1
All other bare soils	.03	2

Attachment D – Pavement Design

Pavement Design Discussion

Base and Subgrade Materials:

As noted in the site visit last fall, the subgrade soils near Spruce Creek Road were sampled and testing showed that they have an R-value of 69. To be conservative, for the pavement design, an R-value of 60 was used to calculate a resilient modulus of 18,259 psi for input to the pavement design program.

If any embankment (CDOT Item 203) is needed to be imported for this project, we recommend that it be required to have a minimum R-value of 60 when tested in accordance with AASHTO T190.

If any aggregate base course (ABC) (CDOT Item 304) is required, we recommend that it have a minimum R-value of 78, also measured in accordance with AASHTO T190.

Project special provisions for the above items are attached.

Hot Mix Asphalt (HMA)

The recommended HMA for this project is SX(75) with asphalt binder grade PG 58-28. We believe that this is the standard mix produced in the Blue River Valley. The HMA should conform to CDOT Specifications for SX(75) PG 58-28.

We recommend that the HMA be placed in two lifts.

Traffic Loading

Traffic loading was calculated based on the number of dwellings served by the roadway. In this case we used 50 dwellings, then increased the loading by 50% to address the Forest Service Trail Access. The calculation of the traffic loading is attached.

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

Flexible Design Inputs

Project Name: Spruce Creek Road
Route:
Location: Blue River, Colorado
Owner/Agency: Blue River
Design Engineer: New HMA Pavement

Flexible Pavement Design/Evaluation

Structural Number	1.62		**Subgrade Resilient Modulus**	18,259.00	**psi**
Total Flexible ESALs	90,908		**Initial Serviceability**	4.50	
Reliability	90.00	**percent**	**Terminal Serviceability**	2.00	
Overall Standard Deviation	0.44				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.44	1.00	4.00	1.76
			ΣSN	1.76

Spruce Creek Road in Blue River

Yeh No. 223-108

ESAL LOADING

Using MGPEC Default Equations based on number of dwellings.

$ESAL_{20}$ = 62,000 + 80 * R

R = Number of Housing Units Served

$ESAL_{20}$ = 20 Year Single Axle Loads for pavement design.

For Spruce Creek Road, We assumed that there would be 50 residences. Then doubled the number of ESALS because the road services a Forest Service Facility/Trailhead.

$ESAL_{20}$ = 62,000 + 80 * 50 = 66000

Plus 50% for Trail Traffic = 99000

62000 ESAL value to address construction of dwelings

80

50 R - number of dwellings Served

Cars & pickups	0.003
Trash & Snow Plow trucks	0.249

ADT of 500 plus construct

			% of vol.				
500	veh/da X	0.98	X	0.003	ESAL/veh =	1.47	ESAL /Day
500	veh/da X	0.02	X	0.249	ESAL/veh =	2.49	ESAL /Day
						3.96	ESAL /Day

ESAL /Day							
3.96	ESAL /Da X	365	da/yr X	20	yrs =	28908	ESAL
28908	+	62000	=	90908	Design ESALs		

* These equations were also used by CDOT when they followed the AASHTO 1993 Pavement Design Guide.

Work Sheet: 203em
02-03-11 (Re-issued 07-03-17) Spruce Creek Road
(tech chk 01-13-23)
ADA 8.22.23

Revision of Section 203
Embankment Material

Revise Section 203 of the Standard Specifications for this project as follows:

Subsection 203.03, first paragraph, shall include the following:

Imported embankment material shall meet the following requirements for Atterberg limits and gradation:
The upper 2 feet of embankment material below the subgrade elevation shall have a resistance value of at least 60 when tested by the Hveem Stabilometer or the equivalent resilient modulus.

Work Sheet: 304abc
02-03-11 (Re-issued 07-03-17)
(tech chk 01-13-23)
ADA 8.22.23

Spruce Creek Road

Revision of Section 304
Aggregate Base Course

Revise Section 304 of the Standard Specifications for this project as follows:

Subsection 304.02 shall include the following:

Materials for the base course shall be Aggregate Base Course (Class6) as shown in subsection 703.03

The aggregate base course (Class 6) must meet the gradation requirements and have a resistance value of at least 78 when tested by the Hveem Stabilometer method.

****

Instructions to Designers (delete instructions and symbols from final draft):

♦ Use when appropriate, inserting the proper Class of base course.

▲ Use for all Classes of base course, inserting the correct figures.

♥ Insert the specified resistance values.

BLUE RIVER: SPRUCE CREEK RD

PRELIMINARY-LEVEL ENGINEERS OPINION OF PROBABLE CONSTRUCTION COST

PREPARED BY

MULLER ENGINEERING COMPANY, INC.

April 4, 2024

				PROJECT TOTALS		
BID NUMBER	ITEM NUMBER	ITEM	UNIT	TOTAL QUANTITY	UNIT PRICE	COST
1	201-00000	CLEARING AND GRUBBING	L S	1	$8,000.00	$8,000.00
2	202-00035	REMOVAL OF PIPE	LF	35	$50.00	$1,750.00
3	203-00010	UNCLASSIFIED EXCAVATION (COMPLETE IN PLACE)	CY	1,250	$30.00	$37,500.00
4	203-01100	PROOF ROLLING	HOUR	17	$150.00	$2,550.00
5	203-01597	POTHOLING	HOUR	20	$225.00	$4,500.00
6	207-00205	TOPSOIL (REMOVE AND REPLACE)	CY	222	$60.00	$13,320.00
7	208-00002	EROSION LOG TYPE 1 (12 INCH)	LF	350	$7.00	$2,450.00
8	208-00041	ROCK CHECK DAM	EACH	6	$2,000.00	$12,000.00
9	208-00070	VEHICLE TRACKING PAD	EACH	1	$400.00	$400.00
10	208-00207	EROSION CONTROL MANAGEMENT	DAY	7	$350.00	$2,450.00
11	212-00006	SEEDING (NATIVE)	ACRE	0.28	$5,000.00	$1,400.00
12	216-00041	SOIL RETENTION BLANKET (STRAW/COCONUT)	SY	1,333	$4.00	$5,332.00
13	304-06000	AGGREGATE BASE COURSE (CLASS 6)	TON	106	$40.00	$4,240.00
14	403-34721	HOT MIX ASPHALT (GRADING SX) (75) (PG 58-28)	TON	585	$200.00	$117,000.00
15	411-10255	EMULSIFIED ASPHALT (SLOW SETTING)	GAL	106	$4.00	$424.00
16	506-00209	RIPRAP (TYPE L) (WITH BEDDING TYPE I)	CY	6	$200.00	$1,200.00
17	603-05118	18 INCH EQUIVALENT REINFORCED CONCRETE END SECTION HORIZONTAL ELLIPTICAL	EACH	4	$400.00	$1,600.00
18	603-02185	18 INCH EQUIVALENT REINFORCED CONCRETE PIPE HORIZONTAL ELLIPTICAL	LF	88	$115.00	$10,120.00
19	620-00020	SANITARY FACILITY	EACH	1	$1,500.00	$1,500.00
20	625-00000	CONSTRUCTION SURVEYING	L S	1	$8,000.00	$8,000.00
21	626-00000	MOBILIZATION	L S	1	$25,000.00	$25,000.00
22	630-00000	FLAGGING	HOUR	200	$35.00	$7,000.00
23	630-00007	TRAFFIC CONTROL INSPECTION	DAY	8	$350.00	$2,800.00
24	630-00012	TRAFFIC CONTROL MANAGEMENT	DAY	20	$1,200.00	$24,000.00
25	630-80336	BARRICADE (TYPE 3 M-B) (TEMPORARY)	EA	3	$400.00	$1,200.00
26	630-80341	CONSTRUCTION TRAFFIC SIGN (PANEL SIZE A)	EA	9	$75.00	$675.00
27	630-80342	CONSTRUCTION TRAFFIC SIGN (PANEL SIZE B)	EA	4	$90.00	$360.00
28	630-80355	PORTABLE MESSAGE SIGN PANEL	EA	2	$8,500.00	$17,000.00
29	630-80360	DRUM CHANNELIZING DEVICE	EA	40	$40.00	$1,600.00
30	630-80364	DRUM CHANNELIZING DEVICE (WITH LIGHT) (STEADY BURN)	EA	5	$50.00	$250.00
31	630-80380	TRAFFIC CONE	EA	50	$10.00	$500.00
32	607-11525	FENCE (PLASTIC)	LF	100	$4.00	$400.00
SUBTOTAL OF CONSTRUCTION ITEMS						**$316,121**
CE/INDIRECT COSTS (20%)						**$63,224**
TOTAL CONSTRUCTION COST						**$379,345**
TOTAL CONSTRUCTION COST (ROUNDED)						**$380,000**

NOTE: AGGREGATE BASE COURSE QUANTITY ASSUMES EXISTING ROADWAY MATERIAL CAN BE REUSED. ASSUME 1" OF MATERIAL REQUIRED.

Date	Memo/Description	Amount
02/10/2022	Spruce Creek Road	$ 4,174.00
03/11/2022	Spruce Creek Road	$ 11,468.25
04/12/2022	Spruce Creek Road	$ 1,158.50
05/10/2022	Spruce Creek Road	$ 1,201.75
06/07/2022	Spruce Creek Road	$ 354.50
07/05/2022	Spruce Creek Road	$ 2,457.04
08/09/2022	Spruce Creek Road	$ 941.50
09/09/2022	Spruce Creek Road	$ 478.00
12/07/2022	Spruce Creek Road	$ 2,731.50
12/07/2022	Spruce Creek Road	$ 1,181.25
12/07/2022	Spruce Creek Road	$ 1,515.75
12/07/2022	Spruce Creek Road	$ 463.50
12/31/2022	Spruce Creek Road	$ 1,027.50
02/13/2023	Spruce Creek Road	$ 5,859.50
03/07/2023	Spruce Creek Road	$ 6,165.58
04/10/2023	Spruce Creek Road	$ 3,625.75
07/11/23	Spruce Creek Road	$ 2,761.25
10/10/23	Spruce Creek Road	$ 4,496.25
10/31/2023	Spruce Creek Road	$ 3,453.50
11/30/2023	Spruce Creek Road	$ 4,672.90
01/12/2024	Spruce Creek Road	$ 12,051.25
02/07/24	Spruce Creek Road	$ 10,117.00
03/04/24	Spruce Creek Road	$ 6,603.25
04/03/24	Spruce Creek Road	$ 8,465.50
05/07/24	Spruce Creek Road	$ 25,211.25
Total		**$ 122,636.02**
2024 Total	**Spruce Creek Road**	**$ 50,397.00**