



**ADDENDUM #1  
Public Works  
North 71st Street Shoulders and SH 52 Intersection  
BID # 7396-22**

December 20, 2022

The attached addendum supersedes the original Information and Specifications regarding BID # 7396-22 where it adds to, deletes from, clarifies or otherwise modifies. All other conditions and any previous addendums shall remain unchanged.

**Please note: Due to COVID-19, BIDS will only be accepted electronically by emailing [purchasing@bouldercounty.org](mailto:purchasing@bouldercounty.org).**

1. Question: No Bid Bond Form was included in the bid package. Is a Bid Bond required? Or Can a Bid Bond Form be provided?

**ANSWER: A Bid bond is required for this project. The form AIA DOC A310 form can be used.**

2. Question: Are there any Liquidated Damages on this project? If so, what are they?

**ANSWER: Boulder County uses CDOT's Standard Specifications. 108.09, and are per calendar day.**

3. Question: Just a quick question regarding the Bid Bond Percent. In the specifications it is indicating a 5% Bid Bond but on the bottom on the Bid Tabulation sheet it is indicating a 10% Bid Bond . Can you clarify the Bid Bond percent for the project.

**ANSWER: The Bid Bond shall be 10%, Specifications have been revised.**

4. Question: Who is Responsible for Materials Testing?

**ANSWER: Boulder County will provide a qualified Construction Quality Assurance team to perform Quality Assurance (QA) auditing and acceptance testing. The QA staff shall remain independent from the Contractor's production and Quality Control (QC)... The Boulder County construction QA Team or Consultant's will perform on-site inspection and testing of the construction elements of the work to verify that all work has been constructed in conformance with the Contract requirements.**

**The Contractor shall be responsible to establish, document, and implement a Quality Control Plan. The Quality Control Plan shall include all procedures necessary for the Contractor to control the quality of its production processes to meet the requirements of the Contract. The Contractor's Quality Control Plan shall include a testing and inspection schedule to control the production processes.**

5. Question: How long do you anticipate us maintaining the seeding?

**ANSWER: Seeding must be maintained for 2 years.**

6. Question: Can the Box Culvert be Precast?

**ANSWER: No.**

7. Question: When is the anticipated Start Date?

**ANSWER: March 1, 2022.**

8. Question: Is there CDOT Funding associated with the project? Do we have Davis Bacon Wages or DBE Participation?

**ANSWER: No.**

9. Question: Can you please provide us CAD Files for bidding purposes? Please include Proposed and Existing Surfaces.

**ANSWER: No. CAD files will be provided to the awarded contractor for construction purposes.**

10. Question: Can you please provide the Geotech Report?

**ANSWER: Yes. Geotech report will be included as a part of this addendum.**

11. Question: Can you add a Line Item for the Temp Support of High Voltage Cable Pipe? Or indicate where these costs should be carried?

**ANSWER: No. This work shall not be measured or paid for separately but shall be included in the cost of concrete box culvert construction items.**

12. Question: Can you add a Line Item for the Temp Support of High Voltage 3X3 Duct Bank? Or indicate where these cost should be carried?

**ANSWER: No. This work shall not be measured or paid for separately but shall be included in the cost of concrete box culvert construction items.**

13. Question: What permits do anticipate will be needed?

**ANSWER: The Flood Plain Development Permits from City and County, a Boulder Stormwater Quality Permit, and the Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP) are needed. The Contractor shall make all arrangements to obtain any required agency permit(s).**

14. Question: Do you have a project budget you can share for bonding purposes?

**ANSWER: Yes, it will be shared after the bids are received. Upon request.**

15. Question: Does the County require a specific Bid Bond form?

**ANSWER: A specific form is not called out. The AIA DOC A310 form can be used.**

16. Question: Will there be Liquidated Damages on this project? If so, what are they? Our bonding company asks for this information.

**ANSWER: Boulder County uses CDOT's Standard Specifications. 108.09, and are per calendar day.**

17. Question: On page 42 of the specs, RAP is not allowed in the asphalt mix. Typically, the County has allowed up to 20% and has benefited in the cost savings this provides. Would the County reconsider this requirement?

**ANSWER: Per the City development standards it is 10%, Specifications have been updated.**

18. Question: Can you provide what permits are anticipated for this project and a potential cost for those permits? Will Boulder County and City of Boulder permit fees be waived?

**ANSWER: The Flood Plain Development Permits from City and County, a Boulder Stormwater Quality Permit, and the Colorado Discharge Permit System**

**Stormwater Construction Permit (CDPS-SCP) are needed. The Contractor shall make all arrangements to obtain any required agency permit(s). City and County permit fees will be waived.**

19. Question: Will the VMB's be required to be set up prior to the project start date? If so, how long before starting?

**ANSWER: Yes. See specifications Revision of Section 630.**

20. Question: Note 17 on Page 3 of the plans specifies an all-weather surface. Can you please define what is acceptable for an all-weather surface?

**ANSWER: Gravel or asphalt material is acceptable.**

21. Question: How can we get a copy of the Surface Exploration and Pavement Design report prepared by Geocal?

**ANSWER: Geotech report will be included as a part of this addendum.**

22. Question: Page 55 of the specs states the working hours are 9:00 am – 4:30 pm but page 16 states they are 8:00 am – 4:30 pm. Would you please clarify?

**ANSWER: Working hours shall be 8:00am – 4:30pm. Specifications have been revised.**

23. Question: Can you define or provide a spec for the intended use of Item 207-00704 – Subgrade Soil Preparation?

**ANSWER: Specifications Revised.**

24. Question: For the removal of conduits owned by both AT&T and Lumen, how is this item paid for? Do either of the Utilities have a designated/required procedure for the removal of their lines?

**ANSWER: Utility coordination is called out in the Utility Specification. Payment for abandoned conduit removal of utilities is not paid separately.**

25. Question: In the Prebid, it was mentioned that the roadway could be shut down in it's entirety. What are the parameters and duration of shutting down the roadway for the construction of this project?

**ANSWER: The roadway may be closed up to 120 calendar days to accommodate the cast in place structure and site limitations. Access to local businesses shall be maintained.**

**Please see the additional documents included at the end of this addendum:**

- Pre-Bid Meeting Agenda
- Pre-Bid Meeting Sign in Sheet
- Geotech Reports
- Updated Specifications

**Submittal Instructions:**

Submittals are due at the email box only, listed below, for time and date recording on or before **2:00 p.m. Mountain Time on January 5, 2023.**

**Please note that email responses to this solicitation are limited to a maximum of 50MB capacity.**

**NO ZIP FILES OR LINKS TO EXTERNAL SITES WILL BE ACCEPTED. THIS INCLUDES GOOGLE DOCS AND SIMILAR SITES. ALL SUBMITTALS MUST BE RECEIVED AS AN ATTACHMENT (E.G. PDF, WORD, EXCEL).**

**Electronic submittals must be received in the email box listed below. Submittals sent to any other box will NOT be forwarded or accepted. This email box is only accessed on the due date of your questions or proposals. Please use the Delivery Receipt option to verify receipt of your email. It is the sole responsibility of the proposer to ensure their documents are received before the deadline specified above. Boulder County does not accept responsibility under any circumstance for delayed or failed email or mailed submittals.**

Email [purchasing@bouldercounty.org](mailto:purchasing@bouldercounty.org); identified as **BID # 7396-22** in the subject line.

All proposals must be received and time and date recorded at the purchasing email by the above due date and time. Sole responsibility rests with the Offeror to see that their bid is received on time at the stated location(s). Any bid received after due date and time will be returned to the bidder. No exceptions will be made.

The Board of County Commissioners reserve the right to reject any and all bids, to waive any informalities or irregularities therein, and to accept the bid that, in the opinion of the Board, is in the best interest of the Board and of the County of Boulder, State of Colorado.



**RECEIPT OF LETTER  
ACKNOWLEDGMENT**

December 20, 2022

Dear Vendor:

This is an acknowledgment of receipt of Addendum #1 for BID #7396-22, North 71st Street Shoulders and SH 52 Intersection.

In an effort to keep you informed, we would appreciate your acknowledgment of receipt of the preceding addendum. Please sign this acknowledgment and email it back to [purchasing@bouldercounty.org](mailto:purchasing@bouldercounty.org) as soon as possible. If you have any questions, or problems with transmittal, please call us at 303-441-3525. This is also an acknowledgement that the vendor understands that **due to COVID-19, BIDS will only be accepted electronically by emailing [purchasing@bouldercounty.org](mailto:purchasing@bouldercounty.org).**

Thank you for your cooperation in this matter. This information is time and date sensitive; an immediate response is requested.

Sincerely,

Boulder County Purchasing

Signed by: \_\_\_\_\_ Date: \_\_\_\_\_

Name of Company \_\_\_\_\_

End of Document



# BOULDER COUNTY PUBLIC WORKS PRE-BID MEETING AGENDA

Date: 12/13/2022 Time: 10:00 AM County Proj. No.: RD-033-044

Location: North 71<sup>st</sup> Street Federal Proj. No.: N/A Code:

This is for the construction of shoulders along N. 71<sup>st</sup> St. between Winchester Circle and SH 52. Additional improvements include building the structure at Dry Creek 2 and a realignment of the intersection of 71<sup>st</sup> and SH 52.

Description: \_\_\_\_\_

## I. INTRODUCTIONS:

- a. Boulder County Project Team
  - i. Colton Coughlin – Project Manager and Engineer
  - ii. Andrew Barth – Public Information Officer
- b. City Of Boulder
  - i. Lindsay Merz - Engineer
- c. S.E.H.
  - i. Kit Clunis – Engineer
  - ii. Katie Croell - Engineer
- d. CM&I Team
  - i. TBD
- e. Sign-in Sheet provided: All bidders to provide contact information.
  - i. Sheet will be provided to all contractors following the meeting, everyone please email in your name, company, email, and phone number.

## II. PROJECT OVERVIEW:

- f. Project Description and General Site overview:
  - i. Project Schedule –150 working days
  - ii. Maintain driveway access points
  - iii. Traffic Control
    1. City Spec calls out 2 weeks review time
  - iv. Coordinating with utilities
    1. (Work shall take place adjacent to ditch in low flow events)
  - v. Working Hours
    1. 8am to 4:30 pm
  - vi. BOCO SWMP Permit <https://www.bouldercounty.org/transportation/permits/stormwater-quality-permit/>
  - vii. City Of Boulder Floodplain Development Permit
  - viii. Utility Coordination – very important
- g. Specification Overview

## III. BID DOCUMENTS AND CHANGES TO DOCUMENTS:

- h. Obtaining Plans and Specifications:
- i. [https://drive.google.com/drive/folders/1Y4FAd06oDBg\\_K3Jwsr7SE0icQ2Z6Q2q9?usp=share\\_link](https://drive.google.com/drive/folders/1Y4FAd06oDBg_K3Jwsr7SE0icQ2Z6Q2q9?usp=share_link)
- j. All inquiries regarding this BID will be submitted via email to the Boulder County Purchasing Office at [purchasing@bouldercounty.org](mailto:purchasing@bouldercounty.org) on or before 2:00 p.m. **December 15<sup>th</sup>, 2022**. A response from the county to all inquiries will be posted and sent via email no later than **December 20<sup>th</sup>, 2022**.
  - a. Drawing and Specification changes will be posted to the website and notice will be sent via Addendum.

## IV. SCHEDULE OF EVENTS:

- b. Publication: 11/21/2022
- c. Question Acceptance Deadline: 2:00 PM  
12/15/2022
- d. Question Answer Deadline: 12/20/2022 EOB
- e. Closing Date: 2:00 PM 1/5/2022
- f. Contract Award Date: (TBD)
- g. Start of Construction is March or before if possible





BOULDER COUNTY PUBLIC WORKS – ENGINEERING DIVISION  
Pre-Bid Meeting Sign-In Sheet  
North 71<sup>st</sup> Street Shoulders (Schedule B)

Name/Signature	Company	Phone Number	Email address
Bethany Collins	City of Boulder, OSMP Real Estate		<a href="mailto:CollinsB@bouldercolorado.gov">CollinsB@bouldercolorado.gov</a>
Bill Eliassen	Boulder County		<a href="mailto:beliasen@bouldercounty.org">beliasen@bouldercounty.org</a>
Brandon Houser	Structures Inc.	719-369-1398	<a href="mailto:brandonh@structuresinc.net">brandonh@structuresinc.net</a>
Colton Coughlin	Boulder County		<a href="mailto:ccoughlin@bouldercounty.org">ccoughlin@bouldercounty.org</a>
Dan DeLange	Boulder County		<a href="mailto:ddelange@bouldercounty.org">ddelange@bouldercounty.org</a>
Dustin Allard	City of Boulder, OSMP Water Resources	303-579-0914	<a href="mailto:allardd@bouldercolorado.gov">allardd@bouldercolorado.gov</a>
Elissa Roselyn	Goodbee & Associates	303-507-2103	<a href="mailto:elissa@goodbeeassoc.com">elissa@goodbeeassoc.com</a>
Gary Richardson	Asphalt Specialties	303-289-8555	<a href="mailto:garyr@asphaltspecialties.com">garyr@asphaltspecialties.com</a>
Gerrit Slatter	City of Boulder		<a href="mailto:slatterg@bouldercolorado.gov">slatterg@bouldercolorado.gov</a>
Hannah Wassenberg	Hall-Irwin		



BOULDER COUNTY PUBLIC WORKS – ENGINEERING DIVISION  
Pre-Bid Meeting Sign-In Sheet  
North 71<sup>st</sup> Street Shoulders (Schedule B)

James Smith			
Jodi Adams	Noraa Concrete Construction Corporation		
Jody Boulanger	AB Underground		
Katie Croell	SEH	303-586-5814	<a href="mailto:kcroell@sehinc.com">kcroell@sehinc.com</a>
Kit Clunis	SEH	720-540-6831	<a href="mailto:kclunis@sehinc.com">kclunis@sehinc.com</a>
Logan Bloemer	Dietzler Construction Corporation		
Ryan Neeley	GoodLand Construction Inc.	303-278-8100	<a href="mailto:ryan@goodlandconstruction.com">ryan@goodlandconstruction.com</a>



BOULDER COUNTY PUBLIC WORKS – ENGINEERING DIVISION  
Pre-Bid Meeting Sign-In Sheet  
North 71<sup>st</sup> Street Shoulders (Schedule B)

<b>Scott Palmer</b>	<b>Edge Contracting Inc.</b>		
<b>Steve Toney</b>			
<b>Steve Walsh</b>	<b>Martin Marietta</b>	<b>720-245-6445</b>	<a href="mailto:steve.walsh@martinmarietta.com">steve.walsh@martinmarietta.com</a>
<b>Todd Gunderman</b>	<b>J-U-B</b>	<b>801-641-8951</b>	<a href="mailto:tgunderman@jub.com">tgunderman@jub.com</a>
<b>Trent Casey</b>	<b>DeFalco Construction</b>		



March 29, 2022

Short Elliott Hendrickson, Inc.  
Attn: Kit Clunis, P.E.  
2000 South Colorado Boulevard  
Denver, Colorado 80222

**RE: Addendum, Full Depth Reclamation Pavement Design Recommendations  
Subsurface Exploration and Pavement Design Report  
71<sup>st</sup> Street, Lookout Road to Mineral Road,  
Boulder County, Colorado**

Dear Mr. Clunis:

This Addendum Letter contains our Full Depth Reclamation (FDR) pavement design results and recommendations for the proposed roadway improvements for 71<sup>st</sup> Street from Winchester Circle to SH 52 (Mineral Road), in Boulder County, Colorado. The recommendations provided in our previous report, titled "Subsurface Exploration and Pavement Design, 71<sup>st</sup> Street, Lookout Road to Mineral Road, Boulder County, Colorado", and dated December 2, 2016, remain valid except as modified herein.

**Full Depth Reclamation (FDR):** FDR is an in-place recycling method for reconstruction of the existing flexible pavements using the existing pavement section material as the base for the new roadway-wearing surface. FDR would also allow for the necessary grading work and to provide for a more uniform structural support beneath the entire finished pavement. FDR consists of cutting of the existing asphalt mat, pulverizing the existing asphalt mat shoulders, mixing the pulverized asphalt mat with the existing subgrade and/or existing base course, to the specified depth, grading and compacting the mixed material, in accordance with the specifications.

**Mechanistic-Empirical Design Methodology:** The recommendations presented in this section are based on the AASHTO mechanistic-empirical design methodology (M-E Design) for pavements as presented in the CDOT 2021 Pavement Design Manual and/or the CDOT 2021 Pavement Design Manual Addendum. The AASHTOWare M-E Pavement Design Software Version 2.3.1 was used to develop pavement thickness designs. The M-E Design software calculates pavement responses such as stress, strain, and deflection under axle loads and climatic conditions, and calculates the accumulated damage over the design analysis period. The procedure empirically relates calculated damage over time to pavement distresses (e.g. rutting, fatigue cracking, and roughness), based on performance of actual projects in Colorado. Performance verification forms the basis of the acceptance or rejection of a trial design evaluated using the M-E Design software. A successful design is one where the selected performance criteria threshold limits are satisfied at their chosen levels of reliability at the end of the design life, or the minimum age to the first rehabilitation. The performance criteria and reliability factors are selected based on the functional classification of the roadway.

**Performance Criteria:** For FDR pavement design of 71<sup>st</sup> Street, the following performance criteria were used, based on the guidelines provided by CDOT and a classification of Minor Arterial.

<b>New Flexible Pavement Performance Criteria</b>	<b>Limit</b>
Reliability (%)	85
Initial IRI (in/mile)	60.1
Terminal IRI (in/mile)	200
AC top-down fatigue cracking (ft/mile)	3,000
AC bottom-up fatigue cracking (% lane area)	25
AC thermal cracking (ft/mile)	1,500
Permanent deformation – total pavement (in)	0.80
Permanent deformation – AC only (in)	0.65

**Traffic Loading:** The M-E Design methodology considers the Annual Average Daily Truck Traffic (AADTT) to quantify traffic loading to pavements over the design period. The design traffic loading was calculated based on our Subsurface Exploration and Pavement Design Report No G15.1616.000 dated December 2, 2016 and updated for 2022 (the construction year for the FDR stretch of 71<sup>st</sup> St). The design traffic including Average Daily Traffic (ADT) values and traffic distribution are summarized in the following table.

<b>Segment</b>	<b>20 Year Growth Factor (Growth Rate %)</b>	<b>Projected 2022 AADT</b>	<b>% Trucks</b>	<b>Projected 2022 AADTT</b>
71 <sup>st</sup> Street	1.26 (1.12)	5,641	3.5	204

A CDOT Cluster 3 truck traffic distribution was assumed, which has two distinct peaks for Class 5 and Class 9 vehicles, and a 60% lane distribution was applied based on 1 travel lane in each direction.

**Subgrade Soil Strength:** Laboratory test results indicate that the onsite soils in the pavement subgrade generally consist of sandy lean clays. For design, the subgrade was modeled as AASHTO A-6 soils with an R-value of 7, which correlates to a Resilient Modulus of 5,875 psi, based on the Equation 4-1 of CDOT ME Pavement Design Manual 2021.

The properly prepared FDR material was modeled as a non-stabilized base material with a Resilient Modulus of 37,000 psi, which is based on the CDOT Research Report No. CDOT-2020-09, dated July 2020 “Residual Strength of Full Depth Reclamation”.

We understand project constraints limit the total thickness of the new pavement section, so some adjustment of the FDR thickness was applied, and the final FDR was modeled as 4.5 inches thick.

**Pavement Thickness Recommendations:** The following new Hot Mix Asphalt Pavement (HMAP) and FDR sections were calculated using the AASHTOWare Pavement ME Design software, version 2.3.1, in general accordance with the current CDOT Guidelines.

<b>Segment</b>	<b>Thickness of New HMAP (in)</b>	<b>Thickness of FDR (in)</b>
71 <sup>st</sup> Street	5	4 ½

**Hot Mix Asphalt Pavement:** HMAP should consist of a bituminous plant mix composed of a mixture of aggregate and bituminous material that meets the requirements of a job-mix formula established by a qualified engineer in accordance with the current Colorado Department of Transportation Bridge Standard Specifications for Road and Bridge Construction (CDOT Standard Specifications). The following grading and binder types are recommended.

<b>Segment</b>	<b>Top Lift (2-inch)</b>	<b>Lower Lift (3 inch)</b>
71 <sup>st</sup> Street	SX (75) PG 76-28	S (75) PG 64-22

**Full Depth Reclamation (FDR):** We recommend that 1 inch of the subgrade be included in the FDR material. After pulverizing the existing six (6.0) inch asphalt pavement including the one (1) inch subgrade material, the total FDR material will be a little more than Seven (7) inches. For design purposes, we have assumed that at least two and a half (2 ½) inches of the pulverized material has to be removed as part of achieving the finished grade of the FDR material. Some of the proposed FDR Specifications are attached for information and may be updated as appropriate.

If you have any questions, or if we can provide further information, please feel free to give us a call at 303-337-0338.

Sincerely,

**GEOCAL**



Shamshad Hussain, PhD, PE  
 Senior Project Manager

Reviewed by: Nur Hossain, Ph.D., P.E.  
 Principal Engineer

WJZ/G22.2004.000

Attachments: Pavement Design Printouts: Boulder 71<sup>st</sup> Street FDR  
 FDR

### **FDR Proposed Specifications**

The contractor shall develop a written method to maintain the centerline geometry, profile elevations, and cross slope of the existing roadway. The plan shall be submitted to the Engineer for approval a minimum of two weeks prior to starting work.

The existing asphalt mat shall be cut at neat lines as shown in the plans by the use of a cutting wheel attached to a blade or by another approved method. The existing asphalt mat shall be pulverized, and mixed with the existing subgrade, base course, or combination thereof to a specified depth or as directed by the Engineer, with a self-propelled rotary type mixing machine. Existing asphalt mat thicknesses and core information will be available upon request. The mixing machine shall make as many passes as required to uniformly mix the asphalt, subgrade, existing base course, or combination thereof to the required thickness. Mixing of the different materials shall create a homogenous mixture. The particle size of the pulverized asphalt mat shall be a minimum of 99 percent passing the 37.5 mm (1-1/2 inch) sieve. When the addition of water is necessary for initial compaction purposes, unless otherwise approved by the Engineer, it shall be added through the mixing machine with the capability to uniformly distribute water through the mixed materials to within 2 percent of the optimum moisture as determined in accordance with AASHTO T-180 Method D.

When proper mixing has been accomplished, the mixture shall then be bladed, shaped, wetted or dried, and rolled to meet a minimum of 95 percent of the maximum dry density determined in accordance with AASHTO T-180 Method D. Grading equipment used to establish the final surface elevations shall have automatic controls for transverse slope. The transverse slope controls shall be capable of maintaining the final surface within 0.1 percent of the specified slope. Variations from the subgrade plane shall not be more than ¼ inch. The work shall be maintained and tested for conformance to these requirements immediately prior to placing additional pavement layers. An application of diluted emulsified asphalt may be required before placement of the bottom layer of hot bituminous pavement.

**GEOCAL**

GEOSCIENCES & ENGINEERING  
7290 South Fraser Street  
Centennial, Colorado 80112-4286  
Phone: 303-337-0338



# **SUBSURFACE EXPLORATION AND PAVEMENT DESIGN**

**71ST STREET  
LOOKOUT ROAD TO MINERAL ROAD  
BOULDER COUNTY, COLORADO**

**Prepared For**

**Short Elliott Hendrickson Inc.  
Attn: Paul Wells, P.E.  
2000 South Colorado Boulevard  
Suite 6000  
Denver, Colorado 80222**

**December 2, 2016**



# GEOCAL

GEOSCIENCES & ENGINEERING  
7290 South Fraser Street  
Centennial, Colorado 80112-4286  
Phone: 303-337-0338



## SUBSURFACE EXPLORATION AND PAVEMENT DESIGN

71ST STREET  
LOOKOUT ROAD TO MINERAL ROAD  
BOULDER COUNTY, COLORADO



Prepared For

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By: Tristan R. Siegel, P.E.  
Project Engineer

**Short Elliott Hendrickson Inc.**  
**Attn: Paul Wells, P.E.**  
2000 South Colorado Boulevard  
Suite 6000  
Denver, Colorado 80222



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Reviewed By: Ronald J. Vasquez, P.E.  
Principal Engineer

December 2, 2016  
G15.1616.000

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Figure 3	Legend and Notes for Exploratory Borings
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Table 1	Summary of Laboratory Test Results
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Appendix A	Logs of Exploratory Borings
Appendix B	ESAL Calculations and Pavement Design Output

## 1.0 PURPOSE AND SCOPE

This report contains the results of a subsurface exploration and pavement design conducted for the proposed reconstruction of 71<sup>st</sup> Street. The project southern limit begins at the intersection of 71<sup>st</sup> Street and Lookout Road and extends north approximately 1 mile to the intersection with Mineral Road (SH 52), northeast of Boulder in Boulder County, Colorado. A subsurface exploration was conducted to obtain information on soil, bedrock, and groundwater conditions. Soil and bedrock samples were visually classified, and selected samples were tested in the laboratory to evaluate strength, compressibility or swell characteristics, classification, and other pertinent engineering properties. The results of the field and laboratory testing programs were evaluated to develop geotechnical recommendations for the proposed pavement sections, concrete box culverts, and associated retaining walls. The subsurface exploration, traffic loading, and design pavement section calculations for the project corridor are based on current AASHTO, Colorado Department of Transportation (CDOT), and Boulder County procedures.

This report has been prepared to summarize the data obtained and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction of the proposed project are included. Environmental considerations related to the occurrence or potential occurrence of hazardous materials are beyond the scope of this study. Our services were provided in general accordance with our agreement with SEH, Inc., dated March 20, 2015.

## 2.0 PROPOSED CONSTRUCTION

Based on information provided by SEH, we understand that the proposed construction will consist of roadway reconstruction and drainage improvements for 71<sup>st</sup> Street from Lookout Road, north to Mineral Road. The proposed improvements consist of reconstruction of the roadway pavement sections along 71<sup>st</sup> Street, summarized as follows:

Stationing	Southbound Lane	Northbound Lane
1+20 to 28+30	Full Reconstruction	2 inch mill & overlay
28+30 to 48+74	2 inch mill & overlay	2 inch mill & overlay
48+74 to 54+02	Full Reconstruction	Full Reconstruction

Stationing	SB Shoulder	NB Shoulder
1+20 to 25+35	Full Reconstruction	No Reconstruction
25+35 to 28+30	Full Reconstruction	Safety Edge Construction
28+30 to 54+02	Full Reconstruction	Full Reconstruction

The intersection of 71<sup>st</sup> Street and SH 52 will be realigned to an improved location just east of its current location, and the profile of 71<sup>st</sup> Street will be raised slightly between approximately Sta. 50+00 to Sta. 54+02 to meet the current roadway elevation of SH 52. The roadway profile otherwise is not expected to change significantly.

Three new concrete box culverts (CBC) below 71<sup>st</sup> Street are also planned: at Dry Creek, approximately ½ mile south of the intersection of 71<sup>st</sup> Street and Mineral Road (Sta. 32+30); at White Rock and Left Hand ditches, approximately ¼ mile north of the intersection of 71<sup>st</sup> Street, and Lookout Road at approximately Sta. 11+90 and Sta. 13+40, respectively.

The scope of the proposed construction was based on discussions with SEH and the FOR plans. If the scope of the proposed construction changes, we should be notified to re-evaluate the recommendations contained in this report

### 3.0 SITE CONDITIONS AND GEOLOGY

The project corridor is two lane, asphalt paved 71<sup>st</sup> Street from Lookout Road to Mineral Road. The land surface in the area gently slopes to northeast flowing Dry Creek which crosses near the center of the corridor; topographic relief along 71<sup>st</sup> Street is about 70 feet in the area. Landforms are characterized as bench and valley uplands in the Colorado Piedmont. Boulder Reservoir is located about 1 mile west of the area and feeds the intermittent Dry Creek. The Boulder and White Rock and the Boulder and Left Hand Ditches cross the corridor near the southern end. Land use is predominately composed of residential homes south of the ditches, and horse properties to the north. The area has been slightly graded for roadway and residential development.

Published geological mapping assigns natural unconsolidated surficial soils to fine grained eolian sands and silts at the southern end of the corridor, and sands and gravels from the Slocum Alluvium at the northern end. Soils derived from the shale and interbedded sands of the Pierre Shale basement rocks are located in the central part of the corridor, with clayey silts and sands of the Piney Creek Alluvium in the vicinity of Dry Creek. Based on published

geohydraulic maps, shallow groundwater is indicated to be less than 20 feet deep and is interpreted as flowing from west to northeast in unconfined alluvial aquifers.

## 4.0 SUBSURFACE EXPLORATION

The subsurface exploration for this project was conducted on September 15, 2015 and consisted of drilling 10 borings at the approximate locations shown on Figures 1A through 1D, Locations of Exploratory Borings. Seven of the borings were drilled to depths of 5 feet for pavement design purposes, and three borings (Borings B-1, B-2 and B-3) were drilled to approximately 25 feet deep for Concrete Box Culvert foundation information at the stream crossing locations mentioned above. The borings were drilled using a Central Mine Equipment (CME) 55 truck-mounted drill rig equipped with 4-inch-diameter solid-stem augers. A representative of Geocal, Inc. logged the borings.

Soil and bedrock samples were collected generally following the applicable ASTM standard test methods and using a nominal 2-inch ID California spoon sampler (ASTM D3550), or a 1 $\frac{3}{8}$ -inch ID split spoon sampler (ASTM D1586). The penetration resistance values, when properly evaluated, indicate the relative consistency or density of the soils or bedrock hardness. Samples were obtained at approximately 5 foot intervals, and composite bulk samples of auger cuttings were obtained from the upper five feet of the pavement design borings. Upon completion of the drilling, the borings were backfilled with auger cuttings and compacted with the weight of the drill rig. Borings drilled in paved areas were capped with at least 9 inches of asphalt cold patch, or the thickness of the existing pavement, whichever was greater, placed and compacted in approximate 2 inch lifts.

Logs of the subsurface conditions encountered, including depths at which samples were collected, penetration resistance values, and groundwater information are shown on Figure 2 - Fence Diagram of Exploratory Borings, and on the boring logs included in Appendix A - Logs of Exploratory Borings. Samples collected from the borings were transported to our laboratory for review by our project engineer and selected samples were programmed for laboratory testing.

## 5.0 SUBSURFACE CONDITIONS

The following paragraphs provide a generalized description of subsurface conditions encountered at the boring locations. For more detailed information, please refer to Figures 2 and 3. Each boring was drilled in the northbound lane of 71<sup>st</sup> Street due to utility conflicts throughout the corridor of the southbound lane. Each of the pavement sections measured approximately 6 inches in thickness; aggregate base course (ABC) was not encountered:

Below the asphalt, many of the borings encountered artificial fill which extended to depths of approximately 2 feet to 5 feet below existing grade. The artificial fill generally consisted of either sandy clays with varying amounts of sand, or gravely sand with fine to coarse sand and fine to medium gravel. Beneath the artificial fill were natural sandy clays with varying amounts of sand. The clays were generally soft to medium stiff, medium plasticity, and extended to bedrock. Claystone bedrock was encountered in Borings B-1, B-2 and B-3 at depths of 17 feet to 18 feet below grade. The claystone was generally weathered in the upper 5 feet to 6 feet, grading to slightly weathered to hard with depth, and extended to the maximum depth explored of 25 feet. Groundwater was encountered in Borings B-1 and B-3 at depths of approximately 14 feet to 16 feet below grade, respectively. Groundwater levels are expected to fluctuate with varying seasonal and weather conditions. In Boring B-1, the groundwater level corresponded with the water level of Boulder and Left Hand Ditch. In Boring B-3, groundwater levels corresponded with the water level of Dry Creek.

## 6.0 LABORATORY TESTING

Laboratory tests conducted on selected soil samples consisted of swell-compression, gradation, Atterberg limits (liquid and plastic limits), Resistance R-value, water-soluble sulfate, water-soluble chloride content, pH, and laboratory resistivity. Geocal laboratory test results are presented on Figures 4 through 9, and summarized in Table 1. Chemical test results are summarized in Table 2.

**Swell-Compression:** Swell-compression tests (ASTM D4546) were conducted on selected samples to evaluate compressibility or swell characteristics under loading and wetting. The samples were placed in odometer rings between porous discs. An initial load of 500 pounds per square foot (psf) or 1,000 psf was applied to the samples and the samples were allowed to stabilize. After stabilization, the samples were submerged and the percent

volume change measured. The sample was incrementally loaded and the volume change monitored until deformation practically ceased under each load.

The swell-compression test result shown on Figures 4 and 5 indicate nil swell potential under moderate surcharge loading and wetting for the clay samples tested, and nil swell potential and low compressibility under increased loading for the bedrock sample tested. The results also indicate moderate compressibility for the soil and bedrock sample under increased loading.

**Gradation and Atterberg Limits:** Soil samples were classified in accordance with the American Association of State Highway and Transportation Officials (AASHTO) classification system. The classification systems are based on the Liquid Limit (ASTM D423), Plastic Limit (ASTM D424) and grain size distribution (ASTM D422). These parameters provide qualitative information on the suitability of the soils for use in civil engineering projects. Gradation and Atterberg limits test results are shown on Figures 6 through 8.

The combined gradation and Atterberg limits test results indicate that the majority of the soils tested classified as sandy lean clays to clayey sands, with a few samples classifying as lean clay with sand and sand with clay and gravel. The AASHTO soil classifications were generally A-6 (sandy lean clay) to A-7-6 (clayey sand), with group indices ranging from 4 to 21; some samples classified as A-2-4 or A-2-6 with a group index of 0.

**Resistance R-Value:** The R-value is a measurement of the soil's ability to transfer traffic loading laterally, and is useful in evaluating the pavement support characteristics of subgrade soils. Test results are shown on Figure 9 for the bulk sample taken from the upper 5 feet of Boring P-2. The results indicate an R-value of 7, or poor pavement support characteristics for the sample tested.

**Water-Soluble Sulfates:** The water-soluble sulfate test is a measurement of the potential degree of sulfate attack on concrete exposed to the onsite soils and bedrock. Sulfate solutions react with tri-calcium aluminate hydrate, which is a normal constituent of Portland cement concrete, forming calcium sulfo-aluminate hydrate with an accompanying substantial volume expansion which causes cracking. Sulfate expansion problems will typically exist when the soils have concentrations in excess of 0.10%.

The concentration of water-soluble sulfates measured on the samples tested ranged from "not detected" to 0.50%. The higher concentrations indicate a Class 2 "Severity of Sulfate Exposure" in accordance with Table 601-2 of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction (2011 Edition). For design, Class 2 requirements, as defined in Section 601.04 Sulfate Resistance should be used

for concrete exposed to the soils encountered along the corridor. Water soluble sulfate test results are summarized in Table 2.

**Buried Metal Corrosion:** Laboratory resistivity, chloride, and pH tests were conducted on selected samples, and the results are summarized in Table 2. These test results may be used to help evaluate the corrosion potential to buried metal; however, a corrosion specialist should be consulted to interpret the results. In general, resistivity values varied from 730 ohm-cm to 1,120 ohm-cm, measured chloride contents varied from 0.0540% to 0.1028%, and the pH values varied from 7.4 to 7.6.

## 7.0 FOUNDATION RECOMMENDATIONS

Based on the subsurface conditions encountered, a new concrete box culvert (CBC) should be feasible for the Boulder and Left Hand Ditch crossing and the Dry Creek crossing. The CBC at Boulder and White Rock Ditch may be extended to accommodate the proposed sidewalk. According to preliminary plans provided by SEH, the base of the proposed CBC at Left Hand Ditch will be at an approximate elevation of 5152 feet, and the base of the proposed Dry Creek CBC will be at an approximate elevation of 5110 feet. We have assumed that each CBC will be supported by a simple mat type foundation (i.e. bottom of the box), and associated retaining walls will be supported by conventional spread footings. Recommendations for these foundations are provided below.

### 7.1 CONCRETE BOX CULVERTS

At the time of our subsurface exploration, groundwater was encountered at a depth of approximately 14 feet below existing grades in Boring B-1, and a depth of approximately 16 feet in Boring B-3, drilled in the area of the proposed CBCs. At the anticipated depth of the bottom of the CBCs at Left Hand and White Rock Ditches, the natural soils encountered consisted of moist, soft to medium stiff, sandy lean clay. Some subexcavation of the foundation soils will likely be necessary to provide support for the box and to provide a working platform. We understand that the CBCs at the Boulder and White Rock Ditch will likely be extended instead of reconstructed, however, the same foundation recommendations for the extension apply at this location.

At the anticipated depth of the bottom of the CBC at Dry Creek, the natural soils encountered consisted of moist, soft, sandy lean clay. The natural clay soils encountered in the area of the proposed CBC at Dry Creek are



not adequate to provide direct support for a stiffened concrete mat foundation for the box. Additional soil foundation reinforcement will be necessary in order to support the proposed culvert and recommendations are provided below.

The following geotechnical recommendations are provided for design and construction of mat foundations used to support the box culverts:

Concrete Box Culvert Location	CBC Bottom Elevation (feet)	Bearing Material	Nominal Soil Bearing Pressure (psf)	Resistance Factor	Load Factor	Maximum Allowable Soil Bearing Pressure (psf)	Vertical Modulus of Subgrade Reaction For Mat Foundations (pci)
Boulder and White Rock Ditch	5156	2 ft. of engineered fill	8550	0.45	1.35	2850	36
Boulder and Left Hand Ditch	5152	2 ft. of engineered fill	8550	0.45	1.35	2850	36
Dry Creek	5110	Claystone bedrock	11400	0.45	1.35	3800	300

- 1) The CBCs at Boulder and White Rock Ditch and Boulder and Left Hand Ditch should be placed on a minimum of 2 feet of engineered fill. Areas of loose or soft materials encountered within the foundation excavation should be removed and replaced with granular material meeting the requirements of a CDOT Class 1 material. New engineered fill should be placed in lifts not to exceed 8 inches, moisture conditioned to within 2% of optimum moisture content and compacted to at least 95% of the maximum standard Proctor density.
- 2) The lateral resistance of mat foundations placed on onsite sandy lean clay soils will be a combination of the sliding resistance of the mat on the foundation materials and passive earth pressure against the sides of the mat. Sliding friction at the bottom of the mat may be calculated assuming an internal friction angle of 17 degrees for the onsite clayey soils. A resistance factor of 0.8 should be applied.
- 3) Material meeting the requirements of CDOT Class 1 fill should be used as backfill for box culverts. Passive pressure against the sides of the mat may be calculated using the values given for earth pressures in Section 8.0 of this report.
- 4) Based on our experience, post-construction settlement of a mat foundation designed as recommended is expected to be less than 1 inch, assuming uniform loading. Differential movement across the structure is expected to be less than  $\frac{3}{4}$  inch.
- 5) Groundwater was encountered at approximately 16 feet below roadway grade in Boring B-3 at the time of our subsurface exploration. Depending on the construction season, groundwater is anticipated to be encountered during construction, flow rates into the excavation are expected to be moderate, and dewatering through the use of external well points may be needed. Groundwater levels can be expected to change based on climatic conditions and area drainage characteristics. The contractor should be qualified and experienced in working with shallow groundwater conditions. Hydrostatic uplift can be resisted by the dead weight of the structure. If additional uplift resistance is necessary, extending the foundation slab beyond the edge of the walls may be considered. Uplift resistance can be calculated considering the weight of the soil within a prism defined by a plane extending upward and away from the edge of the foundation slab at an angle of 30 degrees from the vertical. The unit weight of soil may be assumed as 48 pounds per cubic foot (pcf) below the water table and 110 pcf above the water table.
- 6) A representative of Geocal should observe the mat foundation excavations prior to concrete placement.

## 7.2 RETAINING WALL SPREAD FOOTINGS

The following recommendations are provided for design and construction of spread footing foundations for support of cast-in-place cantilever (CIP) retaining walls, used as wing walls.

- 1) Refer to the Table in Section 7.1 of this report for recommended bearing capacity values for design of retaining wall spread footings.
- 2) New engineered fill should consist of non-expansive soils placed in uniform lifts not exceeding 8 inches and compacted to at least 95% of the maximum standard Proctor dry density at moisture contents within 2% of optimum.
- 3) Footings should be provided with at least 3 feet of soil cover above their bearing elevation for frost protection. Footings should be protected against scour or buried below scour depth.
- 4) The lateral resistance of spread footing foundations placed on fine grained soils will be a combination of the sliding resistance of the footing on the foundation materials and passive earth pressure against the side of the footing. Sliding friction at the bottom of the footings may be calculated assuming an internal friction angle of 17 degrees for onsite clay soils. A resistance factor of 0.8 should be applied.
- 5) Passive pressure against the sides of the footings may be calculated using the values given for earth pressures in Section 8.0 Earth Pressures, of this report. Compacted fill placed against the sides of the footings to resist lateral loads should be granular soils, placed and compacted to at least 95% of the maximum standard Proctor dry density at moisture contents near optimum.
- 6) A representative of Geocal should observe excavations for spread footing foundations prior to concrete placement.

## 8.0 EARTH PRESSURES

### 8.1 PERMANENT RETAINING WALLS

We understand that cast-in-place cantilever (CIP) wing walls are anticipated at each end of the concrete box culverts. The following recommendations should be observed for permanent retaining walls. Wingwalls and any adjacent retaining structures should be supported by the same foundation type as the CBC. Walls and retaining structures which are laterally supported and can be expected to undergo only a slight amount of deflection should be designed for lateral earth pressures based on the "at-rest" earth pressure condition. Walls which rotate and/or deflect sufficiently to mobilize the internal soil strength of the wall backfill may be designed for the "active" earth pressure condition.

The natural clay soils encountered onsite are not suitable for use as wall backfill. Imported structure backfill material should meet CDOT standard specifications for Class 1 material. The following earth pressure coefficients are recommended for imported CDOT Class 1 structure backfill material.

<u>Material</u>	<u>Active (<math>K_a</math>)</u>	<u>At-Rest (<math>K_o</math>)</u>	<u>Passive (<math>K_p</math>)</u>	<u><math>\gamma_T</math> – Unit Weight (pcf)</u>	<u><math>\phi</math> – Friction Angle (deg)</u>
Imported Class 1	0.28	0.44	3.53	135	34

The above values are for backfill placed and compacted in accordance with the CDOT standard specifications. Lateral wall movements or rotation equal to 0.5% of the wall height are typically required to develop the active case for granular backfill, whereas lateral movement equal to at least 1% of the wall height is required to establish full passive resistance. Suitable factors of safety should be applied to the above ultimate values to limit strain needed to reach ultimate strength, particularly in the case of passive resistance.

Equivalent fluid unit weights may be assumed as follows:

Above groundwater:	$\gamma_{eq}$	=	$\gamma_T \times K_{a,o,p}$
Below groundwater:	$\gamma_{eq}$	=	$(\gamma_T - 62.4) \times K_{a,o,p}$
where	$\gamma_T$	=	soil total unit weight
	$K_{a,o,p}$	=	appropriate earth pressure coefficient

The above parameters are for a horizontal backfill and no surcharge loading. Retaining structures should be designed for appropriate surcharge pressures such as from traffic, snow storage, etc. The buildup of water behind a wall will also increase the lateral pressures. A drainage system should be included in the wall design to prevent hydrostatic pressure buildup, unless the wall is designed to accommodate the additional pressure.

Placement and compaction of backfill should be in accordance with the CDOT standard specifications. Care should be taken not to over compact the backfill or use large equipment, which may cause excessive lateral loading against the walls.

Settlement of wall backfill is estimated at approximately 1 inch and should occur during construction, assuming CDOT Class 1 Structure Backfill material is used and provided the base of the backfill and embankment area is prepared in accordance with Section 9.0 Site Grading and Excavations.

## 8.2 TEMPORARY RETAINING WALLS

We understand that temporary shoring retaining walls may be used during construction to retain soils up to 9 feet above the excavated depth at CBC locations. The shoring will not have any tieback systems due to right-of-way constraints behind the walls. The soils are expected to be retained using temporary sheeting or soldier pile and lagging methods. The following earth pressure coefficients are recommended for onsite clays retained and which may assist in resisting wall loads.

<u>Material</u>	<u>Active</u> <u>(<math>K_a</math>)</u>	<u>Passive</u> <u>(<math>K_p</math>)</u>	<u><math>\gamma_T</math> – Unit Weight</u> <u>(pcf)</u>	<u><math>\phi'</math> – Friction Angle</u> <u>(deg)</u>	<u>Cohesion</u> <u>(pcf)</u>
Onsite Sandy Clays	0.55	1.82	120	17	500

Shoring, sheeting, and bracing systems should be designed by a professional engineer registered in the State of Colorado. The contractor should submit to the Engineer for approval all design calculations including assumptions, reference material, and design cross sections, and should assume responsibility for safe working conditions.

## 9.0 SITE GRADING AND EXCAVATIONS

Excavation of the onsite materials should be possible with conventional heavy duty equipment. The re-use of onsite materials will be a function of where the material is taken from and the intended use. Existing vegetation, debris, and any other deleterious materials should be stripped and removed from all proposed pavement, walkway, and fill areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. Fill should be placed and compacted in accordance with the CDOT standard specifications. Flatwork areas should be stripped of existing vegetation and topsoil, uniformly scarified to a depth of 8 inches, moisture conditioned and compacted in accordance with the CDOT standard specifications. Prepared subgrade areas should be proof rolled per the CDOT standard specifications prior to paving. Areas that deform, rut, or pump excessively should be excavated and replaced with properly placed and compacted non-expansive granular material. Material meeting CDOT Class 1 grading requirements are not expected to be encountered on this site and will need to be imported. No formal slope stability analyses were performed to evaluate slopes on this project, and slopes flatter than OSHA regulations may be needed where seepage is encountered.

The ground surface underlying proposed fills should be carefully prepared by removing all organic matter and oversized material (greater than 6 inches maximum dimension), scarifying to a depth of 8 inches and re-compacting in accordance with the CDOT standard specifications. The exposed surface should be proof-rolled in accordance with Section 203.09 of the CDOT standard specifications prior to placement of any new fill. Settlement of properly compacted embankments construction of properly compacted material similar to that encountered onsite should be on the order of 1% to 2% of the embankment height.

**Excavations:** The excavations for this project at all three culvert locations are anticipated to be primarily in soft to medium stiff natural clay soils, especially in the area of Dry Creek. Excavations within these materials should be possible with conventional excavation equipment; however, excavations below groundwater level will likely require a shoring system to provide safe working conditions as these materials are generally not stable at slopes steeper than approximately 3H:1V, particularly if a surcharge (e.g. traffic) is present above the excavation.

If sloped excavations are used, stockpiled material should be placed no closer than two times the the depth of the excavation. Sloped excavations should conform to applicable OSHA regulations and the contractor should assume responsibility for excavations that are safe for workers. Excavations are anticipated to be in Type C soils, per the OSHA soil classification system.

Excavations should be cut to a stable slope or be temporarily braced, depending upon the excavation depths and the subsurface conditions encountered. Temporary construction slopes should be designed in compliance with the most recent governing regulations. Stockpiles should be placed well away from the edge of the excavation and their heights should be controlled so they do not surcharge the sides of the excavation. Proper surface drainage should be provided around permanent cuts to direct the surface runoff away from the cut face. Construction slopes should be closely observed for signs of mass movement: tension cracks near the crest, bulging at the toe, etc. If potential stability problems are observed, we should be contacted for further evaluations.

Sheet piles could be considered for excavation support during construction and could serve as a permanent retention system. Shoring, sheeting, and bracing systems should be designed by a professional engineer registered in the State of Colorado.

**Dewatering:** During our field exploration, groundwater was encountered in Borings B-1 and B-3 at an elevation approximately equal to the water level in Dry Creek, adjacent to Boring B-3 (i.e. at a depth of approximately 16 feet below existing grade). Groundwater flow rates into the excavation for the Dry Creek CBC could be

significant, and dewatering will likely be needed during construction. For excavation base and slope stability, the groundwater level should be lower than the maximum subexcavation depth needed to establish suitable bearing conditions. This requirement should be evaluated by the excavation contractor. Lowering of the groundwater level may be required to maintain stability of the excavation base and side slopes. The contractor should be experienced with the types of surface and subsurface conditions that exist at this site and be responsible for design of an acceptable temporary or permanent bracing system. Groundwater levels can be expected to fluctuate seasonally.

## 10.0 UNDERDRAIN SYSTEM

Due to the relatively shallow groundwater level compared to bottom of proposed culvert elevations encountered at this site, the proposed structures and retaining walls should be provided with an underdrain system which will help reduce the buildup of hydrostatic pressures. The underdrain system should consist of a perforated PVC pipe surrounded by free draining granular material placed at the bottom of the wall backfill and sloped at a minimum 2% grade to suitable gravity outlets. Free draining granular material used in the drain system should conform to Class B filter material as specified in the CDOT standard specifications. Animal guards should be considered for use at the pipe outlets.

## 11.0 PAVEMENT DESIGN RECOMMENDATIONS

A pavement section is a layered system designed to distribute concentrated traffic loads to the subgrade without overstressing the subgrade soils. Performance of the pavement structure is a function of a number of factors including, but not limited to, the physical properties of the subgrade soils, drainage, and traffic loading. Pavement sections presented in this report are based on the Boulder County and Colorado Department of Transportation (CDOT) pavement thickness design procedures.

Hot Mix Asphalt Pavement (HMAP) pavement thickness sections were calculated using the Boulder County Design Criteria, and the WinPAS 12 computer modeling, based on the AASHTO 1993 Pavement Design methodology. Software printouts are included in Appendix B.

**Design Traffic Loading:** The 18-kip Equivalent Single Axle Load (ESAL) is the equivalent 18,000 pound single axle loading for different vehicle types, and the design period ESALs is the total equivalent loading applied to the pavement for the design period. The flexible pavement thickness calculation is based on a 20 year design life.

The design ESAL calculations were based on the 2014 ADT of 4,200 vehicles per day and was obtained from the Boulder County website. Based on the 2014 ADT values obtained from the County website and the expected increase in traffic on the corridor due to roadway improvements, a CDOT 20 year growth factor of 3.5% was assumed for the project corridor.

The following CDOT vehicle equivalency factors and traffic distribution were used for ESAL calculations:

<u>Vehicle Type</u>	<u>CDOT Flexible Pavement Vehicle Equivalency Factor</u>	<u>% of Traffic</u>
Passenger Vehicle	0.003	91.0
Single Unit Truck	0.249	4.5
Combination Unit Truck	1.087	4.5

A design lane factor of 60% was applied to project corridor, which assumes 1 travel lane in each direction. Based on these values, a design ESAL<sub>20</sub> value of 1,167,919 was calculated and was used for flexible pavement thickness calculations.

**Subgrade Soil Strength:** The majority of the pavement subgrade soils encountered had AASHTO Classifications of A-6 to A-7-6 with Group Indices ranging from 4 to 21. Laboratory test results indicate R-value of 7 for the sandy lean clay sample tested, and is believed to be a representation of the soils in pavement subgrade areas.

The following design parameters were used for the pavement design:

**General**

Initial Serviceability	4.5
Terminal Serviceability	2.54
Reliability Level	85%
Overall Standard Deviation	0.44

Soils

R-Value	7
Resilient Modulus	3,230 psi

Asphalt

Structural Coefficient, HMAP	0.44
Structural Coefficient, Class 6 Aggregate Base Course (ABC)	0.12
Drainage Coefficient	1.0

**Pavement Thickness Recommendations:** The pavement sections presented in this section were calculated using AASHTO and Boulder County procedures and the WinPAS 12 computer modeling software. The recommended new full depth pavement sections are summarized in the following table. Pavement design software printouts are included in Appendix A.

<u>Location</u>	<u>Pavement Type</u>	<u>Pavement Thickness (in)</u>	<u>Aggregate Base Course (ABC) Thickness (in)</u>
71 <sup>st</sup> Street	HMAP on ABC (R-value = 7)	8¼	6

**Hot Mix Asphalt Pavement (HMAP):** HMAP materials should consist of a bituminous plant mix composed of a mixture of aggregate and bituminous material that meets the requirements of a job-mix formula established by a qualified engineer. The following grading and binder types are recommended for this project:

71<sup>st</sup> Street

Top Lift:	Grading S (100) PG 58-22
Lower Lifts:	Grading S (100) PG 58-22

**Aggregate Base Course (ABC):** Material should meet specifications in accordance with the CDOT standard specifications and have a minimum R-value of 78. The material should be compacted to at least 95% of the maximum density as determined by AASHTO T-180.

**Subgrade Preparation:** Due to the roadway and intersection realignment at SH52, new pavement will be placed in addition to the profile of 71<sup>st</sup> Street being raised to meet existing grades. In the area of new roadway realignment, the existing ground surface should be uniformly scarified to at least 8 inches and compacted to at least 95% of the maximum standard Proctor dry density at moisture contents within 2% of optimum.

New engineered fill should be considered for support of new pavements. Engineered fill placed to support new pavements should be moisture conditioned to within -1% to +3% of optimum moisture content and compacted to at least 95% of the maximum standard Proctor dry density (AASHTO T99). Debris and any otherwise unsuitable



materials should be removed and wasted. New fill needed for support of pavements should be non-expansive, granular, and have a minimum R-value of 7.

**Proof-Roll:** Prior to paving, the subgrade should be proof-rolled in accordance with Section 203.09 of the CDOT standard specifications. Areas of the subgrade that rut or deflect excessively under the wheel loads should be stabilized. Proof-rolled areas should be paved within 48 hours unless affected by precipitation, construction traffic, or otherwise disturbed. The contractor should anticipate subgrade conditions that vary from optimum moisture, and the addition of water or drying of the subgrade soils to achieve proper moisture conditions will be needed. Areas that are noticeably dry should be moisture conditioned and compacted. Some of the onsite clay soils may be difficult to stabilize when wet of optimum. The use of lime, fly ash, cement, or geogrids may be considered to stabilize yielding subgrades. Coarse granular imported soils may need to be used with a geogrid.

**Drainage, Frost Potential, and Utilities:** The collection and diversion of surface drainage away from paved areas is extremely important for the satisfactory performance of the pavement. The design of surface drainage should be carefully considered to remove all water from the roadway paved areas. Groundwater was encountered at a minimum depth of about 14 feet during drilling. The groundwater is at a depth at which a separate pavement subsurface drain should not be needed. The predominant soil types are sandy lean clay and lean clay with sand that are moderately susceptible to frost heave. However, frost heave potential may be reduced with proper surface drainage and construction control. Major utilities, such as gas, water, and sewer should be placed prior to paving. Trench backfill should be properly placed and compacted to reduce differential settlement and subsequent distress to the pavement structure.

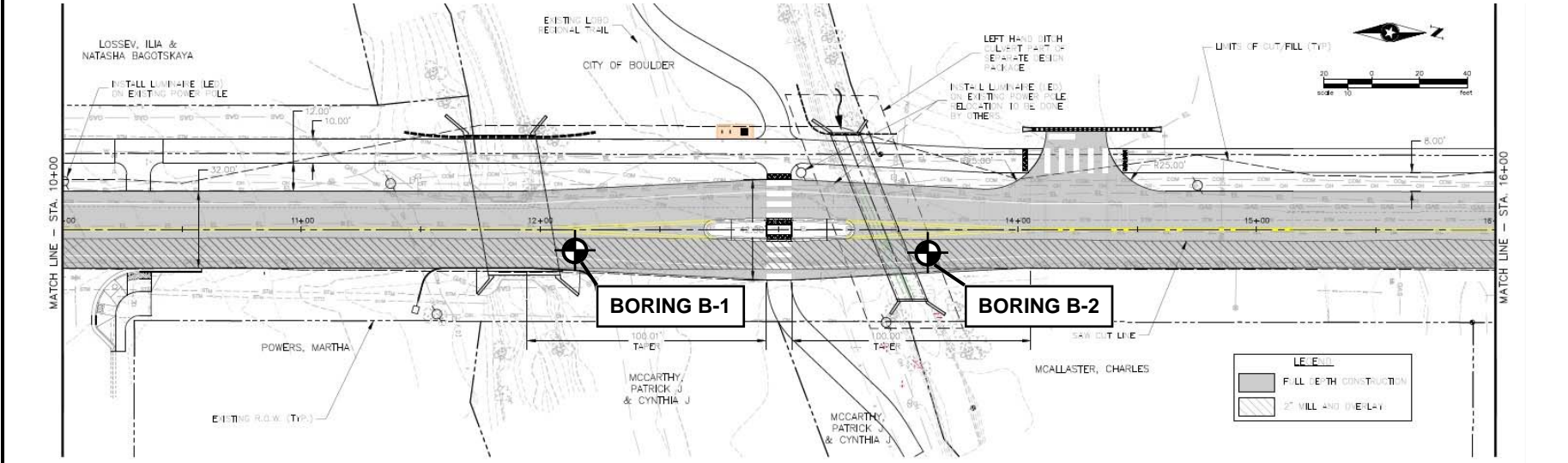
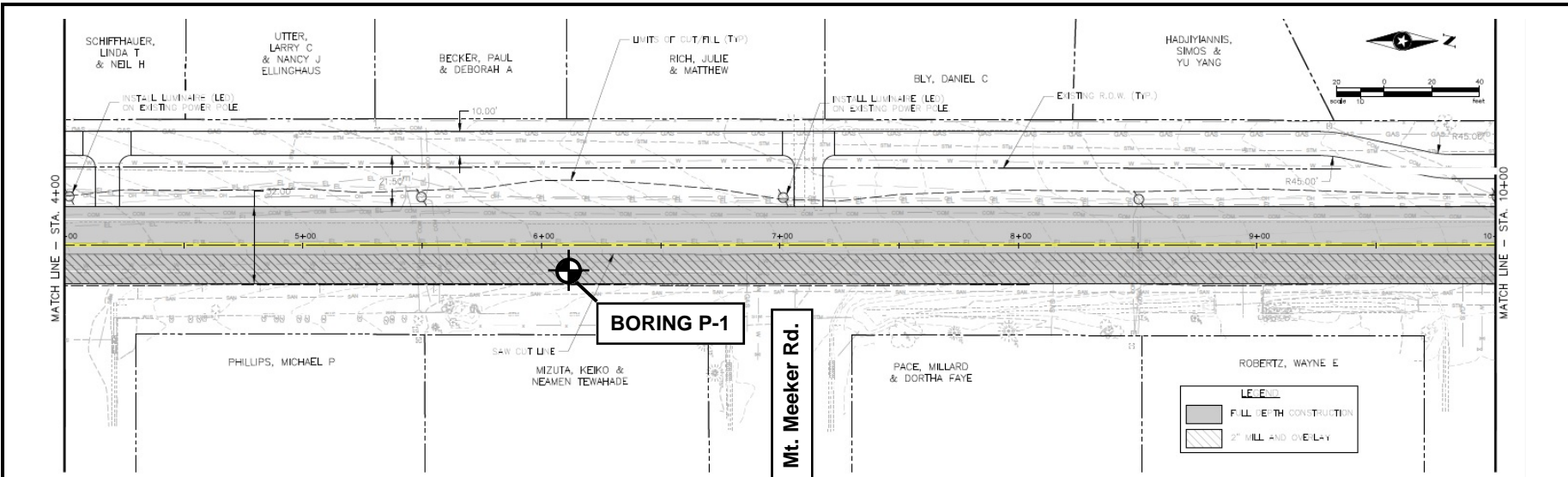
**Maintenance:** Periodic maintenance of paved areas will extend pavement life. Crack sealing should be performed on a frequent basis as new cracks appear. Chip seals, fog seals, or slurry seals applied at approximate 3 year to 5 year intervals will help reduce oxidative embrittlement problems associated with asphalt pavements. As conditions warrant, it may be necessary to perform full depth patching, milling, and overlays at approximate 10 year intervals or more frequently.

## 12.0 LIMITATIONS

This report has been prepared in accordance with generally accepted geotechnical engineering practices used in this area, and has been prepared for design purposes. The conclusions and recommendations submitted in this report are based upon the data obtained from the borings drilled at the approximate locations shown on Figures 1-A through 1-D. The nature and extent of variations between the exploratory borings may not become evident until excavation is performed. If during construction, subsurface conditions appear to be different from those described herein, this office should be advised at once so re-evaluation of the recommendations may be made.

Geocal's professional services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities at the time this report was prepared in this area. No warranty expressed or implied is made. This report is not a bidding document. Any contractor reviewing this report must draw his or her own conclusions regarding site conditions and specific construction techniques to be used on this project. Geocal is not responsible for the interpretation of the site surface and subsurface conditions by others that are not consistent with the contents of this report.

Explorations into the occurrence or potential occurrence of hazardous materials, or other environmental assessments that may be applicable to the site are beyond the scope of services represented by this report. On-site observation of excavations and foundation bearing strata and testing of geotechnical materials by a representative of this office is recommended.

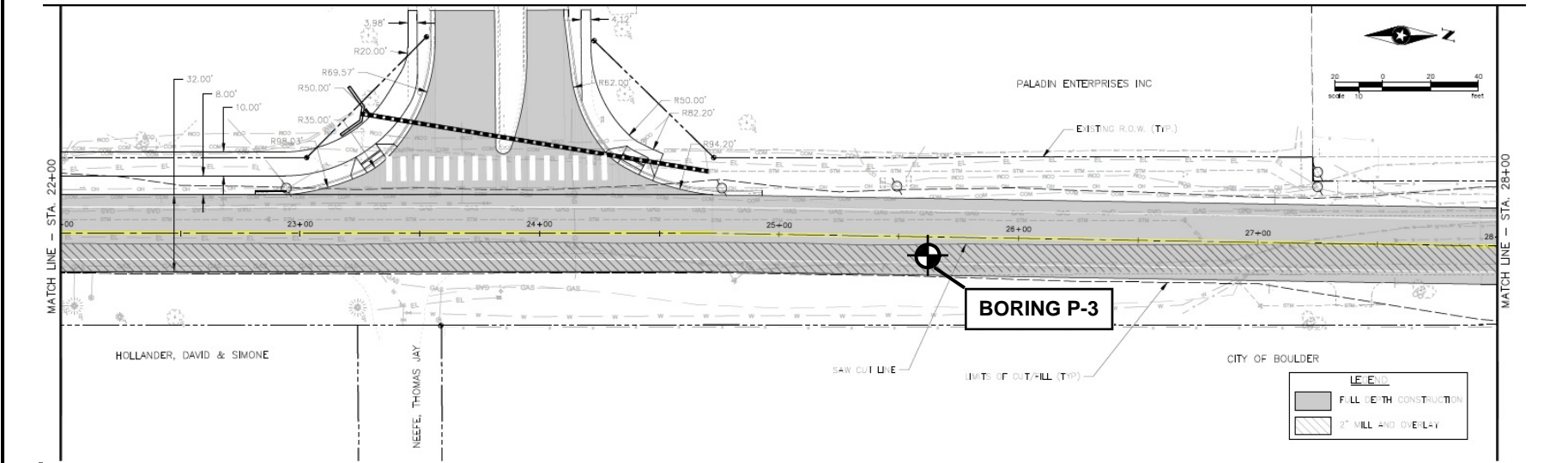
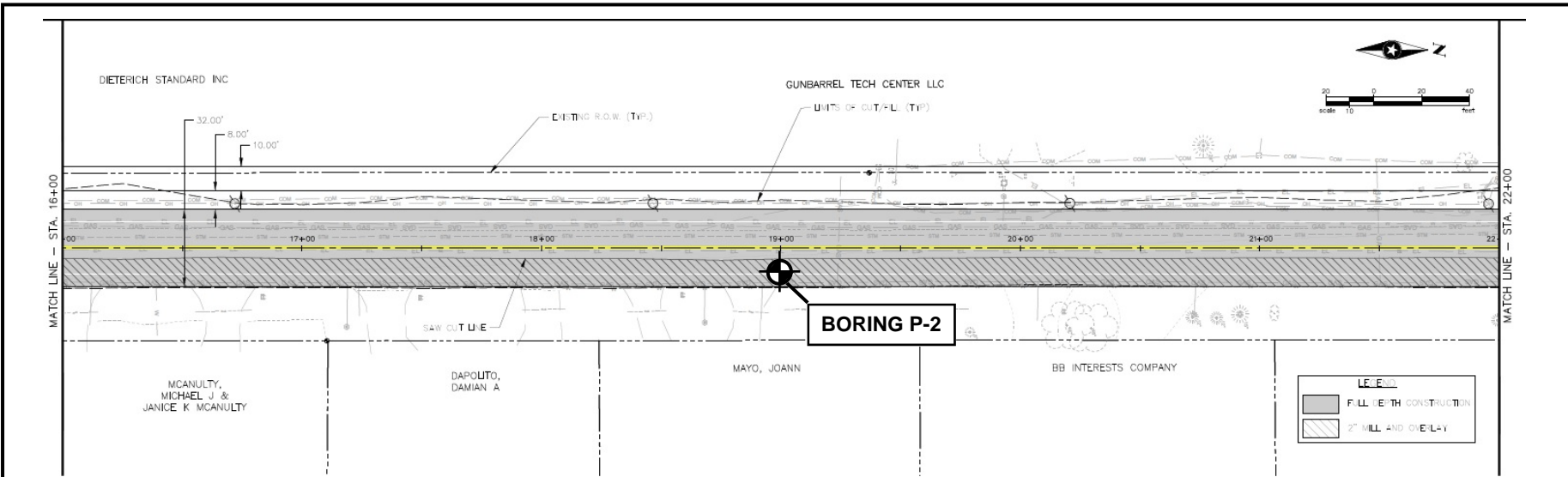


NOTE: NOT TO SCALE.

GEOCAL, INC.  
G15.1616.000

71st STREET, LOOKOUT ROAD TO MINERAL ROAD  
LOCATIONS OF EXPLORATORY BORINGS

FIGURE 1A

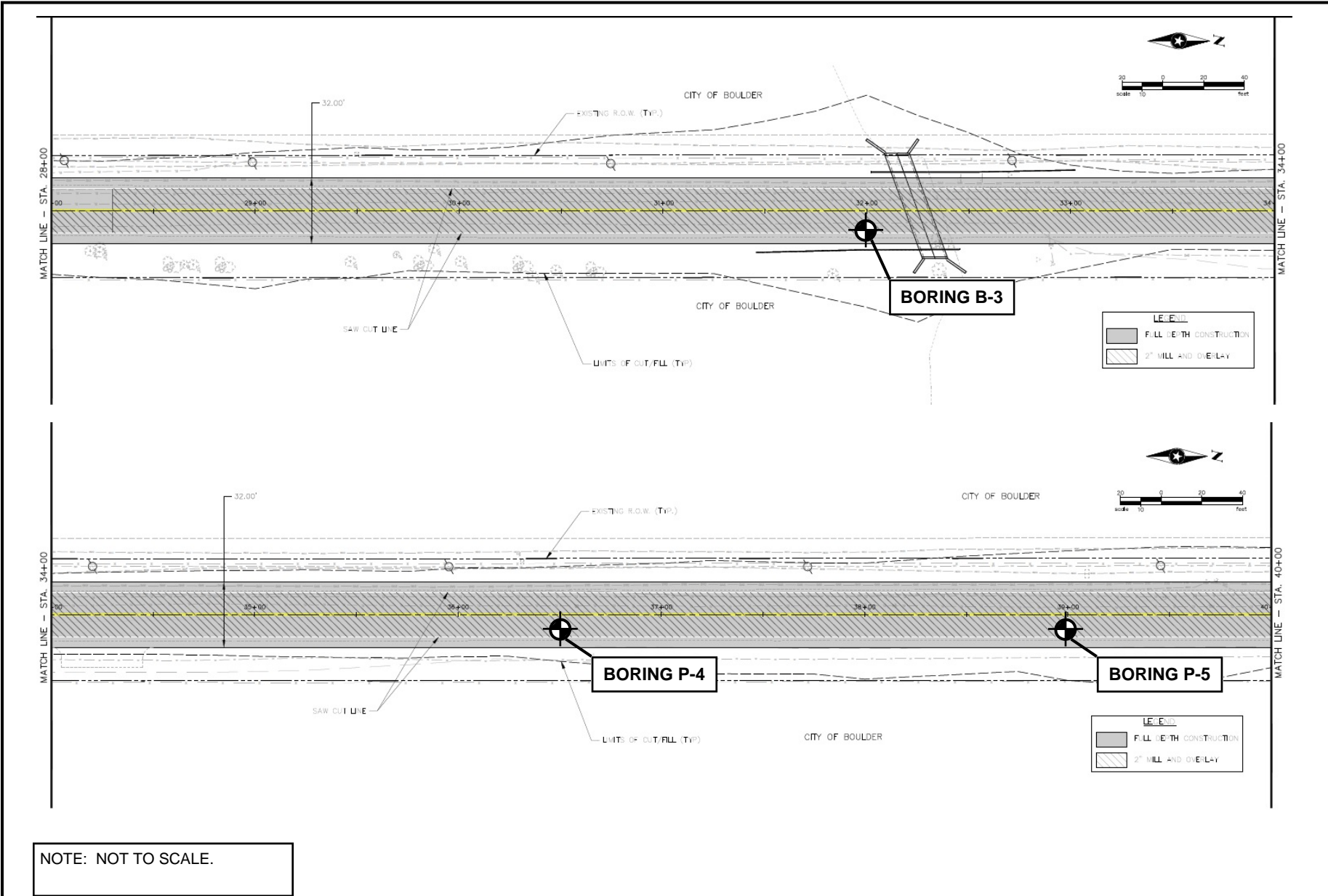


NOTE: NOT TO SCALE

GEOCAL, INC.  
G15.1616.000

71st STREET, LOOKOUT ROAD TO MINERAL ROAD  
LOCATIONS OF EXPLORATORY BORINGS

FIGURE 1B

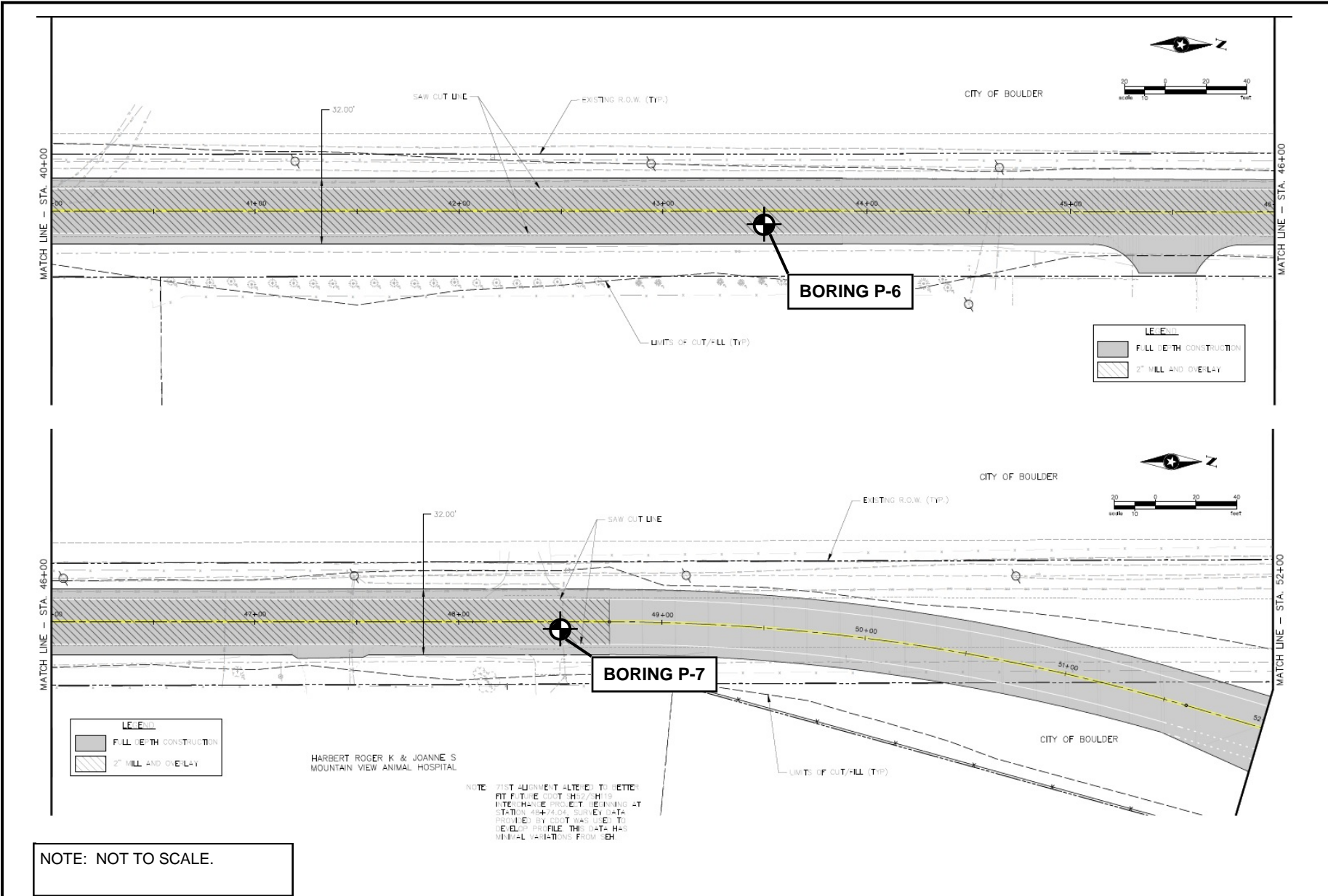


GEOCAL, INC.  
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71st STREET, LOOKOUT ROAD TO MINERAL ROAD  
LOCATIONS OF EXPLORATORY BORINGS

FIGURE 1C





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71st STREET, LOOKOUT ROAD TO MINERAL ROAD  
LOCATIONS OF EXPLORATORY BORINGS

FIGURE 1D

STRATIGRAPHY & GW - A SIZE - GINT STD US LAB.GDT - 10/29/15 10:01 - W:\ENGINEERING\CLIENTS\SEH INC\2015 PROJECTS\71ST STREET, LOOKOUT RD TO MINERAL RD, BOULDER COUNTY\71

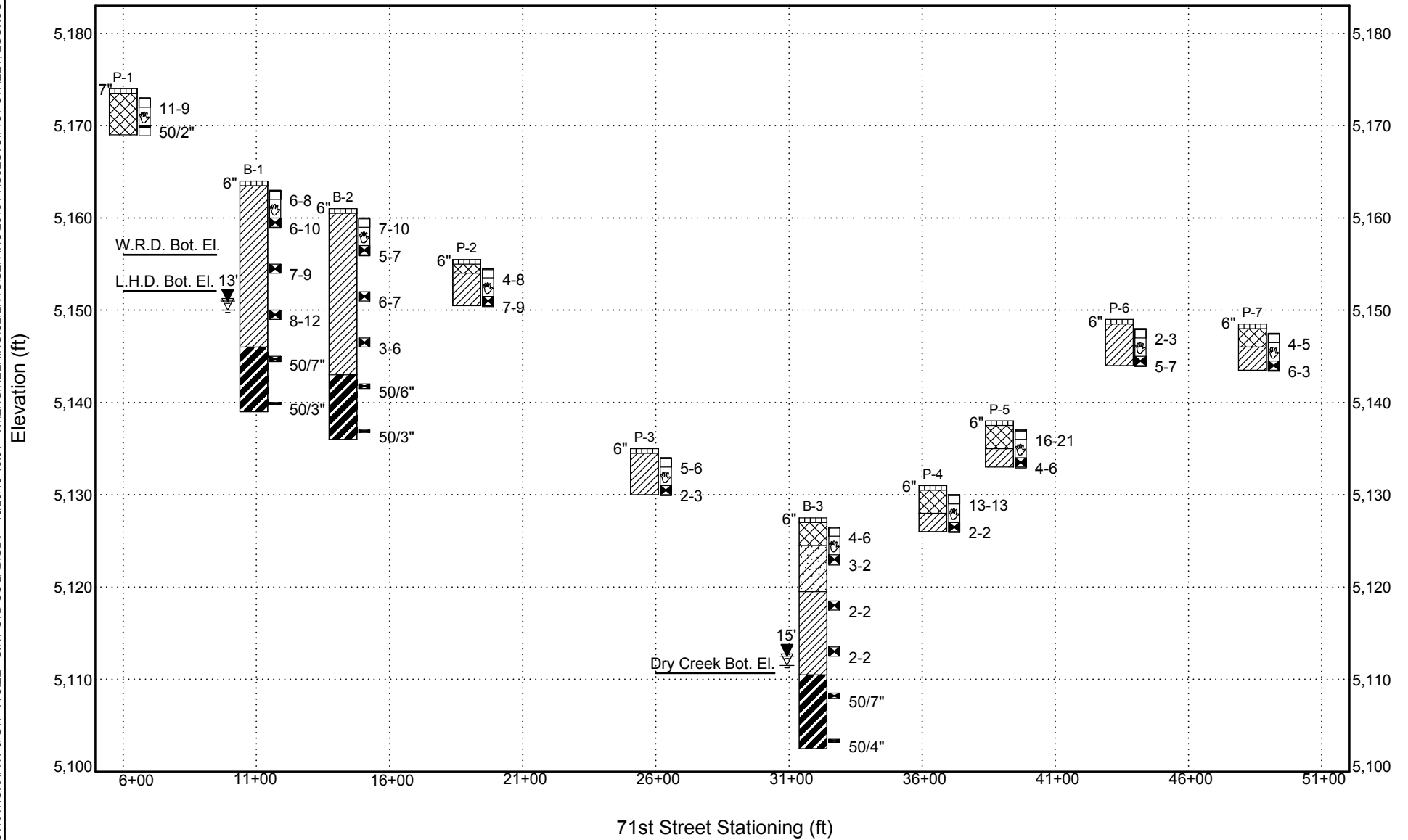


7290 South Fraser Street  
Centennial, CO 80112  
Telephone: (303)-337-0338  
Fax: (303)-337-0247

### FIGURE 2: FENCE DIAGRAM OF EXPLORATORY BORINGS

CLIENT SEH  
PROJECT NUMBER G15.1616.000

PROJECT NAME 71st Street, Boulder County  
PROJECT LOCATION 71st Street, Between Lookout Rd. and SH52



## LEGEND



ASPHALT PAVEMENT, thickness in inches shown to the left of the log.



FILL, Gravelly SAND, loose to dense, non-plastic, moist, fine to coarse sand, fine to medium gravel.



Sandy CLAY-Clayey SAND, medium to very dense, low to medium plasticity, moist, brown to dark brown, fine to coarse sand.



Sandy CLAY, soft to very stiff, medium plasticity, moist to wet, medium to dark brown, fine sand, trace medium to coarse sand.



SANDSTONE-CLAYSTONE BEDROCK, hard, moist, tan to medium brown with slight gray mottling.

9/12

Drive sample blow count, indicates that 9 blows from a 140 pound hammer falling 30 Inches were required to drive the California or SPT sampler 12 inches.



Indicates drive sample, 2 inch I.D. California liner samples.

0



Indicates depth to ground water at the end of drilling.

Bot. El.

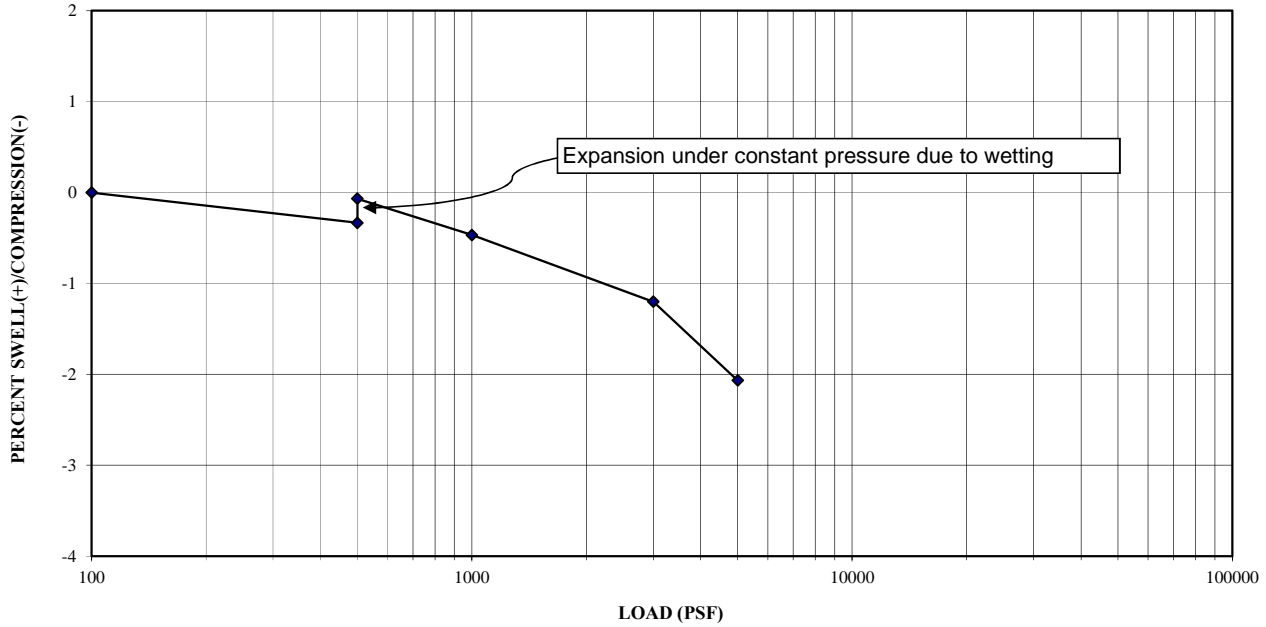
Indicates proposed bottom culvert elevations.

## NOTES

1. Borings were drilled on September 15, 2015 with a CME 45 drill rig equipped with 4 inch diameter solid-stem
2. Locations of borings shown on Figure 1 are approximate.
3. The lines between strata represent approximate boundaries between material types. Transitions between materials may actually be gradual.
4. Boring logs are drawn to elevations obtained from plan and profile sheets provided by SEH.
5. Water level readings shown on the logs were made at the time of drilling and under conditions indicated. Fluctuations in the water level may occur with time.

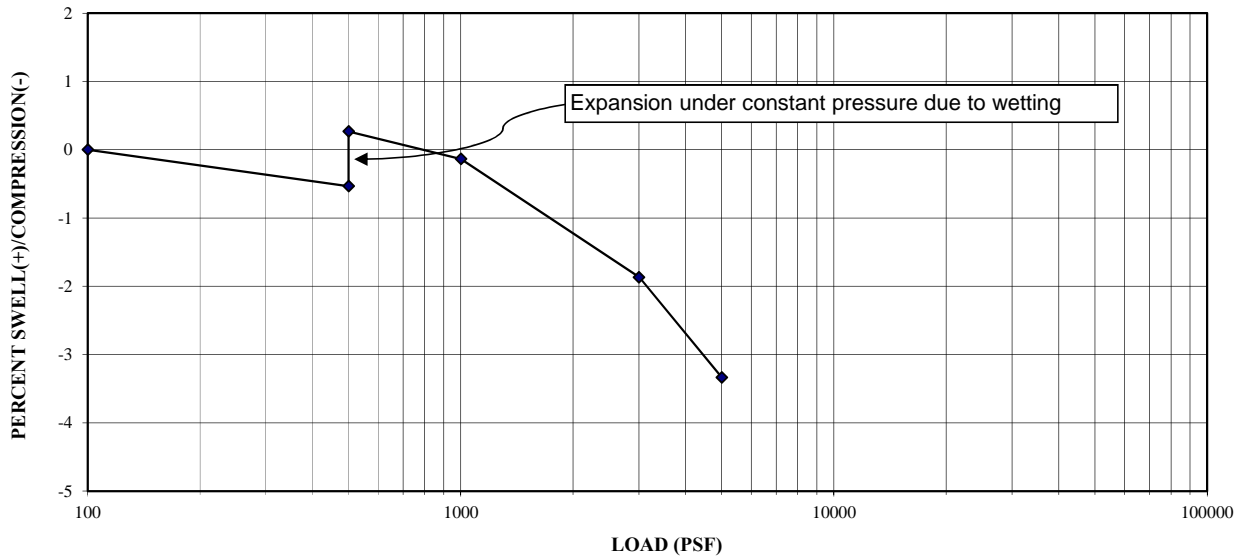


**SWELL-COMPRESSION TEST**



<b>Sample Location</b>	Boring B-1
<b>Sample Depth</b>	14 feet
<b>Sample Description</b>	Lean clay with sand
<b>USCS Classification</b>	CL
<b>AASHTO Classification</b>	A-4(4)

<b>Dry Density</b>	117 pcf
<b>Moisture Content</b>	13.1 %
<b>Volume Change</b>	0.3 %
<b>Swell Pressure</b>	0 psf



<b>Sample Location</b>	Boring B-2
<b>Sample Depth</b>	9 feet
<b>Sample Description</b>	Sandy lean clay
<b>USCS Classification</b>	CL
<b>AASHTO Classification</b>	A-6(14)

<b>Dry Density</b>	109 pcf
<b>Moisture Content</b>	19.0 %
<b>Volume Change</b>	0.8 %
<b>Swell Pressure</b>	800 psf

**GEOCAL, INC.**

71st Street, Boulder County

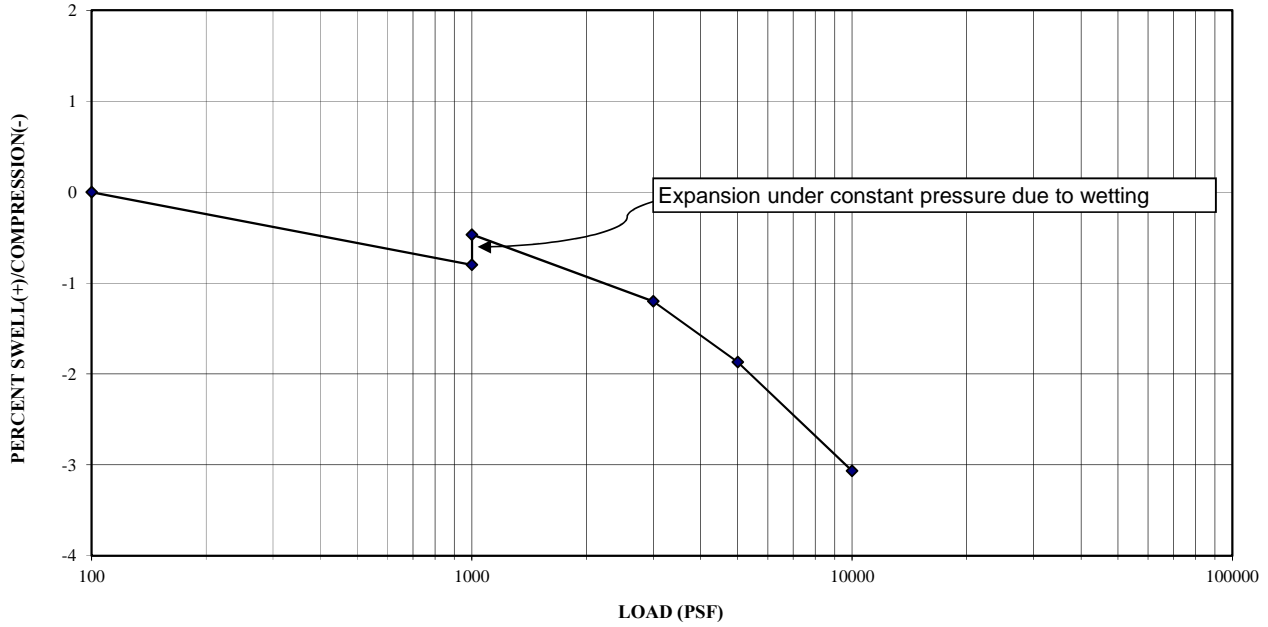
**JOB NO. G15.1616.000**

**SWELL - COMPRESSION TEST RESULTS**

**FIGURE NO.**

**4**

**SWELL-COMPRESSION TEST**



<b>Sample Location</b>	Boring B-3
<b>Sample Depth</b>	19 feet
<b>Sample Description</b>	Sandstone/claystone bedrock
<b>USCS Classification</b>	
<b>AASHTO Classification</b>	

<b>Dry Density</b>	127 pcf
<b>Moisture Content</b>	8.4 %
<b>Volume Change</b>	0.3 %
<b>Swell Pressure</b>	0 psf

**GEOCAL, INC.**

71st Street, Boulder County

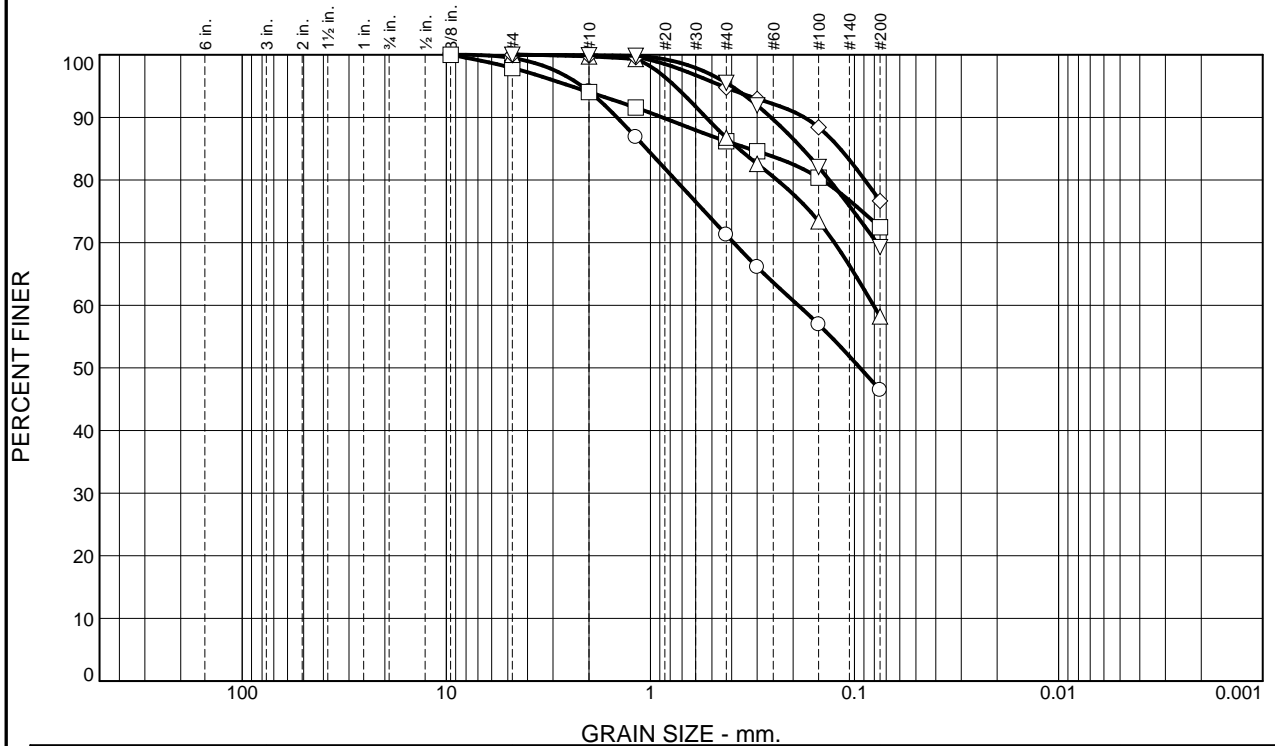
**JOB NO.** G15.1616.000

**SWELL - COMPRESSION TEST RESULTS**

**FIGURE NO.**

5

# Gradation Test Results



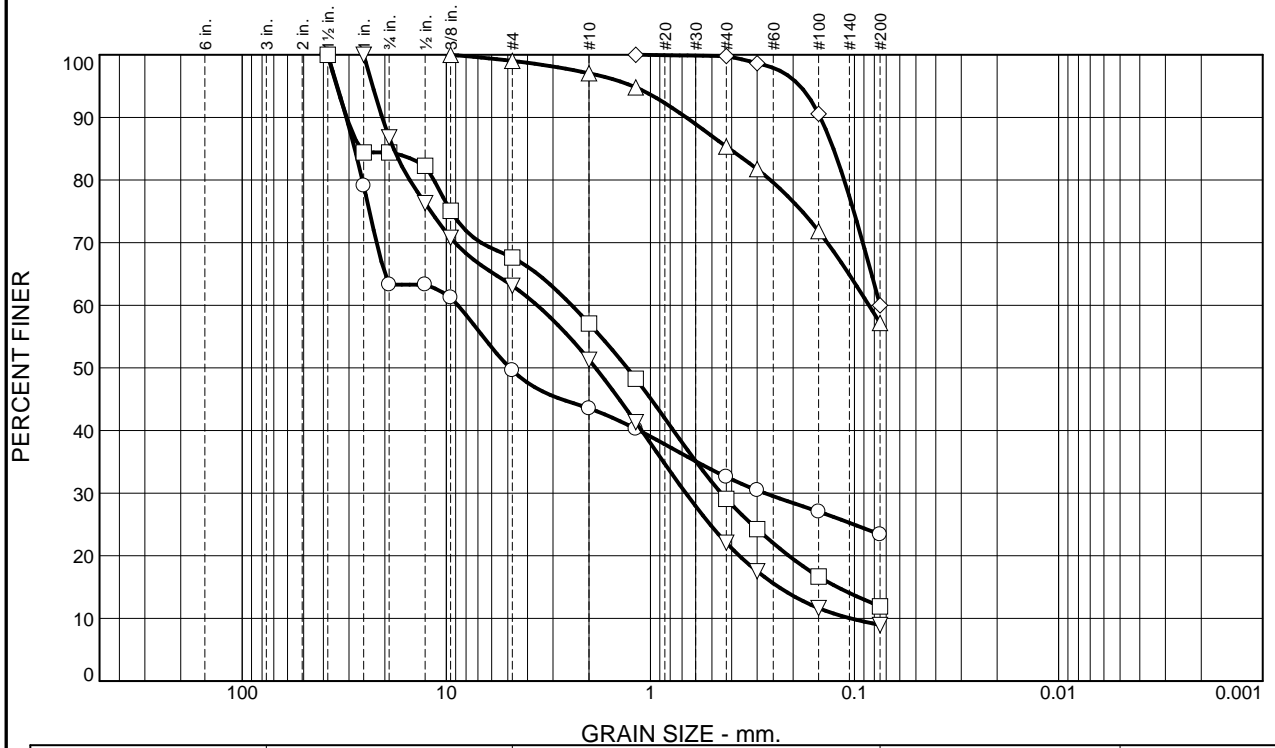
GRAIN SIZE - mm.										
% +3"		% Gravel		% Sand			% Silt		% Clay	
○	0	1		53			46			
□	0	2		26			72			
△	0	0		42			58			
◇	0	0		23			77			
▽	0	0		31			69			
LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu	
○	43	16	1.0450	0.1887	0.0939					
□	27	19	0.3282							
△	28	16	0.3695	0.0808						
◇	45	17	0.1176							
▽	40	16	0.1800							

Material Description	USCS	AASHTO
○ clayey sand	SC	A-7-6(8)
□ lean clay with sand	CL	A-4(4)
△ sandstone-claystone bedrock		
◇ lean clay with sand	CL	A-7-6(21)
▽ sandy lean clay	CL	A-6(14)

<p><b>Project No.</b> G15.1616.000 <b>Client:</b> SEH, Inc.</p> <p><b>Project:</b> 71st Street, Boulder County</p> <p>○ <b>Location:</b> Boring B-1      <b>Depth:</b> 1 foot      <b>Sample Number:</b> 7210-1</p> <p>□ <b>Location:</b> Boring B-1      <b>Depth:</b> 14 feet      <b>Sample Number:</b> 7210-4</p> <p>△ <b>Location:</b> Boring B-1      <b>Depth:</b> 19 feet      <b>Sample Number:</b> 7210-5</p> <p>◇ <b>Location:</b> Boring B-2      <b>Depth:</b> 4 feet      <b>Sample Number:</b> 7210-7</p> <p>▽ <b>Location:</b> Boring B-2      <b>Depth:</b> 9 feet      <b>Sample Number:</b> 7210-8</p>	<p><b>Remarks:</b></p>
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**GEOCAL, INC.**

# Gradation Test Results



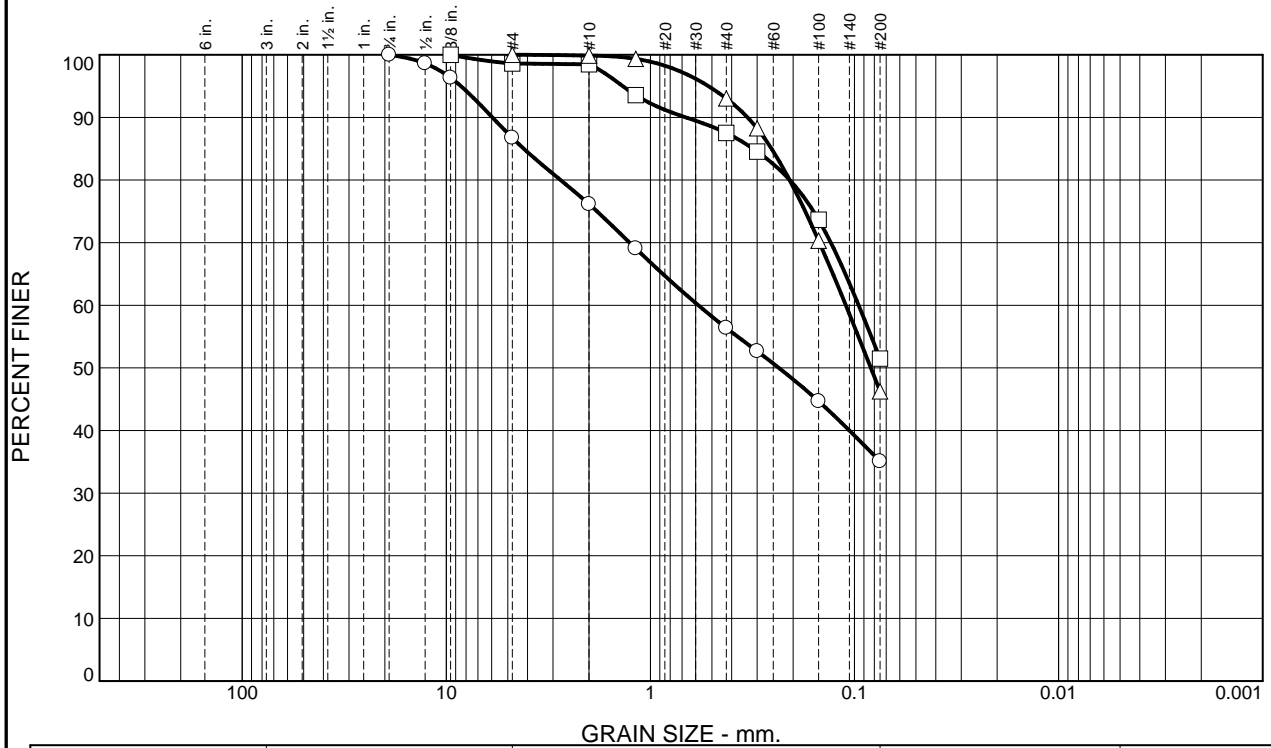
GRAIN SIZE - mm.										
% +3"		% Gravel		% Sand			% Silt		% Clay	
○	0	50		27				23		
□	0	32		56				12		
△	0	1		42				57		
◇	0	0		40				60		
▽	0	37		54				9		
LL	PL	D85	D60	D50	D30	D15	D10	C <sub>c</sub>	C <sub>u</sub>	
○	26	16	28.1144	8.7828	4.8839	0.2751				
□	27	14	26.2633	2.4297	1.2988	0.4501	0.1213			
△	35	15	0.4107	0.0850						
◇	30	13	0.1269	0.0750						
▽	23	15	18.1036	3.5898	1.8573	0.6704	0.2348	0.1043	1.20	34.41

Material Description	USCS	AASHTO
○ sandstone/claystone bedrock		
□ poorly graded sand with clay and gravel	SP-SC	A-2-6(0)
△ sandy lean clay	CL	A-6(8)
◇ sandy lean clay	CL	A-6(7)
▽ well-graded sand with clay and gravel	SW-SC	A-2-4(0)

<p><b>Project No.</b> G15.1616.000 <b>Client:</b> SEH, Inc.</p> <p><b>Project:</b> 71st Street, Boulder County</p> <p>○ <b>Location:</b> Boring B-3      <b>Depth:</b> 19 feet      <b>Sample Number:</b> 7210-12</p> <p>□ <b>Location:</b> Boring P-1      <b>Depth:</b> 1 foot      <b>Sample Number:</b> 7210-13</p> <p>△ <b>Location:</b> Boring P-2      <b>Depth:</b> 1-5 feet      <b>Sample Number:</b> 7210-16</p> <p>◇ <b>Location:</b> Boring P-3      <b>Depth:</b> 4 feet      <b>Sample Number:</b> 7210-18</p> <p>▽ <b>Location:</b> Boring P-4      <b>Depth:</b> 1 foot      <b>Sample Number:</b> 7210-19</p>	<p><b>Remarks:</b></p>
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**GEOCAL, INC.**

# Gradation Test Results



	GRAIN SIZE - mm.					
	% +3"	% Gravel	% Sand		% Silt	% Clay
○	0	13	52		35	
□	0	1	48		51	
△	0	0	54		46	

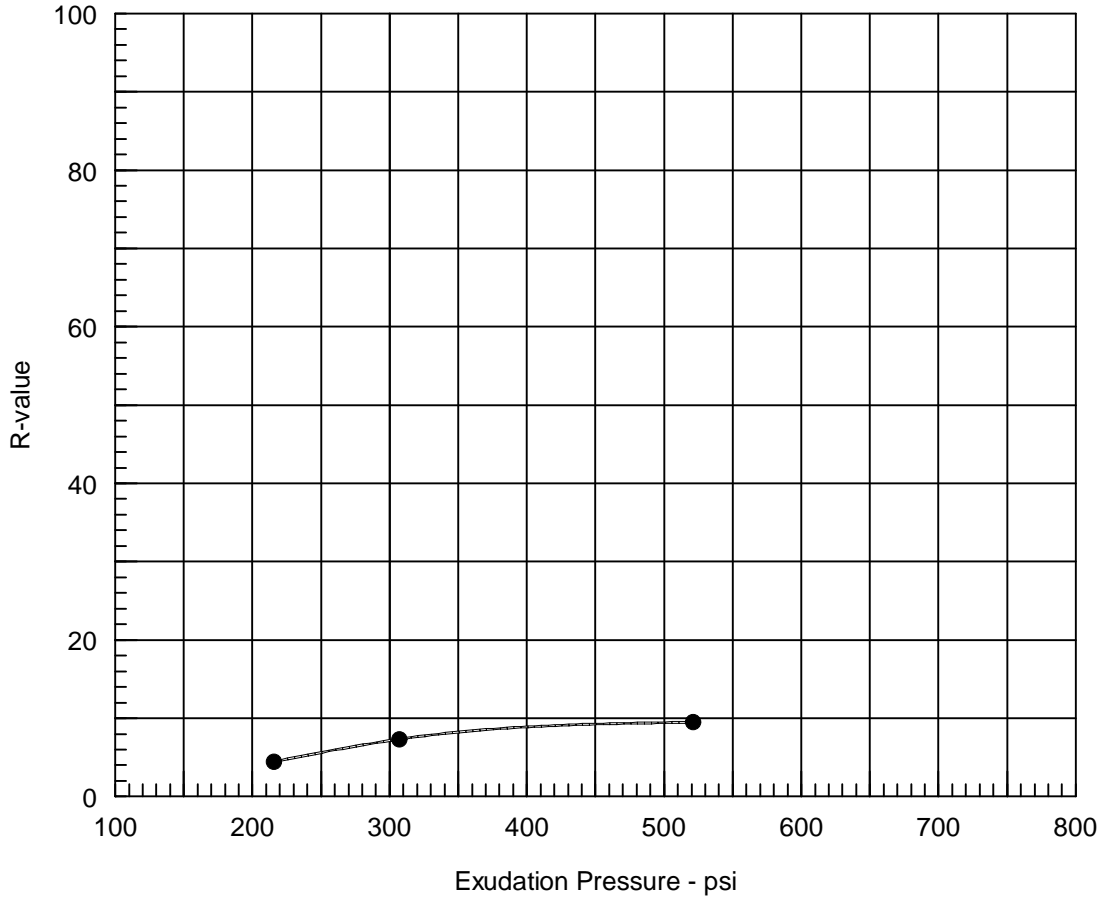
	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
○	26	15	4.1714	0.5829	0.2347					
□	32	15	0.3142	0.0954						
△	30	13	0.2549	0.1103	0.0832					

Material Description	USCS	AASHTO
○ clayey sand	SC	A-2-6(0)
□ sandy lean clay	CL	A-6(5)
△ clayey sand	SC	A-6(4)

<b>Project No.</b> G15.1616.000 <b>Client:</b> SEH, Inc. <b>Project:</b> 71st Street, Boulder County ○ <b>Location:</b> Boring P-5 <b>Depth:</b> 1-5 feet <b>Sample Number:</b> 7210-22 □ <b>Location:</b> Boring P-6 <b>Depth:</b> 1 foot <b>Sample Number:</b> 7210-23 △ <b>Location:</b> Boring P-7 <b>Depth:</b> 4 feet <b>Sample Number:</b> 7210-25	<b>Remarks:</b>   
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**GEOCAL, INC.**

# R-VALUE TEST REPORT



**Resistance R-Value and Expansion Pressure - AASHTO T 190**

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	130	108.0	17.3	0.00	137	2.53	521	9	9
2	120	103.9	19.6	0.00	142	2.60	307	7	7
3	100	101.3	22.7	0.00	148	2.56	216	4	4

Test Results	Material Description
R-value at 300 psi exudation pressure = 7	sandy lean clay
<b>Project No.:</b> G15.1616.000 <b>Project:</b> 71st Street, Boulder County <b>Location:</b> Boring P-2 <b>Sample Number:</b> 7210-16 <b>Depth:</b> 1-5 feet <b>Date:</b> 10/22/2015	<b>Tested by:</b> H. Redzic <b>Checked by:</b> T. Siegel, P.E. <b>Remarks:</b>
<b>R-VALUE TEST REPORT</b> <b>GEOCAL, INC.</b>	<b>Figure 9</b>

Client: **SEH, Inc**  
 Project Name: **71st Street, Boulder County**

Project #: **G15.1616.000**

**TABLE 1**  
**SUMMARY OF LABORATORY TEST RESULTS**

Sample Location		Natural	Natural	Gradation			Atterberg Limits		Swell	Swell	R-Value	AASHTO	Soil or Bedrock Description
Boring No.	Depth (feet)	Moisture Content (%)	Dry Density (pcf)	Gravel (%)	Sand (%)	Passing No. 200 Sieve	Liquid Limit (%)	Plasticity Index (%)	Pressure (psf)	w/.5 or 1 ksf Surcharge (%)	at 300psi Exudation Pressure	Class. (Group Index)	
B-1	1	11.3	118	1	53	46	43	27				A-7-6(8)	Clayey sand
B-1	4	18.4	106										Lean clay with sand
B-1	9	19.1	108										Lean clay with sand
B-1	14	13.1	117	2	26	72	27	8	0	0.3		A-4(4)	Lean clay with sand
B-1	19	11.8	104	0	42	58	28	12					Sandstone/claystone bedrock
B-2	1	14.7	114										Sandy lean clay
B-2	4	20.2	106	0	23	77	45	28				A-7-6(21)	Lean clay with sand
B-2	9	19.0	109	0	31	69	40	24	800	0.8		A-6(14)	Sandy lean clay
B-2	14	18.8	112										Sandy lean clay
B-3	4	13.0	107										Sandy lean clay
B-3	9	23.0	102										Sandy lean clay
B-3	19	8.4	127	50	27	23	26	10	0	0.3			Sandstone/claystone bedrock
P-1	1	3.1	120	32	56	12	27	13				A-2-6(0)	Poorly graded sand with clay & gravel
P-1	4	8.6	132										Sandy lean clay, fill
P-2	4	18.0	110										Lean clay with sand
P-2	1-5			1	42	57	35	20			7	A-6(8)	Sandy lean clay
P-3	1	12.9	118										Sandy lean clay, trace gravel
P-3	4	19.8	106	0	40	60	30	17				A-6(7)	Sandy lean clay
P-4	1	4.0	115	37	54	9	23	8				A-2-4(0)	Well graded sand with clay & gravel
P-4	4	14.5	111										Sandy clay, fill
P-5	4	15.7	111										Sandy clay with gravel
P-5	1-5			13	52	35	26	11				A-2-6(0)	Clayey sand
P-6	1	14.5	108	1	48	51	32	17				A-6(5)	Sandy lean clay
P-6	4	18.6	109										Sandy clay, fill
P-7	4	14.2	114	0	54	46	30	17				A-6(4)	Clayey sand

**TABLE 2**

Client: **SEH, Inc.**  
 Project Name: **71st Street, Boulder County**

Project #: **G15.1616.000**

**SUMMARY OF LABORATORY CHEMICAL TEST RESULTS**

Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Laboratory Resistivity (ohm-cm)	pH	Chloride Water Soluble (%)	Water Soluble Sulfates (%)	AASHTO Class. (Group Index)	Soil or Bedrock Description
Boring No.	Depth (feet)								
B-1	4	18.4	106				0.03		Lean clay with sand
B-1	9	19.1	108				0.06		Lean clay with sand
B-2	1	14.7	114				0.01		Sandy lean clay
B-2	14	18.8	112				Not detected		Sandy lean clay
B-3	4	13.0	107				0.50		Sandy lean clay
B-3	9	23.0	102				0.34		Sandy lean clay
P-1	4	8.6	132			0.1028			Sandy lean clay, fill
P-2	4	18.0	110	730	7.6				Lean clay with sand
P-3	1	12.9	118			0.0960			Sandy lean clay, trace gravel
P-4	4	4.0	115	1,120	7.6				Sandy clay, fill
P-5	4	15.7	111			0.0540			Sandy clay with gravel
P-6	4	18.6	109	1,100	7.4				Sandy clay, fill



# **APPENDIX A**

## **LOGS OF EXPLORATORY BORINGS**

<b>CLIENT</b> <u>SEH</u>	<b>PROJECT NAME</b> <u>71st Street, Boulder County</u>
<b>PROJECT NUMBER</b> <u>G15.1616.000</u>	<b>PROJECT LOCATION</b> <u>71st Street, Between Lookout Rd. and SH52</u>
<b>DATE STARTED</b> <u>9/15/15</u> <b>COMPLETED</b> <u>9/15/15</u>	<b>GROUND ELEVATION</b> <u>5164 ft</u> <b>NORTH</b> <u>1100</u>
<b>DRILLING CONTRACTOR</b> <u>Elite Drilling Services</u>	<b>GROUND WATER LEVELS:</b> <b>EAST</b> <u>0</u>
<b>DRILLING METHOD</b> <u>SSA</u> <b>HOLE SIZE</b> <u>4 inches</u>	▼ <b>AT TIME OF DRILLING</b> <u>14.00 ft / Elev 5150.00 ft</u>
<b>LOGGED BY</b> <u>Ben Walter</u> <b>CHECKED BY</b> <u>Tristan Siegel, P.E.</u>	▼ <b>AT END OF DRILLING</b> <u>13.00 ft / Elev 5151.00 ft</u>
<b>NOTES</b> _____	<b>AFTER DRILLING</b> ---

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 11/30/16 14:48 - W:\ENGINEERING\CLIENTS\SEH INC\2015 PROJECTS\71ST STREET, LOOKOUT RD TO MINERAL RD, BOULDER COUNTY\LOGS.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONFINED COMP. STRENGTH (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	% Swell (+) or Consol (-) / Swell Pressure (psf)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0	[Hatched Pattern]	HMA-6"											
		(CL) Sandy CLAY, stiff, medium plasticity, moist to wet, medium to dark brown, fine to medium sand	✕ MC	100	6-8		118	11.3	43	16	27	46	
			☞ GB										
5			✕ MC	100	6-10		106	18.4					
10			✕ MC	100	7-9		108	19.1					
15	▼ ▼		✕ MC	100	8-12		117	13.1	27	19	8	72	
20	[Diagonal Hatched Pattern]	SANDSTONE-CLAYSTONE BEDROCK, hard, moist, tan to medium brown	✕ MC	100	50/7"		104	11.8	28	16	12	58	
25	[Diagonal Hatched Pattern]		✕ MC	100	50/3"								

Bottom of boring at 25.0 feet.

<b>CLIENT</b> <u>SEH</u>	<b>PROJECT NAME</b> <u>71st Street, Boulder County</u>
<b>PROJECT NUMBER</b> <u>G15.1616.000</u>	<b>PROJECT LOCATION</b> <u>71st Street, Between Lookout Rd. and SH52</u>
<b>DATE STARTED</b> <u>9/15/15</u> <b>COMPLETED</b> <u>9/15/15</u>	<b>GROUND ELEVATION</b> <u>5161 ft</u> <b>NORTH</b> <u>1435</u>
<b>DRILLING CONTRACTOR</b> <u>Elite Drilling Services</u>	<b>GROUND WATER LEVELS:</b> <b>EAST</b> <u>0</u>
<b>DRILLING METHOD</b> <u>SSA</u> <b>HOLE SIZE</b> <u>4 inches</u>	<b>AT TIME OF DRILLING</b> <u>---</u>
<b>LOGGED BY</b> <u>Ben Walter</u> <b>CHECKED BY</b> <u>Tristan Siegel, P.E.</u>	<b>AT END OF DRILLING</b> <u>---</u>
<b>NOTES</b> _____	<b>AFTER DRILLING</b> <u>---</u>

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 11/30/16 14:48 - W:\ENGINEERING\CLIENTS\SEH INC\2015 PROJECTS\71ST STREET, LOOKOUT RD TO MINERAL RD, BOULDER COUNTY\71ST, BOULDER COUNTY LOGS.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONFINED COMP. STRENGTH (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	% Swell (+) or Consol (-) / Swell Pressure (psf)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0	[Hatched Pattern]	HMA-6"											
		(CL) Sandy CLAY, medium stiff to stiff, medium to high plasticity, moist, grey to dark brown, fine to medium sand, trace coarse sand, trace silt	✕ MC	100	7-10		114	14.7					
			☞ GB										
5			✕ MC	100	5-7		106	20.2	45	17	28	77	
10			✕ MC	100	6-7		109	19.0	40	16	24	69	
15			✕ MC	100	3-6		112	18.8					
20	[Diagonal Hatched Pattern]	SANDSTONE-CLAYSTONE BEDROCK, hard, moist, tan, with fine sand	✕ MC	100	50/6"								
25	[Diagonal Hatched Pattern]		✕ MC	100	50/3"								

Bottom of boring at 25.0 feet.

**CLIENT** SEH **PROJECT NAME** 71st Street, Boulder County  
**PROJECT NUMBER** G15.1616.000 **PROJECT LOCATION** 71st Street, Between Lookout Rd. and SH52  
**DATE STARTED** 9/15/15 **COMPLETED** 9/15/15 **GROUND ELEVATION** 5127.5 ft **NORTH** 3200  
**DRILLING CONTRACTOR** Elite Drilling Services **GROUND WATER LEVELS:** **EAST** 0  
**DRILLING METHOD** SSA **HOLE SIZE** 4 inches **▽ AT TIME OF DRILLING** 16.00 ft / Elev 5111.50 ft  
**LOGGED BY** Ben Walter **CHECKED BY** Tristan Siegel, P.E. **▽ AT END OF DRILLING** 15.00 ft / Elev 5112.50 ft  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---


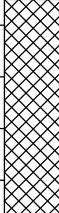
GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 11/30/16 14:48 - W:\ENGINEERING\CLIENTS\SEH INC\2015 PROJECTS\71ST STREET, LOOKOUT RD TO MINERAL RD, BOULDER COUNTY\71ST, BOULDER COUNTY LOGS.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONFINED COMP. STRENGTH (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	% Swell (+) or Consol (-) / Swell Pressure (psf)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0		HMA-6"											
		(SP) FILL-Gravelly SAND, loose, no plasticity, moist, black, fine to coarse sand, fine to medium gravel	MC	100	4-6								
		(SC) Clayey SAND, loose, low plasticity, moist, dark brown, fine to coarse sand	GB										
5			MC	100	3-2		107	13.0					
		(CL) Sandy CLAY, trace silt, soft, medium plasticity, moist, dark brown modeled with grey, fine sand, trace medium sand	MC	100	2-2		102	23.0					
15			MC	100	2-2								
		SANDSTONE-CLAYSTONE BEDROCK, lightly moist, hard, Grey mottled with tan to medium brown	MC	100	50/7"		127	8.4	26	10	16	23	
20			MC	100	50/4"								
25			MC	100	50/4"								

Bottom of boring at 25.0 feet.

**CLIENT** SEH **PROJECT NAME** 71st Street, Boulder County  
**PROJECT NUMBER** G15.1616.000 **PROJECT LOCATION** 71st Street, Between Lookout Rd. and SH52  
**DATE STARTED** 9/15/15 **COMPLETED** 9/15/15 **GROUND ELEVATION** 5174 ft **NORTH** 610  
**DRILLING CONTRACTOR** Elite Drilling Services **GROUND WATER LEVELS:** **EAST** 0  
**DRILLING METHOD** SSA **HOLE SIZE** 4 inches **AT TIME OF DRILLING** ---  
**LOGGED BY** Ben Walter **CHECKED BY** Tristan Siegel, P.E. **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 11/30/16 14:48 - W:\ENGINEERING\CLIENTS\SEH INC\2015 PROJECTS\71ST STREET, LOOKOUT RD TO MINERAL RD, BOULDER COUNTY\71ST, BOULDER COUNTY LOGS.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONFINED COMP. STRENGTH (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	% Swell (+) or Consol (-) / Swell Pressure (psf)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0		HMA-7"											
		(SC) FILL-Clayey SAND, with gravel, medium to very dense, low plasticity, moist, brown, fine to coarse sand, fine gravel	✱ MC	100	11-9		120	3.1	27	14	13	12	
			✎ GB										
5			✱ MC	100	50/2"		132	8.6					

Bottom of boring at 5.0 feet.

**CLIENT** SEH **PROJECT NAME** 71st Street, Boulder County  
**PROJECT NUMBER** G15.1616.000 **PROJECT LOCATION** 71st Street, Between Lookout Rd. and SH52  
**DATE STARTED** 9/15/15 **COMPLETED** 9/15/15 **GROUND ELEVATION** 5155.5 ft **NORTH** 1900  
**DRILLING CONTRACTOR** Elite Drilling Services **GROUND WATER LEVELS:** **EAST** 0  
**DRILLING METHOD** SSA **HOLE SIZE** 4 inches **AT TIME OF DRILLING** ---  
**LOGGED BY** Ben Walter **CHECKED BY** Tristan Siegel, P.E. **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---



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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONFINED COMP. STRENGTH (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	% Swell (+) or Consol (-) / Swell Pressure (psf)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0	[Hatched pattern]	HMA-6"											
		(CL) FILL-Sandy CLAY, trace gravel, stiff, medium plasticity, lightly moist to moist, dark brown, fine to medium sand, trace coarse sand, trace fine gravel	✂ MC	100	4-8								
		(CL) Sandy CLAY, stiff, medium plasticity, lightly moist, dark brown, fine to medium sand	✋ GB						35	15	20	57	
5			✂ MC	100	7-9		110	18.0					

Bottom of boring at 5.0 feet.

**CLIENT** SEH **PROJECT NAME** 71st Street, Boulder County  
**PROJECT NUMBER** G15.1616.000 **PROJECT LOCATION** 71st Street, Between Lookout Rd. and SH52  
**DATE STARTED** 9/15/15 **COMPLETED** 9/15/15 **GROUND ELEVATION** 5135 ft **NORTH** 2567  
**DRILLING CONTRACTOR** Elite Drilling Services **GROUND WATER LEVELS:** **EAST** 0  
**DRILLING METHOD** SSA **HOLE SIZE** 4 inches **AT TIME OF DRILLING** ---  
**LOGGED BY** Ben Walter **CHECKED BY** Tristan Siegel, P.E. **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 11/30/16 14:48 - W:\ENGINEERING\CLIENTS\SEH INC\2015 PROJECTS\71ST STREET, LOOKOUT RD TO MINERAL RD, BOULDER COUNTY\71ST, BOULDER COUNTY LOGS.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONFINED COMP. STRENGTH (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	% Swell (+) or Consol (-) / Swell Pressure (psf)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0		HMA-6"											
		(CL) Sandy CLAY, trace silt, medium stiff to stiff, low to medium plasticity, lightly moist to moist, tan to medium brown, fine to medium sand	✂ MC	100	5-6		118	12.9					
			✋ GB										
5			✂ MC	100	2-3		106	19.8	30	13	17	60	

Bottom of boring at 5.0 feet.

**CLIENT** SEH **PROJECT NAME** 71st Street, Boulder County  
**PROJECT NUMBER** G15.1616.000 **PROJECT LOCATION** 71st Street, Between Lookout Rd. and SH52  
**DATE STARTED** 9/15/15 **COMPLETED** 9/15/15 **GROUND ELEVATION** 5131 ft **NORTH** 3650  
**DRILLING CONTRACTOR** Elite Drilling Services **GROUND WATER LEVELS:** **EAST** 0  
**DRILLING METHOD** SSA **HOLE SIZE** 4 inches **AT TIME OF DRILLING** ---  
**LOGGED BY** Ben Walter **CHECKED BY** Tristan Siegel, P.E. **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONFINED COMP. STRENGTH (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	% Swell (+) or Consol (-) / Swell Pressure (psf)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0		HMA-6"											
		(SP) FILL-Gravelly SAND, dense, no plasticity, moist, brown with redish brown gravel, fine to coarse sand, fine to medium gravel	MC	100	13-13		115	4.0	23	15	8	9	
		(CL) Sandy CLAY, trace silt, medium plasticity, moist, brown, fine to medium sand	GB										
5			MC	100	2-2		111	14.5					

Bottom of boring at 5.0 feet.



**CLIENT** SEH **PROJECT NAME** 71st Street, Boulder County  
**PROJECT NUMBER** G15.1616.000 **PROJECT LOCATION** 71st Street, Between Lookout Rd. and SH52  
**DATE STARTED** 9/15/15 **COMPLETED** 9/15/15 **GROUND ELEVATION** 5138 ft **NORTH** 3900  
**DRILLING CONTRACTOR** Elite Drilling Services **GROUND WATER LEVELS:** **EAST** 0  
**DRILLING METHOD** SSA **HOLE SIZE** 4 inches **AT TIME OF DRILLING** ---  
**LOGGED BY** Ben Walter **CHECKED BY** Tristan Siegel, P.E. **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---



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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONFINED COMP. STRENGTH (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	% Swell (+) or Consol (-) / Swell Pressure (psf)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0	[Hatched Pattern]	HMA-6"											
	[Cross-hatched Pattern]	(SP) FILL-Gravelly SAND, dense, no plasticity, moist, brown, fine to coarse sand, fine to medium gravel	MC	100	16-21								
	[Diagonal Pattern]	(CL) Sandy CLAY, trace silt, stiff, medium plasticity, moist, brown, with fine sand, trace medium to coarse sand.	GB						26	15	11	35	
5	[Diagonal Pattern]		MC	100	4-6		111	15.7					

Bottom of boring at 5.0 feet.

**CLIENT** SEH **PROJECT NAME** 71st Street, Boulder County  
**PROJECT NUMBER** G15.1616.000 **PROJECT LOCATION** 71st Street, Between Lookout Rd. and SH52  
**DATE STARTED** 9/15/15 **COMPLETED** 9/15/15 **GROUND ELEVATION** 5149 ft **NORTH** 4350  
**DRILLING CONTRACTOR** Elite Drilling Services **GROUND WATER LEVELS:** **EAST** 0  
**DRILLING METHOD** SSA **HOLE SIZE** 4 inches **AT TIME OF DRILLING** ---  
**LOGGED BY** Ben Walter **CHECKED BY** Tristan Siegel, P.E. **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONFINED COMP. STRENGTH (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	% Swell (+) or Consol (-) / Swell Pressure (psf)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0		HMA-6"											
		(CL) Sandy CLAY, with gravel, medium stiff to stiff, medium plasticity, moist, medium brown to slightly redish brown, fine to medium sand, trace coarse sand, fine to medium sand	✂ MC	100	2-3		108	14.5	32	15	17	51	
			✋ GB										
5			✂ MC	100	5-7		109	18.6					

Bottom of boring at 5.0 feet.

**CLIENT** SEH **PROJECT NAME** 71st Street, Boulder County  
**PROJECT NUMBER** G15.1616.000 **PROJECT LOCATION** 71st Street, Between Lookout Rd. and SH52  
**DATE STARTED** 9/15/15 **COMPLETED** 9/15/15 **GROUND ELEVATION** 5148.5 ft **NORTH** 4850  
**DRILLING CONTRACTOR** Elite Drilling Services **GROUND WATER LEVELS:** **EAST** 0  
**DRILLING METHOD** SSA **HOLE SIZE** 4 inches **AT TIME OF DRILLING** ---  
**LOGGED BY** Ben Walter **CHECKED BY** Tristan Siegel, P.E. **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONFINED COMP. STRENGTH (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	% Swell (+) or Consol (-) / Swell Pressure (psf)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0		HMA-6"											
		(CL) FILL-Sandy CLAY, stiff, medium plasticity, moist, medium brown to brown modeled with grey, fine to medium sand, trace coarse sand	MC	100	4-5								
		(CL) Sandy CLAY, stiff, medium plasticity, moist, medium brown, fine sand, trace medium sand	GB										
5			MC	100	6-3		114	14.2	30	13	17	46	

Bottom of boring at 5.0 feet.

# **APPENDIX B**

## **ESAL CALCULATIONS AND PAVEMENT DESIGN OUTPUT**

## Design Lane ESAL Calculations

71st Street - AASHTO 1993 Pavement Design Methodology	Vehicle Type/Classification (%)		
	Cars & Pickups	Single Unit Trucks	Combination Unit Trucks
<b>Vehicle Type Load Factor</b>	0.003	0.249	1.087
Assumed Growth Factor= 3.50%			
Number of Lanes (per direction) = 1		% in Design Lane= 60%	
<i>Percent of types</i>	<b>100%</b>	<i>91.0%</i>	<i>4.5%</i>
<i>2014 ADT Estimate</i>	<b>4,200</b>	3,822	189
Projected 2015 ADT	<b>4,203</b>	3,823	190
<i>Projected 2034 ADT</i>	<b>4,206</b>	3,824	191
Projected 2035 ADT	<b>4,209</b>	3,825	192
<b>20-Yr Design ADT</b>	<b>4,206</b>	<b>3,824</b>	<b>191</b>
<b>Roadway ESAL</b>	<b>1,946,531</b>	<b>83,746</b>	<b>347,181</b>
<b>Design Lane ESAL</b>	<b>1,167,919</b>		

# WinPAS

Pavement Thickness Design According to  
**1993 AASHTO Guide for Design of Pavements Structures**  
American Concrete Pavement Association

## Flexible Design Inputs

Project Name: 71st Street, Lookout Road to Mineral Road  
Route: 71st Street  
Location: Boulder County  
Owner/Agency: Boulder County  
Design Engineer: R-value 7 subgrade

## Flexible Pavement Design/Evaluation

<b>Structural Number</b>	4.46	<b>Subgrade Resilient Modulus</b>	3,230.00 psi
<b>Total Flexible ESALs</b>	1,167,919	<b>Initial Serviceability</b>	4.50
<b>Reliability</b>	85.00 percent	<b>Terminal Serviceability</b>	2.54
<b>Overall Standard Deviation</b>	0.44		

## Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.44	1.00	8.25	3.63
Graded Stone Base	0.12	1.15	6.00	0.83
			$\Sigma$ SN	4.46

BOULDER COUNTY  
COLORADO DEPARTMENT OF TRANSPORTATION  
SPECIAL PROVISIONS  
NORTH 71ST STREET SHOULDERS

The 2021 Standard Specifications for Road and Bridge Construction controls construction of this project. The following special provisions supplement or modify the Standard Specifications and take precedence over the Standard Specifications and plans.

PROJECT SPECIAL PROVISIONS

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BOULDER COUNTY  
COLORADO DEPARTMENT OF TRANSPORTATION  
SPECIAL PROVISIONS  
NORTH 71ST STREET SHOULDERS  
STANDARD SPECIAL PROVISIONS

<b>Name</b>	<b>Date</b>	<b>No. of Pages</b>
Revision of Section 103 – Colorado Resident Bid Preference	(October 1, 2021)	1
Revision of Section 103 –Consideration of Proposals	(January 6, 2022)	1
Revision of Section 105 – Control of Work	(October 26, 2021)	1
Revision of Section 106 – Buy America Requirements – Non-Federal Aid	(October 1, 2021)	1
Revision of Section 106 – Conformity to the Contract of Hot Mix Asphalt (Less than 5,000 Tons)	(October 1, 2021)	3
Revision of Section 109 – Prompt Payment (Local Agency)	(April 26, 2022)	2
Revision of Section 207 – Topsoil	(October 1, 2021)	6
Revision of Section 212 – Soil Amendments, Seeding, and Sodding	(October 1, 2021)	18
Revision of Section 401 – Composition of Mixtures – Voids Acceptance	(October 1, 2021)	1
Revision of Section 401 – Reclaimed Asphalt Pavement	(October 1, 2021)	2
Revision of Section 601 – Concrete Mix Designs	(October 1, 2021)	1
Revision of Section 601 – Structural Concrete	(October 1, 2021)	1
Affirmative Action Requirements – Equal Employment Opportunity Project First Program	(October 1, 2021)	11 2



### NOTICE TO BIDDERS

The proposal guaranty shall be a certified check, cashier's check, or bid bond in the amount of 10 percent of the Contractor's total bid.

Pursuant to subsections 102.04 and 102.05, it is recommended that bidders on this project review the work site and plan details with an authorized Department representative. Prospective bidders shall contact one of the following listed authorized Department representatives at least 12 hours in advance of the time they wish to go over the project.

Project Engineer -	Colton Coughlin	
	Office Phone:	303-682-6779

The above referenced individuals are the only representatives of the Department with authority to provide any information, clarification, or interpretation regarding the plans, specifications, and any other contract documents or requirements.

Questions received from bidders along with Boulder County responses will be sent to all attendees of the pre bid conference as they become available.

If the bidder has a question or requests clarification that involves the bidder's innovative or proprietary means and methods, phasing, scheduling, or other aspects of construction of the project, the Project Engineer will direct the bidder to contact the Resident Engineer directly to address the question or clarification. The Resident Engineer will keep the bidder's innovation confidential and will not share this information with other bidders.

The Resident Engineer will determine whether questions are innovative or proprietary in nature. If the Resident Engineer determines that a question does not warrant confidentiality, the bidder may withdraw the question. If the bidder withdraws the question, the Resident Engineer will not answer the question and the question will not be documented on the CDOT web site. If the bidder does not withdraw the question, the question will be answered, and both the question and CDOT answer will be posted on the web site. If the Resident Engineer agrees that a question warrants confidentiality, the Resident Engineer will answer the question, and keep both question and answer confidential. CDOT will keep a record of both question and answer in their confidential file.

Questions and answers shall be used for reference only and shall not be considered part of the Contract.

COMMENCEMENT AND COMPLETIONS OF WORK  
(WORKING DATE)

The Contractor shall commence work under the Contract on or before the 15<sup>th</sup> day following Contract execution or the 30th day following the date of award, whichever comes later, unless such time for beginning the work is changed by the Chief Engineer in the "Notice to Proceed." The Contractor shall complete all work within **150** working days in accordance with the "Notice to Proceed."

Subsection 108.05 shall include the following:

Salient features for this project are:

- (1) Traffic Control
- (2) Erosion Control
- (3) Demolition/Removals
- (4) Utility Relocations
- (5) Installation of Dry Creek #2 Crossing
- (6) Milling/Earthwork/HMA paving
- (7) Signing and Striping

CITY OF BOULDER  
SPECIAL CONDITIONS

- 1. UTILITY STRUCTURE ACCESS** – The Contractor is responsible for locating all water valves, manholes, monument boxes, traffic pull boxes, etc. prior to construction. All costs associated with locating and raising valve boxes, manholes, monument boxes, traffic pull boxes, etc. if paved over will be deducted from monies due the Contractor.

All water valves, manholes, etc. must be brought to grade during the paving operation. No sanitary sewer manholes or valves may be left inaccessible at any time during the construction process, except immediately during the paving operation.

All liabilities for damages arising from water valves or manholes being left inaccessible during construction, rest with the Contractor. All liabilities for damages arising from sanitary sewer, storm sewer, or private utility manholes or structures being plugged or rendered inoperable due to the Contractor's construction operations, rest with the Contractor.

- 2. ACCESS RAMP LOCATIONS** – The final location of all access ramps will be approved in the field by the City prior to pouring the ramp.
- 3. ACCESS REQUIREMENTS** – Access to driveways and pedestrian routes shall be maintained at all times during construction. Temporary access detours may be allowed, if agreed by both the Engineer and the affected property owner, in advance of the work. Contractor shall coordinate access detours with the affected property owners and/or residents as may be required to function effectively.

Construction and maintenance of temporary access ramps, paths or other temporary facilities at adjacent properties or through work zones shall be the responsibility of the Contractor. Depending on the frequency of use, the duration it is intended, and the overall performance of the temporary facility, the engineer may require the use of better performing materials (including asphalt) as appropriate.

- 4. ADDITIONAL INSURED** – The City of Boulder and the Colorado Department of Transportation shall be listed as an additional insured on the Contractor's General Liability and Automobile Liability policies on this project.
- 5. PAVEMENT MARKINGS** – All pavement marking materials and installation shall be completed by the Contractor as specified below. All pavement markings shall be placed in accordance with CDOT Standard Specification, Section 627 – Pavement Marking.

Standards for application concerning line configurations and color designations shall be as shown in the Manual on Uniform Traffic Control Devices unless otherwise specifically authorized by the Engineer. The City will aid the Contractor with the layout of markings; however, the Contractor is responsible for the final placement and string lining. Any errors in marking made by the Contractor shall be physically removed and replaced at no expense to the City. "Painting over" or "blacking out" is not acceptable. The Engineer shall approve the method of removal and replacement in advance of this work.

All permanent longitudinal lines (all widths, colors and patterns) shall be as designated in the plans, either preformed plastic pavement marking paid for by the square foot or epoxy pavement marking paint with glass beads paid for by the gallon according to Section 627.

CITY OF BOULDER  
SPECIAL CONDITIONS

- 6. SCHEDULING/SEQUENCING REQUIREMENTS** – The Contractor shall phase all work to minimize impacts to traffic. The Contractor shall complete all work which affects any mode of traffic in any given project area before moving into the next project area. Additionally, the Contractor shall schedule and sequence the work so that the duration of pedestrian, bicycle and vehicular traffic interruptions in any given area are minimized. The Contractor shall work diligently from the time an existing area is first disturbed to completion (final grading), before moving to the next.

The intent of this specification is to reasonably minimize pedestrian and lane closure impacts to the traveling public and to minimize visual and operational impacts to local property owners by avoiding the appearance of an “unfinished” work area. All reasonable scheduling requests, which satisfy these intents, will be considered by the City.

REVISION OF SECTION 101  
DEFINITION OF TERMS

Section 101 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 101.28 and replace with the following:

**Department.** Boulder County Transportation Department.

Delete subsection 101.29 and replace with the following:

**Engineer.** The Boulder County Engineer acting directly or through an authorized representative, who is responsible for engineering and administrative supervision of the project.

REVISION OF SECTION 102  
PROJECT PLANS AND OTHER DATA

Section 102 of the Standard Specifications is hereby revised for this project as follows:

Subsection 102.05 shall include the following:

Boulder County will provide electronic files of drawings, the sample contract document, project technical specifications in .pdf format, online at the designated internet bid advertisement site, and they will be considered as the official bid set and record set.

REVISION OF SECTION 105  
CLAIMS FOR CONTRACT ADJUSTMENT

Section 105 of the Standard Specifications is hereby revised for this project as follows:

Subsection 105.22 shall be revised as follows:

The Colorado Department of Transportation will not participate in the resolution process for any claims filed by the Contractor.

Contract claims will follow the appropriate procedures of Subsection 105.22 except that Boulder County or its duly authorized representative will handle all claim review.

REVISION OF SECTION 107  
PERFORMANCE OF SAFETY CRITICAL WORK

Section 107 of the Standard Specifications is hereby revised for this project as follows:

Subsection 107.061 is hereby added to this project as follows:

**107.061 Performance of Safety Critical Work.** The following work elements are considered safety critical work for this project:

- (1) Temporary works: falsework, shoring that exceeds 5 feet in height,
- (2) Work requiring the use of cranes or other heavy lifting equipment.
- (3) Excavation and embankment adjacent to the roadway, especially if it requires shoring
- (4) Work operations such as pile driving and jack hammering which may create vibration and cause debris to fall into traffic.

The Contractor shall submit, for record purposes only, an initial detailed construction plan that addresses safe construction of each of the safety critical elements. When the specifications already require an erection plan, a bridge removal plan, or a removal of portion of bridge plan, it shall be included as a part of this plan. The detailed construction plan shall be submitted two weeks prior to the safety critical element conference described below. The construction plan shall be stamped “Approved for Construction” and signed by the Contractor. The construction plan will not be approved by the Engineer.

The Construction Plan shall include the following:

- (1) Safety Critical Element for which the plan is being prepared and submitted.
- (2) Contractor or subcontractor responsible for the plan preparation and the work.
- (3) Schedule, procedures, equipment, and sequence of operations, that comply with the working hour limitations
- (4) Temporary works required: falsework, bracing, shoring, etc.
- (5) Additional actions that will be taken to ensure that the work will be performed safely.
- (6) Names and qualifications of workers who will be in responsible charge of the work:
  - A. Years of experience performing similar work
  - B. Training taken in performing similar work
  - C. Certifications earned in performing similar work
- (7) Names and qualifications of workers operating cranes or other lifting equipment
  - A. Years of experience performing similar work
  - B. Training taken in performing similar work
  - C. Certifications earned in performing similar work
- (8) The construction plan shall address how the Contractor will handle contingencies such as:
  - A. Unplanned events (storms, traffic accidents, etc.)
  - B. Structural elements that don't fit or line up
  - C. Work that cannot be completed in time for the roadway to be reopened to traffic
  - D. Replacement of workers who don't perform the work safely
  - E. Equipment failure
  - F. Other potential difficulties inherent in the type of work being performed
- (9) Name and qualifications of Contractor's person designated to determine and notify the Engineer in writing when it is safe to open a route to traffic after it has been closed for safety critical work.
- (10) Erection plan or bridge removal plan when submitted as required elsewhere by the specifications. Plan requirements that overlap with above requirements may be submitted only once.



REVISION OF SECTION 107  
PERFORMANCE OF SAFETY CRITICAL WORK

A safety critical element conference shall be held two weeks prior to beginning construction on each safety critical element. The Engineer, the Contractor, the safety critical element subcontractors, and the Contractor's Engineer shall attend the conference. Required pre-erection conferences or bridge removal conferences may be included as a part of this conference.

After the safety critical element conference, and prior to beginning work on the safety critical element, the Contractor shall submit a final construction plan to the Engineer for record purposes only. The Contractor's Engineer shall sign and seal temporary works, such as falsework, shoring etc., related to construction plans for the safety critical elements, (3) Removal of Bridge, (4) Removal of Portion of Bridge and (5) Temporary Works. The final construction plan shall be stamped "Approved for Construction" and signed by the Contractor.

The Contractor shall perform safety critical work only when the Engineer is on the project site. The Contractor's Engineer shall be on site to inspect and provide written approval of safety critical work for which he provided signed and sealed construction details. Unless otherwise directed or approved, the Contractor's Engineer need not be on site during the actual performance of safety critical work, but shall be present to conduct inspection for written approval of the safety critical work.

When ordered by the Engineer, the Contractor shall immediately stop safety critical work that is being performed in an unsafe manner or will result in an unsafe situation for the traveling public. Prior to stopping work, the Contractor shall make the situation safe for work stoppage. The Contractor shall submit an acceptable plan to correct the unsafe process before the Engineer will authorize resumption of the work.

When ordered by the Engineer, the Contractor shall remove workers from the project that are performing the safety critical work in a manner that creates an unsafe situation for the public in accordance with subsection 108.06.

Should an unplanned event occur or the safety critical operation deviate from the submitted plan, the Contractor shall immediately cease operations on the safety critical element, except for performing any work necessary to ensure worksite safety, and provide proper protection of the work and the traveling public. If the Contractor intends to modify the submitted plan, he shall submit a revised plan to the Engineer prior to resuming operations.

All costs associated with the preparation and implementation of each safety critical element construction plan will not be measured and paid for separately, but shall be included in the work.

Nothing in the section shall be construed to relieve the Contractor from ultimate liability for unsafe or negligent acts or to be a waiver of the Colorado Governmental Immunity Act on behalf of the Department.

REVISION OF SECTION 107  
LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

Section 107 of the Standard Specifications is hereby revised for this project as follows:

Subsection 107.07 shall be revised to include the following:

Prior to working adjacent to driveways, the contractor shall confirm the work schedule with property owner 3 business days in advance of the work.

Access to residence and businesses shall be maintained at all times unless arrangements are made with the property owner and a copy of the written agreement is provided to the Project Engineer.

Subsection 107.15 shall be revised to include the following:

- (i) All insurance policies identified in this section shall name Boulder County and CDOT as additional insured.

Subsection 107.17 shall include the following:

The Contractor shall be responsible for any damages done by the Contractor that is outside the scope of this work, including but not limited to irrigation facilities, landscaping, or private property. The Contractor shall be responsible for returning damages to their original condition at no cost to the project.

REVISION OF SECTION 107  
PROTECTION OF EXISTING VEGETATION

Section 107 of the Standard Specifications is hereby revised for this project as follows:

Subsection 107.12 shall include the following:

- A. The Contractor shall save all existing vegetation in this area, except for those trees and shrubs which must be removed to accommodate construction of the project.
- B. The Contractor shall perform all the work in such a manner that the least environmental damage will result. All questionable areas or items shall be brought to the attention of the Engineer for approval prior to removal or any damaging activity. Trees and/or shrubs that are damaged during construction but could have been saved shall be replaced at the expense of the Contractor.
- C. The Contractor shall make every effort to maintain adjacent property and landscaping during construction. Any damage to adjacent property resulting from the Contractor's manner or method of execution of the work, shall be promptly replaced or restored to pre-construction condition by the Contractor at the Contractor's expense. Any damage to adjacent property deemed unavoidable by the engineer during construction shall be replaced or restored to pre-construction condition by the Contractor and paid for as F/A Landscaping. The contractor shall promptly report any vegetation damaged or scarred during construction to the Engineer for assessment of damages.
- D. The following measures shall be taken to protect existing trees adjacent to the project:
  1. Fencing material shall encircle any trees whose outer drip line edge is within 20 feet of any construction activities. The fencing material shall be bright, contrasting color, durable, and a minimum of 4 feet in height. Posts used shall be comparable to metal T-post or heavier weight, and placed to a depth of no less than 2 feet below ground level. Fencing material shall be placed at the drip line or 15 feet from tree trunk, whichever is greater, and maintained in an upright position throughout the duration of construction activities.
  2. No material shall be placed or piled within the drip line of existing trees. No heavy objects such as wood pallets, metal railings, etc., shall lean against or come into contact with tree trunks.
  3. When root cutting is unavoidable, a clean sharp cut shall be made to avoid shredding or smashing. Exposed roots shall be covered immediately to prevent desiccation. Where roots will be cut in a straight line, such as behind a curb or along a sidewalk, a saw such as a concrete saw with a sharp blade that penetrates 1 foot shall be used on top of the ground prior to excavating so that the roots are not torn or smashed during excavation.
  4. Sidewalk and pavement should be contoured sufficiently to avoid cutting surface tree roots. Whenever possible, tree roots should be bridged or floated over with walks.
- E. Measurement and Payment: All work necessary as defined in the specifications to protect the existing vegetation shall not be paid for separately, but shall be included in the cost of the work, except Fence (Plastic) which will be paid by the linear foot.

REVISION OF SECTION 107  
STORMWATER CONSTRUCTION PERMIT

Section 107 of the Standard Specifications is hereby revised for this project as follows:

Subsection 107.25(c) shall include the following:

The Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP) shall be obtained by the contractor.

REVISION OF SECTION 107  
AIR QUALITY CONTROL

**Section 107** of the Standard Specifications is hereby revised for this project as follows:

**Subsection 107.24, Air Quality Control**, shall include the following:

Equipment Emissions

Boulder County projects shall meet or exceed current Colorado Air Quality standards. The project work shall be performed using practices that minimize air quality detriments during construction. All the standards below shall be followed to improve air quality related to this project:

- 1) Emissions standards:
  - a. Optimally, electric or hybrid powered equipment or vehicles will be used on all projects.
  - b. Equipment engines shall be compliant with the most recent Environmental Protection Agency (EPA) requirements.
  - c. Contractors are required to maintain a minimum emissions level for diesel fueled equipment at a Tier 3 level.
  - d. Contractors shall provide certification of compliance with diesel emissions standards. Failure to do so will result in immediate stoppage of work, and is a non-excusable delay per subsection 108.08(c)2.
  - e. All diesel vehicles, construction equipment, and generators on site shall be fueled with ultra-low sulfur diesel fuel (ULSD) or a biodiesel (B20) blend approved by the original engine manufacturer with sulfur content of 15 ppm or less.
- 2) Proximity: Any project within 1000 linear feet of a residence or regular gathering location of multiple people (i.e., schools, parks, places of worship, commercial buildings, etc.) is required to have either electric, hybrid or Tier 4 diesel powered equipment or vehicles.
- 3) Exemption: Emergency equipment is exempt from this specification. All reasonable effort will be made to replace equipment placed in service at the beginning of the emergency work with equipment as specified above as soon as possible.
- 4) Unless shown otherwise in the bid tabulation for this project, costs to achieve this specification will be included in the overall cost of the project.
- 5) Definition: Vehicle, for the purposes of this specification, is defined as any diesel-powered company owned car or truck. It does not apply to personal vehicles.

REVISION OF SECTION 108  
PROSECUTION AND PROGRESS

Section 108 of the Standard Specifications is hereby revised for this project as follows:

At the weekly progress meetings, the Contractor shall submit a written statement of planned activities and anticipated inspection, testing and surveying requirements for the upcoming week. The Contractor shall provide a twenty-four hour notice to the Engineer if the Contractor elects to change a planned activity.

Working hours shall be between the hours of 8:00 a.m. and 4:30 p.m., Mondays through Fridays. Working outside of these hours will only be permitted with written approval from the County Engineer.

In the event that the Contractor received approval to work additional hours for his convenience, the Contractor shall reimburse the County for the cost of providing additional engineering and inspections services. The reimbursement to the County will be at a rate of \$65.00 per hour for each County employee required to be on the job site. This cost will be deducted from any money due the Contractor.

REVISION OF SECTION 109  
MEASUREMENT AND PAYMENT

Section 109 of the Standard Specifications is hereby revised for this project as follows:

In subsection 109.06 (a), 1<sup>st</sup> paragraph, delete the 2<sup>nd</sup> sentence and replace with the following:

The amount to be retained will be 10% of the value of the completed work, to a maximum of 5% of the original contract amount.

Delete subsection 109.07 and replace with the following:

Partial monthly payments to the Contractor for completed work will include payment only for materials actually incorporated in the Work.

REVISION OF SECTION 201  
CLEARING AND GRUBBING

Section 201 of the Standard Specifications is hereby revised for this project as follows:

Subsection 201.01 shall include the following:

Clearing and grubbing includes the removal and disposal of miscellaneous debris within the project limits and includes but is not limited to the following: trees 6-inches in diameter or less, branches, trunks, shrubs, all tree stumps regardless of size (unless otherwise paid for separately as indicated in the plans), trimming of trees, plant materials, miscellaneous landscaping materials, sod, riprap, rock cobble, and all other materials within the work area not otherwise listed as a pay item. This work also includes the preservation from injury or defacement of all vegetation and objects designated to remain. The Contractor and Engineer shall establish environmental limits during walk through. No trees, shrubs, plants, grasses, and other vegetation shall be removed until marked and approved by the Engineer.

Subsection 201.04 shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Clearing and Grubbing	Lump Sum

Trimming of trees, removal of trees 6-inches in diameter or less and their stumps, the removal of branches, trunks, shrubs, plant materials, miscellaneous landscaping materials, and sod will not be paid for separately but shall be included in the work. Chipping, hauling, and disposal of removed materials will not be paid for separately but shall be included in the work.



REVISION OF SECTION 202  
RECLAIMED ASPHALT PAVEMENT MILLINGS

Section 202 of the Standard Specifications is hereby revised for this project as follows:

Subsection 202.09 shall include the following:

The Contractor shall take possession of all the Reclaimed Asphalt Pavement (RAP) millings removed from the existing asphalt mat on this project. Remaining RAP millings, if any, may be used in the project as allowed in the Contract or as approved by the Engineer. Otherwise, they shall become the property of the Contractor and shall be disposed of at his expense outside the project limits.

Subsection 202.12 shall include the following:

Unless otherwise specified in the Contract, the disposal and hauling of the RAP millings to other locations or its use on the project or at other locations will not be measured and paid for separately, but shall be included in the work.

REVISION OF SECTION 202  
REMOVAL OF PAVEMENT MARKINGS

Section 202 of the Standard Specifications is hereby revised for this project as follows:

Subsection 202.11 shall be revised as follows:

Delete the second and third paragraph and replace with:

Removal of existing or temporary pavement markings will not be measured and paid for separately, but shall be included in the work. Sandblasting of pavement that is to be covered with pavement marking material will not be measured and paid for separately but shall be included in the work.

Any additional existing pavement markings that conflict with proposed construction traffic control shall be removed as required and included in item 630, Traffic Control.

Prior to removal of any existing striping, the contractor will submit to the engineer a method of removal statement for approval. This method statement must include grinding method including dust mitigation and must minimize the scarring on the existing pavement.

REVISION OF SECTION 202  
CLEAN CULVERT

Revise Section 202 of the Standard Specifications for this project as follows:

Subsection 202.01 shall include the following:

This work consists of cleaning, removing, and disposing of sediment and other debris in the storm drain inlets and culverts at locations shown on the plans.

Subsection 202.10 shall include the following:

Before cleaning operations, remove and store all grates and other appurtenances from the inlet or culvert pipe.

Perform culvert cleaning using a vacuum truck method as approved. Use a high-pressure washer to strip off all soil sediment and other debris accumulated on the structure's walls. Suction the mix of water and debris out of the structure and into the vacuum truck. Dispose of removed material at a suitable facility located off the project site per applicable regulations and guidelines. The remaining material left in the structure after cleaning shall be removed at the Contractor's expense. Document and provide in writing the total amount of material removed.

Replace all damaged or missing bolts for the grates and other appurtenances. Upon completing cleaning, treat existing and new bolts required for the grates and other appurtenances with anti-seize compound. Then, reinstall the grate and appurtenances using the treated bolts.

If debris accumulates in clean structures during construction, reclean structures at the Contractor's expense.

Subsection 202.11 shall include the following:

Measure Clean Culvert by the actual number of existing culvert pipes and inlets that are cleaned and accepted. Cleaning of drainage pipe between inlets, barrier drain holes, and flaps, when required, will not be measured or paid for separately; include it in the work price.

Subsection 202.12 shall include the following:

Pay under:

<b>Pay Item</b>	<b>Pay Unit</b>
Clean Culvert	Each

Payment will consist of full compensation for all labor, materials, and equipment required to clean, maintain, remove, and dispose of sediment and other debris from storm drain inlets and culverts prior to construction.

The amount of anti-seize compound and new bolts required will not be measured and paid for separately; include it in the work price.

The quantity of debris and water disposal will not be measured and paid for separately; include it in the work price.

The amount of water required for pressure washing will not be measured and paid for separately; include it in the work price.

REVISION OF SECTION 203  
EMBANKMENT MATERIAL

Section 203 of the Standard Specifications is hereby revised for this project as follows:

Subsection 203.03, first paragraph, shall include the following:

Embankment material shall meet the following requirements:

The upper 2 feet of embankment material below the subgrade elevation shall have a resistance value of at least 7 when tested by the Hveem Stabilometer or the equivalent resilient modulus.

REVISION OF SECTION 203  
EXCAVATION AND EMBANKMENT

**Section 203** of the Standard Specifications is hereby revised for this project as follows:

Subsection 203.05 (b), first paragraph, shall include the following:

Excess material that must be removed from the project shall become the property of the Contractor and disposed of outside the project limits.

The Contractor shall make all arrangements to obtain any required agency permit(s) and written permission from property owners for disposal locations outside the limits of the project, within unincorporated Boulder County.

Disposal of more than 50 cubic yards of unclassified excavation within unincorporated Boulder County may qualify for one of the following review processes: Grading Permit, Site Plan Review, Site Plan Review Waiver, or Limited Impact Special Review, per Boulder County Land Use. Copies of the permit(s) and written permission shall be furnished to the Engineer before the disposal area is used.

Subsection 203.12 shall include the following:

Payment for Unclassified Excavation and Unclassified Excavation (Complete in Place) shall also include costs associated with obtaining any necessary permits or written permissions and will not be paid separately.

REVISION OF SECTION 207  
 TOPSOIL

Section 207 of the Standard Specifications is hereby revised for this project as follows:

Subsection 207.02 shall include the following:

The source of imported topsoil for this project is undesignated. Topsoil shall be fertile, friable, and of a USDA texture listed as "Suitable" below. Topsoil shall be free of any admixture of subsoil or slag and shall be free of stones, lumps, refuse, plants or their roots, sticks, noxious weeds, salts, soil sterilants or other material detrimental to plant growth. Imported topsoil shall be obtained from a well-drained site that is free of flooding. Topsoil shall not be collected at the supplier's facility, delivered or used onsite in any manner while in a frozen or muddy condition. The topsoil shall be delivered in an un-compacted state, and shall be spreadable in even un-clodded layer(s).

All imported topsoil shall be approved at its source by the City of Boulder's Project Manager's representative prior to delivery or placement in planting areas. Should noxious weeds be present at the topsoil source, the City's representative will make recommendations (including rejection of the material) to the Contractor as to an appropriate action plan prior to, during, and after delivery to the project site. The Contractor shall supply a sample of topsoil to the Colorado State University Soil Testing Laboratory for analysis a minimum of thirty (30) days prior to delivery of topsoil to the project site. The Contractor shall submit to the City of Boulder Project Manager a Certificate of Compliance from the CSU Soil, Water, and Plant Testing Laboratory verifying organic matter content, pH, sodium absorption ratio, electrical conductivity and nutrient levels. The Contractor shall also contact the City of Boulder Project Manager to inspect and approve all planting areas and topsoil stockpile areas prior to delivery or placement of topsoil.

Topsoil shall meet the mechanical analysis outlined in the following table:

(a) Topsoil Mechanical Analysis

<u>Screen</u>	<u>Passing percent</u>	<u>Retained percent</u>
1 inch screen	100%	0-0%
½ inch screen	97-100%	0-3%

Contractor supplied topsoil shall meet the following criteria:

<u>Property</u>	<u>Minimum Value</u>	<u>Maximum Value</u>
pH	6.0	8.0
Sodium Absorption Ratio	none	13.0
Salts (electrical conductivity)	none	4.0 mmhos/cm
Organic Matter	2%	10%
*Exchangeable Sodium %	none	15%
Calcium carbonate %	none	10%

$$*\text{Exchangeable Sodium \%} = \frac{\text{Exchangeable Sodium (Na) as meq/100 gm}}{\text{Cation Exchange Capacity (CEC) as meq/100 gm}} \times 100$$

Suitable USDA Texture- sandy loam, sandy clay loam, loam, clay loam, silt loam.  
 Unsuitable USDA Texture- sand, loamy sand, silt, silty clay loam, silty clay, sandy clay, clay.

REVISION OF SECTION 207  
TOPSOIL

*\*Texture as determined by hydrometer analysis and classified using U.S. Dept. of Agriculture (USDA) texture class names.*

The topsoil may be amended to bring it into conformance with these specifications. This amended topsoil is subject to approval before use.

Topsoil shall contain the following minimum ammonium DTPA (chelate) extractable nutrients (this is the extractable solution used by CSU Soil, Water and Plant Testing Laboratory).

Nitrogen	3 ppm (Air Dried Basis)
Phosphorus	3 ppm
Potassium	30 ppm
Iron (Fe)	5 ppm

Topsoil shall not include any minerals or elements in abundances detrimental to plant growth. All rocks and debris larger than 1 ½ inches in diameter that are visible after the topsoil is spread shall be removed and disposed of in an appropriate manner offsite or in a location pre-approved by the City of Boulder Project Manager.

Subsection 207.03 shall include the following:

Topsoil meeting project specifications shall be placed by the Contractor in all formal landscape planting areas and medians to a finished depth of 24 inches to be measured from 4 inches below proposed finish grades in order to accommodate the specified depth of wood mulch for all planter beds.

The Contractor is responsible for the following activities:

- i) Protecting finish grade areas and re-grading to correct any irregularities caused by hauling materials or other construction activity over finish grade areas. The Contractor shall replenish any planting areas found deficient of topsoil.
- ii) Repairing any erosion or other damage resulting from weathering action before final acceptance.

Any planting areas receiving topsoil placement shall be finished smoothly, properly compacted and free from irregular surface changes. The Contractor shall finish all planting areas by hand methods if a satisfactory finish cannot be completed with power equipment.

Finish grading shall conform to the grade elevations as shown on the approved engineered grading plans and shall be free of debris and other materials that would be detrimental to the plantings. Settling of any finish grade shall not be more than 0.10 feet; if settling is greater, the Contractor shall bring the grade to specified elevations by addition of topsoil.

**Subgrade Soil Preparation.** Before placement of topsoil, the subgrade shall be ripped to a minimum depth of 14 inches. Subgrade shall be mostly dry and friable. Subgrade shall crumble without sticking together, yet not be so dry and hard that it does not break apart easily.

Underground utilities shall be located prior to soil preparation.

Subgrade soil preparation equipment shall meet the requirements for either winged tip or parabolic shanks.

REVISION OF SECTION 207  
TOPSOIL

Operation shall be performed to fracture the soil uniformly without lifting or furrowing the surface excessively. The Contractor shall submit a method statement for subgrade soil preparation other equipment will be considered.

1. Winged tip shanks (dozer equipment) shall be a minimum of 6 inches wide and have 2 inches of vertical profile change on the blade with a 40 – 60-degree sweep angle.

The Contractor shall calibrate the subgrade soil preparation equipment using a minimum 30 linear feet of the initial pass. The Contractor shall utilize the rod penetrometer to verify that that de-compaction was successfully done. The Contractor shall take penetration measurements every 6 inches across a transect perpendicular to the direction of the tractor and spanning the width of the subgrade soil preparation. Depths of penetration shall confirm that a minimum of 12 inches can be achieved without reaching 300 psi on the rod penetrometer pressure gage (approximately 30 pounds of pressure on the T-handle).

Existing subgrade shall be de-compacted to a depth of 14 inches. If multiple passes are needed, the subsequent passes shall be positioned so that the ripping equipment (subsoilers) from the previous pass are split by the subsequent pass. Following ripping, the Contractor shall remove all sticks, stones, debris, clods, and all other substances greater than 6 inches in diameter. The Contractor shall restrict motorized vehicle and foot traffic from passing over the ripped area since this would recompact the areas that received subgrade soil preparation.

The first 4 feet from the edge of pavement shall be ripped to a depth of 6 inches. If the project is going to use aggregate base course or recycled asphalt as a shouldering technique, those areas will not require subgrade soil preparation. Depth of soil ripping for the subgrade soil preparation shall be checked with the rod penetrometer.

The Contractor shall verify adequate de-compaction of the entire area to have topsoil placed using a rod penetrometer in the presence of the Engineer. Tests shall be performed at a minimum of ten random locations per each acre as selected by the Engineer. The Test shall verify that a depth of 12 inches of penetration into the soil can be achieved without reaching 300 psi on the rod penetrometer pressure gage (approximately 30 pounds of pressure on the T-handle). If this depth cannot be achieved for 80 percent of the penetrations, the Contractor shall re-rip the area at no additional cost to the Department.



REVISION OF SECTION 207  
TOPSOIL

Subsection 207.05 shall include the following:

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Topsoil	Cubic Yard
Subgrade Soil Preparation	Square Yard

The addition of manure or soil amendments needed to bring the topsoil into conformance with the specifications, importing topsoil from other sources, and any testing cost associated with this topsoil will not be measured and paid for separately, but shall be included in the work.

REVISION OF SECTION 208  
SWEEPING (SEDIMENT REMOVAL)

Section 208 of the Standard Specifications is hereby revised for this project as follows:

Subsection 208.01 shall include the following:

This work includes 40 hours of the total 120 hours of removal and disposal of debris on the roadway that shall be performed using a street sweeper truck.

Subsection 208.03 shall include the following:

Street-sweeper trucks shall utilize a broom sweeper and be water-filled for dust suppression. The vehicle must be equipped with safety lights. All vehicles are subject to the approval of the Engineer.

Subsection 208.12 shall include the following:

Hours for equipment that is inoperative due to breakdown will not be paid for. Time involved in moving onto or off the project site will not be measured and paid for.

Water used as dust suppression will be incidental to the pay item.

40 hours of general project street sweeping shall be included in the work as described under this specification and as directed by the Engineer.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Sweeping (Sediment Removal)	Hour

**REVISION OF SECTION 208  
 EROSION CONTROL**

Section 208 of the Standard Specifications is hereby revised as follows:

Subsection 208.02(h) shall be replaced with the following:

All erosion logs shall be biodegradable. Photodegradable will not be accepted.

(h) Erosion log. Shall be one of the following types unless otherwise shown on the plans:

- (1) Erosion Log (Type 1) shall be curled aspen wood excelsior with a consistent width of fibers evenly distributed throughout the log. The casing shall be seamless, 100% bio-degradable tube netting sewn together with cotton, biodegradable thread and shall have minimum dimensions shown in Table 208-1, based on the diameter of the log called for on the plans.. The curled aspen wood excelsior shall be fungus free, resin free, and free of growth or germination inhibiting substances.
- (2) Erosion Log (Type 2) shall consist of a blend of 30-40 percent weed free compost and 60-70 percent wood chips. The compost/wood blend material shall pass a 50 mm (2 inch) sieve with a minimum of 70 percent retained on the 9.5 mm (3/8 inch) sieve and comply to subsection 212.02 for the remaining compost physical properties. The compost/wood chip blend may be pneumatically shot into a geotextile cylindrical bag or be pre-manufactured. The geotextile bag shall be 100% bio-degradable tube netting sewn together with cotton, biodegradable thread and have openings of 1/8 to 3/8 inches and contain the compost/wood chip material while not limiting water infiltration.

Erosion log (Type 1 and Type 2) shall have minimum dimensions as shown in Table 208-1, based on the diameter of the log.

**Table 208-1  
 NOMINAL DIMENSIONS OF EROSION LOGS**

Diameter Type 1 (Inches)	Diameter Type 2 (Inches)	Length (feet)		Weight (minimum) (pounds/foot)	Stake Dimensions (Inches)
		Min.	Max.		
9	8	10	180	1.6	1.5 by 1.5 (nominal) by 18
12	12	10	180	2.5	1.5 by 1.5(nominal) by 24
20	18	10	100	4.0	2 by 2 (nominal) by 30

Stakes to secure erosion logs shall consist of pinewood or hardwood.

Subsection 208.02 (k) shall include the following:

Prior to the initial arrival onto the project site, all equipment shall be thoroughly power washed, including the undercarriages and tires. Equipment must be clean of mud, vegetative matter, and other debris to prevent importation of non-native and noxious weed seeds from other project sites.

REVISION OF SECTION 208  
EROSION CONTROL

Subsection 208.12 shall include the following:

Payment will be made under:

<b><u>Pay Item</u></b>	<b><u>Pay Unit</u></b>
Erosion Log (Type 1) (Biodegradable) (12 Inch)	Linear Foot

REVISION OF SECTION 209  
WATERING AND DUST PALLIATIVES

Section 209 of the Standard Specifications is hereby revised for this project as follows:

Subsection 209.08 paragraph two shall be revised as follows:

Water required for all items of work will not be measured and paid for separately, but shall be included in the work, except that water ordered for the benefit or safety of the public will be measured and paid for separately in accordance with the Contract.

REVISION OF SECTION 213  
MULCHING

Section 213 of the Standard Specification is hereby revised as follows:

Subsection 213.02 shall include the following:

All delivered and stored materials must be in in original, unopened and labeled containers.

Subsection 213.02 (a), first paragraph, first sentence shall be deleted and replaced as follows:

Materials for mulching shall consist of Certified Weed Free field or marsh hay or straw of, wheat, sorghum, sorghum-sudan, milo, or millet certified under the Colorado Department of Agriculture Weed Free Forage Certification Program as “Weed Free Mulch” and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5, CRS. Unacceptable straw mulch materials include: barley and rye. Preference will be given to straw from irrigated fields and to straw from current or previous year’s harvest. Each certified weed free mulch bale shall be identified by one of the following:

- (1) One of the ties binding the bale shall consist of blue and orange twine, or
- (2) The bale shall have a regional Forage Certification Program tab indicating the Regional Forage Certification Program Number.”

In addition to the weed free requirements above, mulching containing cheatgrass (*Bromus tectorum* and *Bromus japonicas*), kochia (*Bassia scoparia*) or prickly lettuce (*Lactuca serriola*) will not be accepted.

Subsection 213.02 (a), fourth paragraph shall be deleted and replaced as follows:

The Contractor shall provide a transit certificate for each truckload that has been filled out and signed by the grower and by the Department of Agriculture inspector. The transit certificate shall contain the inspection certificate number, the producer’s name, the type of mulch, the origin, and the quantity purchased in number of bales and estimated weight.

Subsection 213.02 (a), sixth paragraph shall include the following:

Wet, moldy, opened or broken packages or materials will not be accepted

Subsection 213.02 (g), the ground cover requirement for Bonded Fiber Matrices (BFM) shall be replaced with 100%.

Subsection 213.02 (g), the application rate shown in the table for Bonded Fiber Matrices (BFM) shall be replaced with 3200 lbs/Acre.

Subsection 213.02 (b) shall include the following:

The bonded fiber matrix shall be applied in successive layers as to achieve 100% coverage of all soils, and the matrix shall have no holes greater than 1mm. Application must be applied in at least two angles to meet cover requirements this application shall be strictly required.

Subsection 213.03 shall include the following:

No work shall occur when soil is extremely wet.

REVISION OF SECTION 213  
MULCHING

Subsection 213.03(a) shall include the following:

Straw mulch or native hay shall be applied at a rate of 3000 pounds per acre.

Subsection 213.03 (b) delete the second paragraph and replace with the following:

Apply the hydromulch and tackifier mixture at the following rate:

<b>Wood Cellulose Fiber Mulch</b>	<b>Tackifier</b>
3000 lbs./Acre	80 lbs./Acre

**REVISION OF SECTION 216  
 SOIL RETENTION COVERING**

Section 216 of the Standard Specifications is hereby revised as follows:

Subsection 216.01 shall be replaced with the following:

This work consists of furnishing, preparing, applying, placing, and securing soil retention blankets for erosion control on roadway slopes or channels as designated in the Contract

Subsection 216.02 shall be replaced with the following:

Soil retention covering shall be a soil retention blanket as specified in the Contract. All soil retention coverings shall be biodegradable. Photodegradable will not be accepted. Soil Retention Covering shall conform to the following:

Biodegradable blanket is specified, the thread shall be 100 percent biodegradable; polypropylene thread is not allowed.

Blankets and nettings shall be non-toxic to vegetation and shall not inhibit germination of native seed mix as specified in the Contract. The materials shall not be toxic or injurious to humans.

Soil Retention Blanket shall be a machine produced mat consisting of 100 percent coconut fiber. The netting shall be biodegradable. The top and bottom netting shall be 100 percent biodegradable organic jute fiber. Netting shall be constructed using a weave which is unattached at the intersections, and which allows the strands of the net to move independently of each other.

The Blanket shall have, at a minimum, the following physical requirements:

- Roll Width: 6.5 ft
- Thickness, per ASTM D6525, 300 mils
- Matrix Fill Material 100% Coconut
- Mass per Unit Area, per ASTM D6475, 26 oz/sy
- Minimum Tensile Strength, per ASTM D4595, 1968 lb/ft
- Minimum Open Area, 36%
- Open Weave shall be a minimum of 0.5in x0.5 inch.
- Biodegradable Class 2

**TABLE 216-1  
 PERFORMANCE REQUIREMENTS FOR  
 SOIL RETENTION BLANKET – BIODEGRADABLE BLANKET**

Biodegradable Class	Slope Application “C” Factor <sup>1</sup> ASTM D6459	Minimum Tensile Strength MD <sup>2</sup> ASTM D6818
2	<0.1 at 3:1	10.42 lb/in
Notes: 1. “C” Factor is calculated as ratio of soil loss from soil retention blanket protected slope (tested as specified or greater gradient, 3H:1V) to ratio of soil loss from unprotected (control) plot in large-scale testing. 2. MD is for machine direction testing (along the length of the roll).		



REVISION OF SECTION 216  
SOIL RETENTION COVERING

Blankets shall be tested for physical properties and have published data from an independent testing facility.

Large scale testing of Slope Erosion Protection (“C” factor) shall be performed by an independent testing facility.

Subsection 216.08 shall include the following:

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Soil Retention Blanket (Coconut) (Biodegradable)	Square Yard

SECTION 240  
PROTECTION OF MIGRATORY BIRDS  
BIOLOGICAL WORK PERFORMED BY THE CONTRACTOR'S BIOLOGIST

Section 240 is hereby added to the Standard Specifications for this project as follows:

**DESCRIPTION**

**240.01** This work consists of protecting migratory birds during construction.

**MATERIALS AND CONSTRUCTION REQUIREMENTS**

**240.02** The Contractor shall schedule clearing and grubbing operations and work on structures to avoid taking (pursue, hunt, take, capture or kill; attempt to take, capture, kill or possess) migratory birds protected by the Migratory Bird Treaty Act (MBTA). The Contractor shall retain a qualified wildlife biologist for this project. The wildlife biologist shall have a minimum of three years experience conducting migratory bird surveys and implementing the requirements of the MBTA. The Contractor shall submit documentation of the biologist's education and experience to the Engineer for acceptance. A biologist with less experience may be used by the Contractor subject to the approval of the Engineer based on review of the biologist's qualifications.

The wildlife biologist shall record the location of each protected nest, bird species, the protection method used, and the date installed. A copy of these records shall be submitted to the Engineer.

(a) *Vegetation Removal.* When possible, vegetation shall be cleared prior to the time when active nests are present. Vegetation removal activities shall be timed to avoid the migratory bird breeding season which begins on April 1 and runs to August 31. All areas scheduled for clearing and grubbing between April 1 and August 31 shall first be surveyed within the work limits for active migratory bird nests. The Contractor's wildlife biologist shall also survey for active migratory bird nests within 50 feet outside work limits. Contractor personnel shall enter areas outside CDOT right of way only if a written, signed document granting permission to enter the property has been obtained from the property owner. The Contractor shall document all denials of permission to enter property. The Contractor shall avoid all active migratory bird nests. The Contractor shall avoid the area within 50 feet of the active nests or the area within the distance recommended by the biologist until all nests within that area have become inactive. Inactive nest removal and other necessary measures shall be incorporated into the work as follows:

1. *Tree and Shrub Removal or Trimming.* Tree and shrub removal or trimming shall occur before April 1 or after August 31 if possible. If tree and shrub removal or trimming will occur between April 1 and August 31, a survey for active nests shall be conducted by the wildlife biologist within the seven days immediately prior to the beginning of work in each area of tree and shrub removal or trimming. The survey shall be conducted for each phase of tree and shrub removal or trimming.

If an active nest containing eggs or young birds is found, the tree or shrub containing the active nest shall remain undisturbed and protected until the nest becomes inactive. The nest shall be protected by placing fence (plastic) a minimum distance of 50 feet from each nest to be undisturbed. This buffer dimension may be changed if determined appropriate by the wildlife biologist and approved by the Engineer. Work shall not proceed within the fenced buffer area until the young have fledged or the nests have become inactive.

If the fence is knocked down or destroyed by the Contractor, the Engineer will suspend the work, wholly or in part, until the fence is satisfactorily repaired at the Contractor's expense. Time lost due to such suspension will not be considered a basis for adjustment of time charges, but will be charged as contract time.

SECTION 240  
PROTECTION OF MIGRATORY BIRDS  
BIOLOGICAL WORK PERFORMED BY THE CONTRACTOR'S BIOLOGIST

2. *Grasses and Other Vegetation Management.* Due to the potential for encountering ground nesting birds' habitat, if work occurs between April 1 and August 31, the area shall be surveyed by a wildlife biologist within the seven days immediately prior to ground disturbing activities.

The undisturbed ground cover to 50 feet beyond the planned disturbance, or to the right of way line, whichever is less, shall be maintained at a height of 6 inches or less beginning April 1 and continuing until August 31 or until the end of ground disturbance work, whichever comes first.

If birds establish a nest within the survey area, an appropriate buffer of 50 feet will be established around the nest by the CDOT biologist. This buffer dimension may be changed if determined appropriate by the CDOT biologist and approved by the Engineer. The Contractor shall install fence (plastic) at the perimeter of the buffer. Work shall not proceed within the buffer until the young have fledged or the nests have become inactive.

If the fence is knocked down or destroyed by the Contractor, the Engineer will suspend the work, wholly or in part, until the fence is satisfactorily repaired at the Contractor's expense. Time lost due to such suspension will not be considered a basis for adjustment of time charges, but will be charged as contract time.

The wildlife biologist shall conduct raptor nest surveys within 0.5 mile of the construction site prior to the start of construction and prior to each construction phase. This survey can be done with binoculars. If construction activities are located within the Colorado Division of Wildlife (CDOW) recommended buffer zone for specific raptors, "NO WORK" zones shall be established around active sites during construction according to the CDOW standards or as recommended by the wildlife biologist in consultation with the CDOW. The "NO WORK" zone shall be marked with either fencing or signing. Work shall not proceed within a "NO WORK" zone until the wildlife biologist has determined that the young have fledged or the nest is unoccupied.

- (b) *Work on structures.* The Contractor shall prosecute work on structures in a manner that does not result in a taking of migratory birds protected by the Migratory Bird Treaty Act (MBTA). The Contractor shall not prosecute the work on structures during the primary breeding season, April 1 through August 31, unless he takes the following actions:
- (1) The Contractor shall remove existing nests prior to April 1. If the Contract is not awarded prior to April 1 and CDOT has removed existing nests, then the monitoring of nest building shall become the Contractor's responsibility upon Notice to Proceed.
  - (2) During the time that the birds are trying to build or occupy their nests, between April 1 and August 31, the Contractor shall monitor the structures at least once every three days for any nesting activity.
  - (3) If the birds have started to build any nests, they shall be removed before the nest is completed. Water shall not be used to remove the nests if nests are located within 50 feet of any surface waters.
  - (4) Installation of netting may be used to prevent nest building. The netting shall be monitored and repaired or replaced as needed. Netting shall consist of a mesh with openings that are ¾ inch by ¾ inch or less.

If an active nest become established, i.e., there are eggs or young in the nest, all work that could result in abandonment or destruction of the nest shall be avoided until the young have fledged or the nest is unoccupied as determined by the wildlife biologist and approved by the Engineer. The Contractor shall prevent construction activity from displacing birds after they have laid their eggs and before the young have fledged.

SECTION 240  
PROTECTION OF MIGRATORY BIRDS  
BIOLOGICAL WORK PERFORMED BY THE CONTRACTOR'S BIOLOGIST

If the project continues into the following spring, this cycle shall be repeated. When work on the structure is complete, the Contractor shall remove and properly dispose of netting used on the structure.

- (c) *Taking of a Migratory Bird.* The taking of a migratory bird shall be reported to the Engineer. The Contractor shall be responsible for all penalties levied by the U. S. Fish and Wildlife Service (USFWS) for the taking of a migratory bird.

**METHOD OF MEASUREMENT**

**240.03** Wildlife Biologist will be measured by the actual authorized number of hours a wildlife biologist is on site performing the required tasks.

Removal of nests will be measured by the actual number of man-hours spent removing inactive nests just prior to and during the breeding season, April 1 through August 31. During this period, the Contractor shall submit to the Engineer each week for approval a list of the workers who removed nests and the number of hours each one spent removing nests.

Netting will be measured by the square yard of material placed to keep birds from nesting on the structure. Square yards will be calculated using the length of netting measured where it is attached to the ground and the average height of the netting where it is attached to the structure.

**BASIS OF PAYMENT**

**240.04** The accepted quantities measured as provided above will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Wildlife Biologist	Hour
Removal of Nests	Hour
Netting	Square Yard

Payment for Wildlife Biologist will be full compensation for all work and materials required to complete the item, including wildlife biologist, wildlife survey, and documentation (record of nest location and protection method)

Payment for Removal of Nests will be full compensation for all work and material required to complete the work.

Payment for netting will be full compensation for all work and material required to complete the item. Overlaps of netting will not be measured and paid for separately, but shall be included in the work. Maintenance and replacement, removal, and disposal of netting will not be measured and paid for separately, but shall be included in the work.

Clearing and grubbing will be measured and paid for in accordance with Section 201. Mowing will not be measured and paid for separately, but shall be included in the work.

Removal and trimming of trees will be measured and paid for in accordance with Section 202.

Fence (Plastic) will be measured and paid for in accordance with Section 607

REVISION OF SECTION 304  
AGGREGATE BASE COURSE

Section 304 of the Standard Specifications is hereby revised for this project as follows:

Subsection 304.02 shall include the following:

Materials for the subbase shall be Aggregate Base Course (Class 6) 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 respectively when tested by the Hveem Stabilometer method.

REVISION OF SECTION 310  
FULL DEPTH RECLAMATION OF HOT MIX ASPHALT

**Section 310** is hereby added to the Standard Specifications as follows:

**DESCRIPTION**

**310.01** This work will be specified as a total reclamation processed depth as shown on the plans (8" or 12"). Existing asphalt thicknesses vary but are average depth of 3". This work consists of cutting of the existing asphalt mat, pulverizing the existing asphalt mat, mixing the pulverized asphalt mat with the existing subbase, existing base course, or combination thereof, to a depth of 8" or 12" (as shown on the plans), grading and compacting the mixed material, in accordance with and at locations as shown in the Plans and Specifications. Removal of any excess material to achieve final subgrade elevation and profile will not be paid for separately but will be included in the bid unit price of the work.

**CONSTRUCTION REQUIREMENTS**

**310.02** The contractor shall develop a written method to maintain the centerline geometry. The plan shall be submitted to the Engineer for approval a minimum of two weeks prior to starting work. The cost of developing and implementing the plan shall not be paid for separately but shall be included in the cost of Full Depth Reclamation of Hot Mix Asphalt Pavement. All costs of survey staking to re-establish the centerline geometry, profile and cross slopes shall not be paid for separately but shall be included in the cost of Full Depth Reclamation of Hot Mix Asphalt Pavement.

Responsibility for potholing to locate and determine depths of utility lines prior to Full Depth Reclamation shall be the responsibility of the contractor.

The existing asphalt mat shall be cut at neat lines at all tie in points by the use of a cutting wheel attached to a blade or by another approved method. The existing asphalt mat shall be pulverized, and mixed with the existing subbase, base course, or combination thereof to a specified depth or as directed by the Engineer, with a self-propelled rotary type mixing machine. The mixing machine shall make as many passes as required to uniformly mix the asphalt, subbase, existing base course, or combination thereof to the required depth. Mixing of the different materials shall create a homogenous mixture. The particle size of the pulverized asphalt mat shall be a minimum of 99 percent passing the 37.5 mm (1-1/2 inch) sieve. When the addition of water is necessary for initial compaction purposes, unless otherwise approved by the Engineer, it shall be added through the mixing machine with the capability to uniformly distribute water through the mixed materials to within 2 percent of the optimum moisture as determined in accordance with AASHTO T-180 Method D.

When proper mixing has been accomplished, the mixture shall then be bladed, shaped, wetted or dried, and rolled to meet a minimum of 95 percent of the maximum dry density determined in accordance with AASHTO T-180 Method D. Excess material generated shall be hauled and stockpiled at a location as designated in the Plans or by the Engineer. If no location is designated, it shall be the responsibility of the contractor to properly dispose of said material. Grading equipment used to establish the final surface elevations shall have automatic controls for transverse slope. The transverse slope controls shall be capable of maintaining the final surface within 0.1 percent of the specified slope. Variations from the subgrade plane shall not be more than 1/4 inch. The work shall be maintained and tested for conformance to these requirements immediately prior to placing additional pavement layers.

Compaction will be measured for the top 8-inch lift of reclaimed materials, and if appropriate for any lift below the top 8-inch lift. Density testing and materials acceptance will apply to each lift of 8 inches or less that is reclaimed and placed on the project. Acceptance Testing will be based on a random schedule of 1/2000 square

**REVISION OF SECTION 310  
FULL DEPTH RECLAMATION OF HOT MIX ASPHALT**

yards of reclaimed material up to 8 inches and 1/2000 square yards of reclaimed material 8 inches and greater in depth. The compacted material shall be proof-rolled in accordance with Section 209.09. Any areas of deformation shall be removed, treated and re-compacted prior to placement of Hot Mix Asphalt Pavement.

The maximum length of exposed processed asphalt pavement shall be no greater than 0.5 miles unless approved by the Engineer. The maximum time a portion of the roadway will be unpaved is 7 working days unless approved by the Engineer. The exposed longitudinal joint between the existing asphalt mat and the processed mat shall not remain in place for more than one day unless approved by the Engineer. Joint construction and maintenance shall conform to subsection 401.16.

The contractor shall provide emergency access to all affected residences during construction. The contractor shall rough grade and compact roads and provide suitable material to allow passenger car access to all driveways at the end of each day. The cost of placing material to provide ramps to each affected driveway and to provide required emergency access shall not be paid for separately but will be included in the pay item for Full Depth Reclamation of Hot Mix Asphalt Pavement .

**METHOD OF MEASUREMENT**

**310.03** Full Depth Reclamation of Hot Mix Asphalt Pavement will be measured by the square yard of roadway treated, completed and accepted.

**BASIS OF PAYMENT**

**310.04** The accepted quantities of Full Depth Reclamation of Hot Mix Asphalt Pavement will be paid for at the contract unit price per square yard for Full Depth Reclamation of Hot Mix Asphalt Pavement to the depth specified above.

**Pay Item**

**Pay Unit**

Full Depth Reclamation of Hot Mix Asphalt Pavement (0-8")

Square Yard

Payment for Full Depth Reclamation of Hot Mix Asphalt Pavement will be full compensation for all work necessary to complete the item including cutting of the existing asphalt mat, pulverizing the existing asphalt mat, mixing the pulverized asphalt mat into existing subgrade or base course, wetting and compacting the mixed pulverized asphalt mat and subgrade and/or base course, blading, shaping, haul and disposal of excess material, and water.

REVISION OF SECTION 403  
 HOT MIX ASPHALT

Section 403 of the Standard Specifications is hereby revised for this project as follows:

Subsection 403.02 shall include the following:

The design mix for hot mix asphalt shall conform to the following:

Table 403-1					
Property	Test Method	Value For Grading			
		SX(75 )	S(75)		Patching
Air Voids, percent at: N (design)	CPL 5115	3.5 – 4.5	3.5 – 4.5		3.5 – 4.5
Lab Compaction (Revolutions): N (design)	CPL 5115	75	75		75
Stability, minimum	CPL 5106	28	28		28
Aggregate Retained on the 4.75 mm (No. 4) Sieve for S, SX and SG, and on the 2.36mm (No. 8) Sieve for ST and SF with at least 2 Mechanically Induced fractured faces, % minimum*	CP 45	60	60		60
Accelerated Moisture Susceptibility Tensile Strength Ratio (Lottman), minimum	CPL 5109 Method B	80	80		80
Minimum Dry Split Tensile Strength, kPa (psi)	CPL 5109 Method B	205 (30)	205 (30)		205 (30)
Grade of Asphalt Cement, Top Layer		PG64-22	PG__		PG64-22
Grade of Asphalt Cement, Layers below Top		PG__	PG64-22		PG__
Voids in the Mineral Aggregate (VMA) % minimum	CP 48	See Table 403-2	See Table 403-2		See Table 403-2
Voids Filled with Asphalt (VFA), %	AI MS-2	65-80	65-80		65-80
Dust to Asphalt Ratio Fine Gradation Coarse Gradation	CP 50	0.6 – 1.2 0.8 – 1.6	0.6 – 1.2 0.8 – 1.6		0.6 - 1.2 0.8 – 1.6
Note: AI MS-2 = Asphalt Institute Manual Series 2 Note: Mixes with gradations having less than 40% passing the 4.75 mm (No. 4) sieve shall be approached with caution because of constructability problems. Note: Gradations for mixes with a nominal maximum aggregate size of one-inch or larger are considered a coarse gradation if they pass below the maximum density line at the #4 screen. Gradations for mixes with a nominal maximum aggregate size of 3/4" to 3/8" are considered a coarse gradation if they pass below the maximum density line at the #8 screen. Gradations for mixes with a nominal maximum aggregate size of #4 or smaller are considered a coarse gradation if they pass below the maximum density line at the #16 screen. *Fractured face requirements for SF may be waived by RME depending on project conditions.					



REVISION OF SECTION 403  
 HOT MIX ASPHALT

All mix designs shall be run with a gyratory compaction angle of 1.25 degrees and properties must satisfy Table 403-1. Form 43 will establish construction targets for Asphalt Cement and all mix properties at Air Voids up to 1.0 percent below the mix design optimum. CDOT will establish the production asphalt cement and volumetric targets based on the Contractor’s mix design and the relationships shown between the hot mix asphalt mixture volumetric properties and asphalt cement contents on the Form 429. CDOT may select a different AC content other than the one shown at optimum on the Contractor’s mix design in order to establish the production targets as contained on the Form 43. Historically, Air Voids adjustments typically result in asphalt cement increases from 0.1 to 0.5 percent. Contractors bidding the project should anticipate this change and factor it into their unit price bid.

**Table 403-2**

Nominal Maximum Size*, mm (inches)	Minimum Voids in the Mineral Aggregate (VMA)			
	***Design Air Voids **			
	3.5%	4.0%	4.5%	5.0%
37.5 (1½)	11.6	11.7	11.8	N/A
25.0 (1)	12.6	12.7	12.8	
19.0 (¾)	13.6	13.7	13.8	
12.5 (½)	14.6	14.7	14.8	
9.5 (¾)	15.6	15.7	15.8	
4.75 (No. 4)	16.6	16.7	16.8	16.9
	* The Nominal Maximum Size is defined as one sieve larger than the first sieve to retain more than 10%. ** Interpolate specified VMA values for design air voids between those listed. *** Extrapolate specified VMA values for production air voids beyond those listed.			

The Contractor shall prepare a quality control plan outlining the steps taken to minimize segregation of HMA. This plan shall be submitted to the Engineer and approved prior to beginning the paving operations. When the Engineer determines that segregation is unacceptable, the paving shall stop and the cause of segregation shall be corrected before paving operations will be allowed to resume.

The hot mix asphalt may contain up to 10% reclaimed asphalt pavement per City development standards.

Hot mix asphalt for patching shall conform to the gradation requirements for Hot Mix Asphalt (Grading SX).

A minimum of 1 percent hydrated lime by weight of the combined aggregate shall be added to the aggregate for all hot mix asphalt.

Subsection 403.03 shall include the following:

REVISION OF SECTION 403  
HOT MIX ASPHALT

The Contractor shall construct the work such that all roadway pavement placed prior to the time paving operations end for the year, shall be completed to the full thickness required by the plans. The Contractor's Progress Schedule shall show the methods to be used to comply with this requirement.

Delete subsection 403.05 and replace with the following:

**403.05** The accepted quantities of hot mix asphalt will be paid for in accordance with subsection 401.22, at the contract unit price per ton for the bituminous mixture.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Hot Mix Asphalt (Grading SX)(75)(PG 64-22)	Ton
Hot Mix Asphalt (Grading S)(75)(PG 64-22)	Ton
Hot Mix Asphalt (Patching)(Asphalt)	Ton

Aggregate, asphalt recycling agent, asphalt cement, additives, hydrated lime, and all other work and materials necessary to complete each hot mix asphalt item will not be paid for separately, but shall be included in the unit price bid. When the pay item includes the PG binder grade, any change to the submitted mix design optimum asphalt cement content to establish production targets on the Form 43 will not be measured and paid for separately, but shall be included in the work. No additional compensation will be considered or paid for any additional asphalt cement, plant modifications and additional personnel required to produce the HMA as a result in a change to the mix design asphalt cement content.

Historically, typical asphalt cement increases reflected on the Form 43 are from 0.1 to 0.5 percent. However, the Contractor should anticipate the AC increases typical of his mixes. Contractors bidding the project should anticipate this change and factor it into their unit price bid.

When the pay item does not include the PG binder grade, asphalt cement will be measured and paid for in accordance with Section 411. Asphalt cement used in Hot Mix Asphalt (Patching) will not be measured and paid for separately, but shall be included in the work.

Excavation, preparation, and tack coat of areas to be patched will not be measured and paid for separately, but shall be included in the work.

REVISION OF SECTION 601  
CONCRETE

Subsection 601.20 shall include the following:

Curing concrete and cold-weather protection of concrete and concrete structural coating, including all materials, equipment and labor, shall be considered essential and incidental to completing the concrete pay items. No additional payment will be made for cold-weather protection and curing concrete items.

REVISION OF SECTION 603  
REINFORCED CONCRETE PIPE

Section 603 of the Standard Specifications is hereby revised for this project as follows:

Subsection 603.02 shall include the following:

Reinforced concrete pipe shall be manufactured from concrete that meets the requirements for severity of sulfate exposure Class 2 specified in subsection 601.04.

REVISION OF SECTION 603  
TRACER WIRE

Section 603 of the Standard Specifications is hereby revised for this project as follows:

Subsection 603.01 Description, shall include the following:

This work consists of tracer wire installation for culverts and storm sewer. Tracer wire shall be installed at all underground culvert and storm sewer locations, except as noted below.

Tracer wire does not need to be installed for the following situations:

- (a) Short pipe culverts in which a light shining through one end is visible from the other end;
- (b) Short pipe culverts in which the inlet and outlet may easily be observed/identified from the same (or nearly the same) vantage point;
- (c) Underground storm sewer pipe in which a light shining through one end - or through a manhole - is visible on either end.

Subsection 603.02, Materials, shall include the following:

The following materials shall be accepted for tracer wire installation.

- (a) *Tracer Wire*: All trace wire shall have HDPE insulation intended for direct bury, color coded green. High Heat-resistant Nylon coated (THHN) wire is not acceptable as tracer wire.
  - 1. Open Trench – Trace Wire shall be #14 AWG copper, high strength with minimum 450 lb. break load, with minimum 30 mil HDPE insulation thickness.
  - 2. Direction Drilling/Boring - Trace wire shall be #14 AWG copper, extra high strength with minimum 1,150 lb. break load, with minimum 30 mil HDPE insulation thickness.
  - 3. Pipe Bursting/Slip Lining - Trace wire shall be 7 x 7 stranded copper c, extreme strength with 4,700 lb. break load, with minimum 50 ml HDPE insulation thickness.
- (b) *Connectors*:
  - 1. Mainline - All mainline trace wires must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At Crosses, the four wires shall be joined using a 4-way connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative.
  - 2. Direct bury wire connectors – Direct bury wire connectors shall include 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in underground trace wire installation. Connectors shall be dielectric silicon-filled to seal out moisture and corrosion and shall be installed in a manner to prevent any uninsulated wire exposure.
  - 3. Prohibited - Non-locking friction fit, twist on or taped connectors are prohibited.
- (c) *Termination/Access Box*:
  - 1. All trace wire termination points must utilize an approved trace wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose.
  - 2. All grade level/in-ground access boxes shall be appropriately identified with “sewer” cast into the cap and shall be color coded in green
  - 3. A minimum of two (2) feet of excess/slack wire is required in all trace wire access boxes after meeting final elevation.

REVISION OF SECTION 603  
TRACER WIRE

4. All trace wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the trace wire connection and the terminal for the grounding anode wire connection.
  5. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.
- (d) *Prohibited Materials:*
1. Uninsulated wire insulations other than HDPE
  2. Non-locking, friction fit, twist on or taped connectors
  3. Brass or copper ground rods
  4. Wire connections utilizing a taping or spay-on waterproofing

Subsection 603.03A, Tracer Wire Installation, shall be added and include the following:

603.03A.01 General Construction Requirements

Trace wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances greater than 1,000 linear feet and without distortion of signal caused by multiple wires being installed in close proximity to one another. Trace wire systems must be installed as a single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed.

Trace wire shall be installed on top of the pipe and secured (taped/tied) at 5' intervals. Trace wire must be properly grounded as specified.

In occurrences where an existing trace wire is encountered on an existing utility that is being extended or tied into, the new trace wire and existing trace wire shall be connected using approved splice connectors and shall be properly grounded at the splice location as specified.

Any damage occurring during installation of the trace wire must be immediately repaired by removing the damaged wire and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed.

603.03A.02 Storm Sewer System Construction Requirements. A mainline trace wire must be installed, with all interconnecting storm sewer line trace wires properly connected to the mainline trace wire, to ensure full tracing/locating capabilities from a single connection point. Lay mainline trace wire continuously, by-passing around the outside of manholes/structures on the North or East side. Trace wire on all interconnecting storm sewer line trace wires must terminate at an approved trace wire access box location and color-coded green.

- (a) *Storm Sewer on public property* - Trace wire must terminate at an approved grade level/in ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway.
- (b) *Long-runs, greater than 500 linear feet without manholes* - Trace wire access must be provided utilizing an approved grade level/in-ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway. The grade level/in-ground trace wire access box shall be delineated using a minimum 48" polyethylene marker post, color coded green.

603.03A.03 – Grounding Construction Requirements. Trace wire must be properly grounded at all dead ends/stubs. Grounding of trace wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20ft of #14red HDPE insulated copper wire connected to anode (minimum 1.5 lb.) specifically

REVISION OF SECTION 603  
TRACER WIRE

manufactured for this purpose and buried at the same elevation as the utility. When grounding the trace wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the trace wire, at the maximum possible distance. When grounding the trace wire in areas where the trace wire is continuous and neither the mainline trace wire or the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and in-line with the trace wire. Do not coil excess wire from grounding anode. In this installation method, the grounding anode wire shall be trimmed to an appropriate length before connecting to trace wire with a mainline to lateral lug connector. Where the anode wire will be connected to a trace wire access box, a minimum of two (2) ft. of excess/slack wire is required after meeting final elevation.

603A.03A.04 Prohibited Construction Methods.

- (a) Looped wire or continuous wire installations, that have multiple wires laid side-by-side or near one another;
- (b) Trace wire wrapped around the corresponding utility;
- (c) Brass fittings with trace wire connection lugs;
- (d) Wire terminations within the roadway, i.e. in valve boxes, cleanouts, manholes, etc.;
- (e) Connecting trace wire to existing conductive utilities

603.03A.05 Testing Construction Requirements

All new trace wire installations shall be located using typical low frequency (512Hz) line tracing equipment, witnessed by the contractor, engineer and facility owner as applicable, prior to acceptance of ownership.

This verification shall be performed upon completion of rough grading and again prior to final acceptance of the project.

Continuity testing in lieu of actual line tracing shall not be accepted.

Subsection 603.12, Method of Measurement shall include the following:

Tracer wire will be measured by the linear foot complete in place and accepted.

Subsection 603.13 shall include the following:

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Tracer Wire	Linear Foot

Tracer wire, connectors, and termination/access boxes will not be measured and paid for separately but shall be included in the work.

REVISION OF SECTION 614  
SIGNS

Section 614 of the Standard Specifications is hereby revised for this project as follows:

Subsection 614.14 shall include the following:

Pay Item	Pay Unit
Steel Sign Post (2x2 Inch Tubing)	Each

2 1/4" anchor, along with all necessary items and labor required for installation of steel sign posts, will not be measured and paid for separately, but shall be included in the work.



REVISION OF SECTION 630  
PORTABLE MESSAGE SIGN PANEL

Section 630 of the Standard Specifications is hereby revised for this project as follows:

Subsection 630.01 shall include the following:

This work includes furnishing, operating, and maintaining a portable message sign panel.

Add subsection 630.031 immediately following subsection 630.03 as follows:

**630.031 Portable Message Sign Panel.** Portable message sign panel shall be furnished as a device fully self-contained on a portable trailer, capable of being licensed for normal highway travel, and shall include leveling and stabilization jacks. The panel shall display a minimum of three - eight character lines. The panel shall be a dot-matrix type with an LED legend on a flat black background. LED signs shall have a pre-default message that activates before a power failure. The sign shall be solar powered with independent back-up battery power. The sign shall be capable of 360 degrees rotation and shall be able to be elevated to a height of at least five feet above the ground measured at the bottom of the sign. The sign shall be visible from one-half mile under both day and night conditions. The message shall be legible from a minimum of 750 feet. The sign shall automatically adjust its light source to meet the legibility requirements during the hours of darkness. The sign enclosure shall be weather tight and provide a clear polycarbonate front cover.

Solar powered message signs shall be capable of operating continuously for 10 days without any sun. All instrumentation and controls shall be contained in a lockable enclosure. The sign shall be capable of changing and displaying sign messages and other sign features such as flash rates, moving arrows, etc.

Each sign shall also conform to the following:

- (1) In addition to the onboard solar power operation with battery back-up, each sign shall be capable of operating on a hard wire, 100-110 VAC, external power source.
- (2) All electrical wiring, including connectors and switch controls necessary to enable all required sign functions shall be provided with each sign.
- (3) Each sign shall be furnished with an operating and parts manual, wiring diagrams, and trouble-shooting guide.
- (4) The portable message sign shall be capable of maintaining all required operations under Colorado mountain-winter weather conditions.
- (5) Each sign shall be furnished with an attached license plate and mounting bracket.
- (6) Each sign shall be wired with a 7-prong male electric plug for the brake light wiring system.

Subsection 630.13 shall include the following:

The portable message sign panel shall be on the project site at least 10 working days prior to the start of active roadway construction. Maintenance, storage, operation, relocation to different sites during the project, and all repairs of portable message sign panels shall be the responsibility of the Contractor.

Subsection 630.15 shall include the following:

Portable message sign panels will be measured one of the two following ways:

- (1) By the actual number of days each portable message sign is used on the project as approved by the Engineer.
- (2) By the maximum number of approved units in use on the project at any one time.

REVISION OF SECTION 630  
PORTABLE MESSAGE SIGN PANEL

Subsection 630.16 shall include the following:

<b>Pay Item</b>	<b>Pay Unit</b>
Portable Message Sign Panel	Each

## FORCE ACCOUNT ITEMS

### DESCRIPTION

This special provision contains the Department's estimate for force account items included in the Contract. The estimated amounts marked with an asterisk will be added to the total bid to determine the amount of the performance and payment bonds. Force Account work shall be performed as directed by the Engineer.

### BASIS OF PAYMENT

Payment will be made in accordance with subsection 109.04. Payment will constitute full compensation for all work necessary to complete the item.

Force account work valued at \$5,000 or less, that must be performed by a licensed journeyman in order to comply with federal, state, or local codes, may be paid for after receipt of an itemized statement endorsed by the Contractor.

<u>Force Account Item</u>	<u>Estimated Quantity</u>	<u>Amount</u>
F/A Minor Contract Revisions	F.A.	\$ 100,000*
F/A Erosion Control	F.A.	\$ 5,000

**F/A Minor Contract Revisions** – Consists of minor work authorized and approved by the Engineer, which is not included in the contract drawings or specifications and is necessary to accomplish the scope of this contract.

**F/A Erosion Control** – This work consists of Stormwater BMPs authorized and approved by the Engineer. This Force Account is to pay for all necessary work and materials for erosion control items not identified in the plans and at the Engineer's direction. Payment will be made based on time and materials used to perform the work. All items shall be pre-approved by the Engineer prior to installation, or they will be at no cost to the project.

## TRAFFIC CONTROL PLAN - GENERAL

The key elements of the Contractor's method of handling traffic (MHT) are outlined in subsection 630.10(a).

The components of the TCP for this project are included in the following:

- (1) The plans and these special provisions.
- (2) Subsection 104.04 and Section 630 of the specifications.
- (3) Standard Plan S-630-1, Traffic Controls for Highway Construction, Case 17 and Standard Plan S-630-2.
- (4) Schedule of Construction Traffic Control Devices
- (5) Manual on Uniform Traffic Control Devices (MUTCD) (2009 Edition).
- (6) Guide for Work Area Traffic Control, American Traffic Safety Services Association (ATSSA).

Unless otherwise approved by the Engineer, the Contractor's equipment shall follow normal and legal traffic movements. The Contractor's ingress and egress of the work area shall be accomplished with as little disruption to traffic as possible. Traffic control devices shall be removed by picking up the devices in a reverse sequence to that used for installation. This may require moving backwards through the work zone. When located behind barrier or at other locations shown on approved traffic control plans, equipment may operate in a direction opposite to adjacent traffic.

CDOT or Boulder County may have entered into operating agreements with one or more law enforcement organizations for cooperative activities. Under such agreements, at the sole discretion of CDOT, law enforcement personnel may enter the work zone for enforcement purposes and may participate in the Contractor's traffic control activities. The responsibility under the Contract for all traffic control resides with the Contractor and any such participation by law enforcement personnel in Contractor traffic control activities will be referenced in either the Special Provisions or General Notes of the plans depending on whether the Contractor is to hire local law enforcement or if CDOT is contracting with Colorado State Patrol for uniformed traffic control. Nothing in this Contract is intended to create an entitlement, on the part of the Contractor, to the services or participation of the law enforcement organization.

Special Traffic Control Plan requirements for this project are as follows:

During the construction of this project, traffic shall use the present traveled roadway unless identified on the plans or approved by the Engineer. Contractor is responsible for submitting a Method of Handling Traffic (MHT) for each different phase of construction to the County for approval, and to the Engineer for City approval, prior to the beginning of work. Any changes to the MHT shall be submitted to and approved by the County and City prior to implementation. County and City will have a minimum of two weeks for review. The MHT shall include at a minimum the requirements listed under Section 630.09.

MHT shall also include the following: 1] temporary pavement markings; 2] work zone limits; 3] special construction activities if any; 4] traffic control during phasing changes (including provision for pedestrian and bicycle movements); 5] anticipated flagger location(s) and 5] coordination provisions for utility work.

Pedestrian movements shall be fully addressed in the Contractor's Traffic Control Plan (TCP) and Method of Handling Traffic (MHT). No plan will be approved that unreasonably impedes or restricts pedestrian movements. No devices required to implement the Contract requirements will be permitted to be installed on or above sidewalk surface areas unless otherwise approved by the City in the respective TCP or MHT.

### CONSTRUCTION REQUIREMENTS

During construction of this project, traffic shall use the present traveled roadway at all times in all currently-provided directions unless otherwise directed or authorized by the Engineer. The Contractor shall provide full

## TRAFFIC CONTROL PLAN - GENERAL

intersection movements for vehicular and pedestrian traffic at all times, unless otherwise authorized or directed by the Engineer.

Vehicular and pedestrian traffic shall be maintained on paved surfaces that remain stable through all weather conditions. Contractor shall be allowed alternate materials for short-term (one week or less) pedestrian only detours provided the proposed surface is stable and appropriate dust control measures are taken.

Contractor shall maintain access to all roadways, side streets, walkways, alleyways, driveways, and hike/bike paths at all times unless otherwise approved by the Engineer. Access to individual properties shall be maintained at all times unless otherwise approved by the Engineer. Contractor shall be required to coordinate full or partial closures of all private driveways with home owners along the construction area. Contractor shall develop an access maintenance plan in coordination with these owners, obtain their written approval, and submit same to the Engineer two weeks prior to the start of any work which impacts the signatory properties.

The Contractor shall not have construction equipment or materials in the lanes open to traffic at any time unless otherwise approved by the Engineer. All personal vehicle and construction equipment parking is prohibited where it conflicts with safety, access or the flow of traffic. Personal vehicles and construction equipment parking is prohibited in all private parking lots without the respective property owner's permission.

Contractor and subcontractors shall equip their construction vehicles with flashing amber lights. Flashing amber lights on vehicles and equipment shall be visible from all directions.

Contractor shall install construction traffic control devices in locations where they do not block or impede other existing traffic control devices; or sidewalks for pedestrians, disabled persons or bicyclists.

Excavations or holes shall be backfilled, fenced, or otherwise adequately protected when unattended. During non-construction periods (weekends, holidays, etc.), all work shall be adequately protected to provide for the safety of the public.

Traffic control devices used on this project shall be kept clean and in good working order at all times. The Engineer shall make the ultimate determination of "good working order."

Existing signs, traffic signals or other City-owned traffic control devices damaged due to the Contractor's operations shall be replaced in-kind or repaired by the Contractor at no additional cost to the project.

All advanced construction signing shall be installed prior to any construction activity and remain in place for all work periods. Road Work Ahead advance signs shall be reset if required to match the location of the work. Resetting construction signs during construction as required by the work is considered incidental to the project and will not be paid separately. Masking of existing or temporary signs as may be required by the work is considered incidental to the project and will not be paid for separately.

All flaggers used on this project shall be certified by a CDOT-approved flagger-certification program. The Contractor shall provide certificates of all flaggers used on the project 48 hours in advance of that flagger working on the project.

The Contractor shall submit the required MHTs, all appropriate Traffic Control Supervisor and Flagger documentation to the Engineer, and must receive approval prior to setting any traffic control device.

The Contractor shall maintain frequent communication with the Engineer regarding all aspects of the daily and

## TRAFFIC CONTROL PLAN - GENERAL

weekly work schedule.

All construction traffic control devices including signs installed under this project shall be installed as depicted in the MUTCD and other supporting documentation referenced for this project within this Project Special Provision.

Construction signing shall be removed unless work is in progress or equipment has been left on the job site. All portable signs shall be removed at the end of each work day. Costs of removing, resetting or reinstalling construction traffic control devices shall be considered included in the work and will not be paid for separately.

Traffic control devices shall not be stored on the project site.

Contractor shall maintain continuous access through the project for pedestrians, bicycles and disabled persons. When the existing access route is disrupted by construction or construction-related activities, a temporary access shall be provided. All pedestrian access shall be delineated through the work area using proper channelizing devices.

All on-site Contractor personnel including superintendents are required to wear appropriate colored, reflective safety vests.

Contractor personnel shall not direct traffic through a signalized intersection at any time. See the Project Special Provision for Uniformed Traffic Control. When existing traffic signals require power-down, the Contractor shall coordinate all such work with the City of Boulder.

Vertical cuts or fills resulting from construction operations, including planning, adjacent to traffic lanes, shall be temporarily sloped at a 3:1 or flatter slope and delineated at 50 foot intervals immediately after grading or removal operations. Any variances from this requirement shall be approved by the Engineer.

### PAVEMENT MARKINGS

The Contractor shall provide full compliance pavement markings at all times during the construction period. Contractor shall replace faded markings during individual phases as directed by the Engineer. Pavement markings which conflict with the TCP for individual phases shall be obliterated. Painting existing markings black shall not be deemed an acceptable means of obliteration.

### WORK RESTRICTIONS

This project includes restrictions to work times and days that affect traffic during peak traffic times and days, holidays, holiday evenings, holiday weekends, and other circumstances as described in this Project Special Provision. Wherever other laws, ordinances, regulations or orders are more restrictive, they shall take precedence over these requirements.

At least one week prior to starting construction, the Contractor shall notify the Boulder County Engineer of the date the Contractor intends to start construction.

The Contractor shall coordinate and cooperate fully with the City of Boulder, utility owners and other contractors; to assure adequate and proper traffic control is provided at all times. The Contractor shall coordinate and cooperate fully with any others providing traffic control for other operations to assure that work or traffic control devices do not interfere with the free flow of traffic except as allowed by the approved MHT.

The contractor shall schedule all work between 8:00 A.M. and 4:30 P.M Monday through Friday, and shall minimize noise of equipment and crews outside these hours.

## TRAFFIC CONTROL PLAN - GENERAL

The hours noted above are the limits of time from “first cone to last cone” of the traffic control setup/takedown. Construction may be allowed on weekends or Holidays when approved by the Project Manager.

The Contractor shall make emergency repairs, and provide proper protection of the work and traveling public at all times.

The Contractor shall not perform any work requiring lane closure on the roadway unless prior approval received from the County. Side street closures will not be allowed without the prior written approval of the Engineer.

During the resurfacing work, only one lane may be closed to traffic at any time unless approved by the Engineer. Traffic shall not be delayed for more than 30 minutes or as directed by the Engineer.

Work performed and material placed during restricted work times will not be paid unless the completion of the work outside designated hours is pre-approved by the Engineer.

Periods of controller deactivation are only allowed between the hours of 9:00am to 2:00pm weekdays. All such periods shall be scheduled with the Engineer at least 72 hours in advance such that appropriate City personnel can be notified. Note that it is the Contractor’s responsibility to schedule Uniformed Traffic Control and additional advance notice may be required to schedule that item.

The Contractor shall make provisions for emergency vehicle access. The Contractor shall give emergency vehicles priority access at all times.

All costs incidental to the foregoing requirements shall be included in the original contract prices for the project.

UTILITIES

The known utilities within the limits of this project are:

UTILITY	CONTACT/EMAIL	PHONE
AT&T 18494 I-25 Frontage Rd., Platteville, CO 80651	Will Guiles wg9328@att.com	720-369-3984
Comcast (manages AT&T aerial fiber) 8490 N Umatilla St. Federal Heights, CO 80260	Kevin Young kevin_young@cable.comcast.com	720-281-8666
Left Hand Water District PO Box 210, Niwot, CO 80544	Steve Buckbee sbuckbee@lefthandwater.org	303-530-4200
Lumen (formerly CenturyLink) 5325 Zuni St., Room 728, Denver, CO 80221	Chris Janoski Christopher.janoski@lumen.com	720-578-3187
Lumen (formerly CenturyLink) 5325 Zuni St., Room 728, Denver, CO 80221	Robert Davis Rdavis@terratechllc.net	720-854-4341
Xcel Energy Application for Gas & Electric Services	BCLCO@xcelenergy.com	800-628-2121
Xcel Energy – Electric/Gas Distribution 2655 N 63 <sup>rd</sup> St., Boulder, CO 80301	Marissa Matthews Marissa.matthews@xcelenergy.com	303-245-2256
Xcel Energy – Electric Transmission 1800 Larimer St., Denver, CO 80202	Lonnie Martinez lonnie.martinez@xcelenergy.com	303-571-7654
Xcel Energy – Electric Transmission (patrolman) 17805 S. Golden Rd., Golden CO 80401	Shawn Bickler Shawn.bickler@xcelenergy.com	303-883-0089

The work described in these plans and specifications requires full cooperation between the Contractor and the utility owners in accordance with Subsection 105.11 in conducting their respective operations, to complete the utility work with minimum delay to the project.

All new underground facilities, including laterals up to the structure or building being served, installed as part of this project must be electronically locatable when installed, in compliance with Colorado Revised Statutes, Title 9, Article 1.5.

**PART 1 CONTRACTOR SHALL PERFORM THE WORK LISTED BELOW:**

Coordinate project construction with the performance by the utility owner of each utility work element listed in Part 2 below. Perform preparatory work specified in Part 2 for each utility work element. Provide an accurate construction schedule that includes all utility work elements to the owner of each impacted utility.

Provide each utility owner with weekly updates to the schedule. Conduct detailed utility coordination meetings prior to each construction phase to coordinate all requirements and schedules, and provide other necessary accommodations as directed by the Engineer. Notify each utility owner in writing, with a copy to the Engineer, prior to the time each utility work element is to be performed by the utility owner. Provide the advance notice specified in Part 2 immediately prior to the time the utility work must be begun to meet the project schedule.

Provide traffic control, as directed by the Engineer, for any utility work by the utility owner expected to be coordinated with construction. However, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner.

Perform each utility work element for every utility owner listed here in Part 1. Notify each utility owner in advance of any work being done by the Contractor to its facility, so that the utility owner can coordinate its inspections for final acceptance of the work with the Engineer.



## UTILITIES

### **Project Limits – All Utility Owners**

Prior to excavating, the Contractor shall positively locate (through potholing if necessary) all potential conflicts with existing underground utilities and proposed construction, as determined by the Contractor according to proposed methods and schedule of construction. The Contractor shall modify construction plans to avoid existing underground facilities as needed, and as approved by the Engineer. Please note that Colorado 811 (formerly Utility Notification Center of Colorado (UNCC)) marks only its members' facilities – other facilities, such as ditches and drainage pipes may exist, and it is the Contractor's responsibility to investigate, locate and avoid such facilities.

### **AT&T**

The Contractor shall notify AT&T two weeks in advance of starting construction in the vicinity of AT&T's conduits and handholes on the west side of N. 71<sup>st</sup> St.

Upon encountering AT&T's abandoned conduits while excavating for the new culvert at Dry Creek, the Contractor shall confirm with AT&T that the exposed conduits are abandoned, and then remove the conduits as needed.

The Contractor shall maintain access to AT&T's handholes near Sta 30+50 LT and Sta 39+10 LT during construction and shall notify AT&T two weeks in advance of needing AT&T to adjust the handholes to final grade. The Contractor shall have staked or reached final grade in advance. It is expected to take two days for AT&T to adjust the handholes.

### **Left Hand Water District (LHWD)**

The Contractor shall coordinate with LHWD at least two weeks in advance of excavation regarding the means and methods planned to install the Dry Creek box culvert in the vicinity of LHWD's waterline in 71<sup>st</sup> St. near Sta 32+20 RT. It is LHWD's preference for the Contractor to support and protect the waterline in place. Alternatively, the Contractor can request LHWD to temporarily remove the waterline for up to three weeks then rebuild it after the culvert is installed. It is expected to take one day each for LHWD to cut and rebuild the waterline.

Prior to placing backfill over the waterline at the culvert crossing at Dry Creek, the Contractor shall insulate the waterline by placing 2-foot-wide 1-inch foam board insulation between the waterline and the culvert. The insulation shall extend the entire width of the culvert.

The Contractor shall notify LHWD at least one week in advance of exposing the waterline so an LHWD representative can be on-site.

The Contractor shall maintain access to LHWD's facilities throughout construction.

### **Lumen**

The Contractor shall coordinate with Lumen regarding work which was to have been completed prior to construction, including the overhead relocation of Lumen's buried fiber and the raising of Lumen's overhead cable and fiber across Dry Creek. If the work has not been completed prior to construction, then the Contractor shall coordinate with Lumen to complete the work. The Contractor shall remove Lumen's abandoned buried

## UTILITIES

conduit as needed.

### **Xcel Energy – Electric Distribution**

When the Contractor is working in the vicinity of overhead electric lines, it shall be assumed the distribution line is energized and the Contractor shall not be closer than ten feet (10') in any direction from the energized conductors.

If personnel or construction equipment will be within ten feet (10') of energized conductors, Contractor shall call Xcel Energy's Builders Call Line Colorado ("BCLCO") 1-800-628-2121 a minimum of thirty (30) days in advance to arrange for an outage. An outage will be arranged if it is determined to be necessary. The outage will be a day-by-day situation. Typically, there is a fee charged when an electrical outage is required. However, this fee shall be waived for this project since the electric facilities are in public right-of-way. Xcel shall not charge a fee for this work.

### **Xcel Energy – Electric Transmission**

The Contractor shall contact the Xcel Energy Colorado Electric Transmission Line Operations Department at 303-273-4662 or 303-273-4665 a minimum of five days in advance to arrange for a Patrolman to be on site during construction work near Xcel's buried electric transmission facilities. Under no circumstances may work be started within twenty feet in any direction of the transmission lines without clearance from the Patrolman. It is the responsibility of the Contractor to notify the Patrolman whenever starting and ending work.

The Contractor shall support the electric transmission lines if the length of the unsupported pipe exceeds ten feet, which is expected to occur during construction of the culvert at Dry Creek. The Contractor shall provide Xcel Energy with the design of the proposed support system and allow two weeks for review and approval. Examples of approved support methodology are included in the utility plans.

The Contractor shall notify Xcel Energy at least one week in advance of needing Xcel Energy to adjust its two manholes near Sta 38+00 LT, two manholes near Sta 39+50 LT, and manhole and test station near Sta 39+75 LT to final grade. The Contractor shall stake or reach final grade in advance. This work is expected to be coordinated with construction and take one week to complete.

### **Xcel Energy – Gas Distribution**

The Contractor shall notify Xcel Energy four weeks in advance of beginning construction in the vicinity of the 6-inch IP gas line in N. 71<sup>st</sup> St.

The Contractor shall arrange for a stand-by during excavation in the vicinity of the gas line in response to their Colorado 811 notification.

The Contractor shall coordinate with Xcel Energy to support the 6-inch IP gas line when it is exposed for work to be conducted beneath it if the length of the exposed pipe exceeds the maximum allowable unsupported pipe span shown on Table 7.6.1 below from Xcel.

UTILITIES

<b>Table 7.6.1 – Maximum Unsupported Pipe Span</b>					
<b>COATED STEEL PIPE</b> (see notes 1, 2, & 4)			<b>PLASTIC PIPE</b> (see notes 1, 3, & 4)		
<b>Nominal Pipe Diameter (in)</b>	<b>Pipe Wall Thickness (in)</b>	<b>Allowable Unsupported Length (ft)</b>	<b>Nominal Pipe Diameter (in)</b>	<b>SDR</b>	<b>Allowable Unsupported Length (ft)</b>
3/4	.113	11	1/2 CTS	7.0	4
			3/4 IPS	11.0	5
1	.133	13	1 CTS	11.5	5
			1 IPS	11.0	5
1 1/4	.140	14	1-1/4 IPS	10.0	6
1-1/2	.145	15	1-1/2 IPS	11.0	7
2	.154	18	2 IPS	11.0	7
3	.156	22	3 IPS	11.5	9
	.216	21			
4	.156	25	4 IPS	11.5	10
	.237	24			
6	.188	30	6 IPS	11.5	12
	.250	30			
8	.219	35	8 IPS	11.5	14
	.250	35			
10	.219	39			
	.250	39			
12	.250	42			
16	.250	48			
18	.250	51			
20	.250	54			
24	.312	59			
26	.375	61			
30	.375	66			

**PART 2 UTILITY OWNERS SHALL PERFORM THE WORK LISTED BELOW:**

Although the Contractor shall provide traffic control for utility work expected to be coordinated with construction, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner. The utility owner shall prepare and submit to the Engineer a Method of Handling Traffic for utility work to be performed outside typical project work hours. The utility owner shall obtain acceptance of the Method of Handling Traffic from the Engineer prior to beginning the utility work to be performed outside typical project work hours.

**AT&T**

AT&T shall coordinate with the Contractor prior to the Contractor’s removal of AT&T’s abandoned conduits on the west side of N. 71<sup>st</sup> St.

## UTILITIES

Upon receiving at least two weeks' notice from the Contractor, AT&T shall adjust its handholes near Sta 30+50 LT and Sta 39+10 LT. The Contractor shall have staked or reached final grade in advance. The adjustment of the handholes shall be to ¼" to ½" below final grade. It is expected to take two days for AT&T to adjust the handholes.

### **Left Hand Water District (LHWD)**

LHWD shall coordinate with the Contractor regarding the means and methods planned to install the Dry Creek box culvert. If requested by the Contractor, LHWD shall temporarily remove the waterline for up to three weeks after it has been exposed by the Contractor then rebuilt it after the culvert is installed. It is expected to take one day each for LHWD to cut and rebuild the waterline.

After receiving at least one week's notice from the Contractor, LHWD shall provide an on-site representative during construction in the vicinity of their waterline.

### **Lumen**

Lumen shall relocate its buried fiber overhead and raise the overhead line across Dry Creek. This work is expected to be completed prior to construction. Lumen shall confirm that the buried fiber has been removed prior to the Contractor's removal of the abandoned conduit.

### **Xcel Energy – Electric Distribution**

Xcel Energy forces shall temporarily de-energize the overhead electric line on the west side of N. 71<sup>st</sup> St. when requested by the Contractor through Xcel's Builders Call Line at least four weeks in advance.

### **Xcel Energy – Gas Distribution**

Xcel Energy shall provide a stand-by as needed during construction in the vicinity of the 6-inch IP gas line.

### **Xcel Energy – Electric Transmission**

Xcel Energy shall provide a Patrolman to be on-site as required.

After receiving at least one week's notice from the Contractor, Xcel Energy shall adjust its two manholes near Sta 38+00 LT, two manholes near Sta 39+50 LT, and manhole and test station near Sta 39+75 LT to final grade. The Contractor shall stake or reach final grade in advance. The adjustment of the manholes shall be to ¼" to ½" below final grade. This work is expected to be coordinated with construction and take one week to complete.

## **GENERAL:**

The Contractor shall comply with Article 1.5 of Title 9, CRS ("Excavation Requirements") when excavating or grading is planned in the area of underground utility facilities. The Contractor shall notify all affected utilities at least two (2) business days, not including the actual day of notice, prior to commencing such operations. The Contractor shall contact Colorado 811 at phone no. 811 or co811.org to have locations of Colorado 811 registered lines marked by member companies. All other underground facilities shall be located by contacting the respective owner. Utility service laterals shall also be located prior to beginning excavation or grading.

## UTILITIES

The location of utility facilities as shown on the plans, and herein described, are depicted on the utility plans in accordance with their achieved “Quality Levels” as defined in the American Society of Civil Engineers’ document ASCE 83, “Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.”

The locations of utility facilities as shown on the plans were obtained from the best available information. No warranty is made for the adequacy or accuracy of subsurface information provided. The Contractor shall cooperate with the utility owners in their relocation operations as provided in subsection 105.11 of the Standard Specifications for Road and Bridge Construction. No guarantee is made that utility conflicts will be resolved prior to construction activities and any delays resulting from utility relocation work shall be dealt with in accordance with subsection 108.08 of the Standard Specifications for Road and Bridge Construction as amended.

All costs incidental to the foregoing requirements will not be paid for separately but shall be included in the work.