



**Boulder County Purchasing**  
**1325 Pearl Street**  
**Boulder, CO 80302**  
[purchasing@bouldercounty.org](mailto:purchasing@bouldercounty.org)

**INVITATION TO BID**  
**COVER PAGE**

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BID Number: **7471-23**

BID Title: **72 Inch Reinforced Concrete Pipe (Class III)  
N. 51<sup>st</sup> Street at Dry Creek #2**

Pre-Bid Meeting: N/A

BID Questions Due: May 30, 2023 – 2:00 p.m.

Submittal Due Date: June 8, 2023 – 2:00 p.m.

Email Address: [purchasing@bouldercounty.org](mailto:purchasing@bouldercounty.org)

Documents included in this package:

- Bid Instructions
- Terms and Conditions
- Specifications
- Insurance and W-9 Requirements
- Submittal Checklist
- Bid Tab Section
- Signature Page
- Sample Contract
- Plans



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## INSTRUCTIONS

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### 1. Purpose/Background

Boulder County Public Works is seeking bids for reinforced concrete pipe as shown on sheet #10 of the plans and to also include the delivery of the pipe. The reinforced concrete pipe is to be delivered to the Boulder County Walden Ponds Transportation Facility, Attention Jeff Carr, at 3897 N. 75th Street, Boulder, CO 80301. Delivery is requested as near to September 18, 2023 as inventory will permit.

### 2. Written Inquiries

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. **May 30, 2023**. A response from the county to all inquiries will be posted and sent via email no later than **June 1, 2023**.

**Do not contact any other county department or personnel with questions or for information regarding this solicitation.**

### 3. Submittal Instructions

BIDs are due at the email box only, listed below, for time and date recording on or before **2:00 p.m. Mountain Time on June 8, 2023**. A bid opening will be conducted at 3:00 p.m. via Microsoft Teams. Please click on the link below or use the call-in number. A copy of the bid tab will also be sent to all who have submitted a Bid. **Vendors must answer whether line-item pricing information submitted with a bid is confidential or closely held.**

## Microsoft Teams meeting

**Join on your computer, mobile app or room device**

[Click here to join the meeting](#)

Meeting ID: 256 299 564 639

Passcode: 8pgocc

**Or call in (audio only)**

[+1 720-400-7859](tel:+17204007859),481938565# United States, Denver

Phone Conference ID: 481 938 565#

**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 # 7471-23** in the subject line.

All BIDs must be received and time and date recorded by authorized county staff by the above due date and time. Sole responsibility rests with the bidder to see that their BID response is received on time at the stated location(s). Any BIDs received after due date and time will be returned to the bidder.

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

Contractors and their employees, subcontractors, and agents must comply with all federal, state, and local laws, regulations, ordinances, orders, and codes, as well as Boulder County policies, guidelines, and protocols.

**Americans with Disabilities Act (ADA):** Americans with Disabilities Act: If you need special services provided for under the Americans with Disabilities Act (ADA), please contact the Boulder County ADA Coordinator or Human Resources office at (303) 441-3525 as soon as possible to allow sufficient time for service delivery ahead of applicable due dates.



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## **TERMS AND CONDITIONS**

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1. Bidders are expected to examine the drawing, specifications, schedule of delivery, and all instructions. Failure to do so will be at the bidder's risk.
  2. Each bidder will furnish the information required in the Invitation to Bid.
  3. The Contract/Purchase Order will be awarded to that responsible bidder whose submittal, conforming to the Invitation to Bid, will be most advantageous to the County of Boulder, based on best value not only price.
  4. The County of Boulder reserves the right to reject any or all bids and to waive informalities and minor irregularities in bids received, and to accept any portion of or all items proposed if deemed in the best interest of the County of Boulder to do so.
  5. No submittal will be withdrawn for a period of thirty (30) days subsequent to the opening of bids without the consent of the County Purchasing Agent or delegated representative.
  6. A signed purchase order or contract furnished to the successful bidder results in a binding contract without further action by either party.
  7. Late or unsigned bids will not be accepted or considered. It is the responsibility of bidders to ensure that the bid arrives at the Purchasing email address prior to the time indicated in the "Invitation to Bid."
  8. The proposed price will be exclusive of any Federal or State taxes from which the County of Boulder is exempt by law.
  9. Any interpretation, correction or change of the bid documents will be made by Addendum. Interpretations, corrections and changes of the bid documents made in any other manner will not be binding, and bidder will not rely upon such interpretations, corrections and changes. The County's Representative will not be responsible for oral clarification.
  10. Confidential/Proprietary Information: Bids submitted in response to this "Invitation to Bid" and any resulting contract are subject to the provisions of the Colorado Open Records Act, 24-72-201 et seq., C.R.S., as amended. Any restrictions on the use or inspection of material



contained within the bid or resulting contract should be clearly stated in the bid and contract itself. Confidential/proprietary information should be readily identified, marked and/or separated from the rest of the bid. Co-mingling of confidential/proprietary and other information is NOT acceptable. Vendors must answer whether line-item pricing information submitted with a bid is confidential or closely held. Bids that do not identify confidential/proprietary information may be released in their entirety. Pricing totals contained in a bid are not considered confidential.

**The Boulder County Attorney's Office retains sole authority for determining whether the Colorado Open Records Act requires or permits Boulder County to disclose proposal or bid documents, or any information contained therein, pursuant to an open records request.**

11. Boulder County promotes the purchase/leasing of energy efficient materials and products with low toxicity levels when availability, quality and budget constraints allow. Proposers are expected whenever possible to provide products that earn the ENERGY STAR and meet the ENERGY STAR specifications for energy efficiency with power management features enabled. Proposers are encouraged to offer products and equipment with post-consumer recycled-content materials. Products should be packaged and delivered with a minimum amount of recycled packaging that adequately protects the product but is not excessive.
12. Pursuant to Colorado law (House Bill 1292), in any bidding process for public works in which a bid is received from a non-resident bidder who is from a state that provides a percentage bidding preference, a comparable percentage disadvantage will be applied to the bid of that bidder. Bidders may obtain additional information from the Department of Personnel's website: <http://www.colorado.gov/dpa/>.



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## **SPECIFICATIONS**

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### **ACPA REQUIREMENT**

Pipe shall be obtained from a manufacturer that is a current Plant Quality Certified Member of the American Concrete Pipe Association (ACPA), meeting all current ACPA requirements for this Certification. A copy of the ACPA Certification shall be submitted with your proposal.

### **COMPLIANCE WITH 100% PLANS**

The pipe shall be in compliance with the N. 51<sup>st</sup> Street at Dry Creek #2 100% Plans dated February 7, 2023, which are attached at the end of this document.



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## **INSURANCE AND W-9 REQUIREMENTS**

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### **INSURANCE REQUIREMENTS**

#### **Commercial General Liability**

This coverage should be provided on an Occurrence Form, ISO CG001 or equivalent, with Minimum limits of \$1,000,000 Each Occurrence, \$2,000,000 General Aggregate and \$2,000,000 Products Completed Operations Aggregate.

#### **Automobile Liability**

Bodily Injury and Property Damage for any owned, hired, and non-owned vehicles used in the performance of the Contract. Minimum limits \$1,000,000 Each Accident.

#### **Workers' Compensation and Employer's Liability**

Workers' Compensation must be maintained with the statutory limits. Employer's Liability is required for minimum limits of \$100,000 Each Accident/\$500,000 Disease-Policy Limit/\$100,000 Disease-Each Employee.

**Boulder County as Additional Insured: Boulder County shall be named as an additional insured for General Liability, Umbrella/Excess Liability, and Pollution Liability, as designated in this Contract. Additional insured shall be endorsed to the policy.**

**THE ADDITIONAL INSURED WORDING SHOULD BE AS FOLLOWS: County of Boulder, State of Colorado, a body corporate and politic, is named as Additional Insureds.**

**In regards to General Liability, Umbrella/Excess Liability, and Pollution Liability: If any or all of these coverages are required above, additional insured status will be required at the time a contract is executed.**

**Note that the above insurance amounts are the minimum required for this project. Proof of current insurance must be provided with your proposal in the form of a sample certificate. You are NOT required to include additional insured status until the time a contract is executed.**

**If you require a waiver of insurance requirements you may request one in your response with an explanation.**

**W-9 REQUIREMENT**

Provide a copy of your business's W-9 with your proposal.



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## SUBMITTAL SECTION

The bidder's attention is especially called to the items listed below, which must be submitted in full as part of the BID. Failure to submit any of the documents listed below as a part of your BID, or failure to acknowledge any addendum in writing with your BID, or submitting a bid on any condition, limitation or provision not officially invited in this Invitation to Bid (BID) may be cause for rejection of the BID.

**THIS CHECKLIST MUST BE SUBMITTED AS PART OF YOUR BID PACKAGE:** Bidder will check each box indicating compliance:

INCLUDED	ITEM
	Name and Address of the Partners and Subcontractors if applicable
	A detailed project schedule with an all-inclusive total cost
	Information on the relevant experience of key personnel
	State your compliance with the Terms and Conditions in the Sample Contract contained in this BID. Specifically list any deviations and provide justification for each deviation.
	Submit three references for similar projects your company has completed within the last three years and contact information. Boulder County will review all contractor evaluation forms from previous County projects.
	Insurance Certificate
	W-9
	American Concrete Pipe Association (ACPA) Certification
	Signature Page
	Addendum Acknowledgement(s) (If Applicable)

**THIS QUESTION MUST BE ANSWERED AS PART OF YOUR BID PACKAGE:** Bidder will answer Yes or No indicating compliance:

YES OR NO	ITEM
	Do you customarily keep line-item pricing information, such as the information being submitted with this proposal, confidential or closely-held?



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**BID TAB**

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**BOULDER COUNTY PUBLIC WORKS - ENGINEERING**  
 REINFORCED CONCRETE PIPE FOR N. 51<sup>ST</sup> STREET A DRY CREEK #2  
 BC-005104-1.4  
 BID TABULATION  
 19-May-2023

ITEM NO.	ITEM DESCRIPTION	UNIT	TOTAL UNITS	UNIT COST	TOTAL COST
1	72 INCH REINFORCED CONCRETE PIPE (CLASS III)	LINEAR FOOT	214	_____	_____
2	RUBBER GASKETED JOINTS (CONFORMING TO ASTM C443	LUMP SUM	1	_____	_____
3	FREIGHT (DELIVERY TO BOULDER COUNTY WALDEN PONDS TRANSPORTATION FACILITY)	LUMP SUM	1	_____	_____



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**SIGNATURE PAGE**

Contact Information	Response
Company Name including DBA	
List Type of Organization (Corporation, Partnership, etc.)	
Name, Title, and Email Address of Person Authorized to Contract with Boulder County	
Company Address	
Company Phone Number	
Company Website	

**By signing below I certify that:**

- I am authorized to bid on my company's behalf.
- I am not currently an employee of Boulder County.
- None of my employees or agents is currently an employee of Boulder County.
- I am not related to any Boulder County employee or Elected Official.
- (Sole Proprietorships Only) I am not a Public Employees' Retirement Association (PERA) retiree.

\_\_\_\_\_  
**Signature of Person Authorized to Bid on  
 Company's Behalf**

\_\_\_\_\_  
**Date**

Note: If you cannot certify the above statements, please explain in a statement of explanation.

# BOULDER COUNTY SAMPLE CONTRACT

THIS CONTRACT ("Contract") is entered into by and between the Board of County Commissioners on behalf of the County of Boulder, State of Colorado, a body corporate and politic, for the benefit of the [Department] ("County") and [Supplier] ("Contractor"). County and Contractor are each a "Party," and collectively the "Parties."

In consideration of the mutual covenants contained in this Contract, the receipt and sufficiency of which is hereby acknowledged, the Parties agree as follows:

1. Incorporation into Contract: The **Details Summary** is incorporated into this Contract. The **Contract Documents** are incorporated into this Contract by reference, except to the extent that the Proposal, if any is incorporated, contains any obligations placed upon County and not otherwise contained in this Contract.
2. Work to be Performed: Contractor will provide all labor and equipment and do all tasks necessary and incidental to performing the work as described in the **Details Summary** and **Contract Documents** (the "Work"). Contractor will perform the Work (a) in a good and workmanlike manner, (b) at its own cost and expense, (c) in accordance with recognized industry standards of care, skill and diligence for the type of work being performed, and (d) in strict accordance with the Contract.
3. Term of Contract: The **Contract Term** begins on the **Start Date** and expires on the **Expiration Date**, unless terminated sooner. All the Work must be performed during the **Contract Term**.
4. Payment for Work Performed: In consideration of the Work performed by Contractor, and subject to conditions contained in this Contract, County will pay an amount not to exceed the **Contract Amount** to Contractor in accordance with the **Contract Documents**.
5. Invoicing: Contractor will promptly provide a copy of its Form W-9 and invoice template to County upon request. Contractor must submit an invoice to the County by the fifteenth (15th) day of the month for completion of any Work performed in the prior calendar month. All invoices submitted require the following components: Contractor's name and address (submitted W-9 address must match remit address), detailed description of services, dates of services, itemization of labor and materials costs, "Bill to: Boulder County" language, payment remittance address, payer, name and address, date of invoice, unique invoice number, and total amount due. Contractor must send all completed invoices to the **Invoice Contact** in the **Details Summary**. County may require delivery of invoices by email. Failure to submit invoices in a timely manner and in accordance with the terms of this Contract may cause a delay in payment. County may recoup any damages incurred because of Contractor's failure to submit invoices pursuant to the terms of this paragraph. County's acceptance or payment of an invoice will not constitute acceptance of any Work performed under this Contract.
6. Extra Time to Complete the Work (Additional Time only): If Contractor cannot complete the Work by the **Expiration Date**, Contractor may request extra time to complete the Work. County, in its sole discretion, may grant Contractor additional time to complete the Work by sending a written notice of extension to Contractor. An extension of time to complete the Work does not entitle Contractor to additional compensation from County.
7. Extension of Contract Term (Additional Time and Work): Upon mutual agreement of the Parties, this Contract may be extended until the **Final End Date**. During any extended **Contract Term**, the terms of this Contract will remain in full force and effect, unless otherwise amended in writing by the Parties. Where the Contractor will provide additional services for additional compensation beyond the initial **Contract Amount**, the Parties must execute a written amendment before the then-current **Expiration Date**. If necessary, the written amendment will incorporate an updated Scope of Work and updated Fee Schedule as exhibits. Contractor must provide a current Certificate of Insurance to the County that complies with the **Insurance Requirements** of this Contract, if any, prior to any extended **Contract Term**.
8. Schedule of Work: County may designate the hours (on a daily or weekly basis) during which Contractor may perform the Work, strictly for the purposes of minimizing inconvenience to the County and interference with County operations. Contractor will otherwise set its own work schedule.



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

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

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

12. **Independent Contractor:** Contractor is an independent contractor for all purposes in performing the Work. **None of Contractor, its agents, personnel or subcontractors are employees of the County for any purpose, including the Federal Insurance Contribution Act, the Social Security Act, the Federal Unemployment Tax Act, the provisions of the Internal Revenue Code, the Colorado Workers' Compensation Act, the Colorado Unemployment Insurance Act, and the Public Employees Retirement Association. Accordingly, County will not withhold or pay any income tax, payroll tax, or retirement contribution of any kind on behalf of Contractor or Contractor's employees. As an independent contractor, Contractor is responsible for employing and directing such personnel and agents as it requires to perform the Work. Contractor will exercise complete authority over its personnel and agents and will be fully responsible for their actions.**

13. **Termination**

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

b. **Non-Appropriation:** The other provisions of this Contract notwithstanding, County is prohibited by law from making commitments beyond the current fiscal year. Payment to Contractor beyond the current fiscal year is contingent on the appropriation and continuing availability of funding in any subsequent year. County has reason to believe that sufficient funds will be available for the full **Contract Term**. Where, however, funds are not allocated for any fiscal period beyond the current fiscal year, County may terminate this Contract without penalty by providing seven (7) days' written notice to Contractor.

c. Convenience: In addition to any other right to terminate under this Section 13, County may terminate this Contract, in whole or in part, for any or no reason, upon seven (7) days' advance written notice to Contractor.

14. Contractor Obligations upon Termination or Expiration: By the **Expiration Date** or effective date of termination, if earlier, Contractor must (1) remove from County property all of its personnel, equipment, supplies, trash and any hazards created by Contractor, (2) protect any serviceable materials belonging to the County, and (3) take any other action necessary to leave a safe and healthful worksite. Any items remaining on County property after the Expiration Date or the effective date of termination, if earlier, will be deemed abandoned by Contractor.

15. Payable Costs in Event of Early Termination: If County terminates this Contract before the **Expiration Date**, Contractor's payments (and any damages associated with any lawsuit brought by Contractor) are limited to only (1) payment for Work satisfactorily executed and fully and finally completed, as determined by County in its sole discretion, prior to delivery of the notice to terminate, and (2) the reasonable and actual costs Contractor incurred in connection with performing the Work prior to delivery of the notice to terminate. Contractor explicitly waives all claims it may have against the County for any other compensation, such as anticipatory profits or any other consequential, special, incidental, punitive or indirect damages.

16. Remedies for Non-Performance: If Contractor fails to perform any of its obligations under this Contract, County may, at its sole discretion, exercise one or more of the following remedies (in addition to any other remedies provided by law or in this Contract), which shall survive expiration or termination of this Contract:

a. Suspend Performance: County may require that Contractor suspend performance of all or any portion of the Work pending necessary corrective action specified by the County and without entitling Contractor to an increase in compensation or extension of the performance schedule. Contractor must promptly stop performance and incurring costs upon delivery of a notice of suspension by the County.

b. Withhold Payment Pending Corrections: County may permit Contractor to correct any rejected Work at the County's discretion. Upon County's request, Contractor must correct rejected work at Contractor's sole expense within the time frame established by the County. Upon full and final completion of the corrections satisfactory to the County, County will remit payment to Contractor.

c. Deny Payment: County may deny payment for any Work that does not comply with the requirements of the Contract or that Contractor otherwise fails to provide or fully and finally complete, as determined by the County in its sole discretion. Upon County request, Contractor will promptly refund any amounts prepaid by the County with respect to such non-compliant Work.

d. Removal: Upon County's request, Contractor will remove any of its employees or agents from performance of the Work, if County, in its sole discretion, deems any such person to be incompetent, careless, unsuitable, or otherwise unacceptable.

17. Binding Arbitration Prohibited: County does not agree to binding arbitration by any extra-judicial body or person.

18. Conflicts of Interest: Contractor may not engage in any business or personal activities or practices or maintain any relationships that conflict in any way with the full performance of Contractor's obligations.

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

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

21. No Suspension or Debarment: Contractor certifies, and warrants for the Contract Term, that neither it nor its principals nor any of its subcontractors are debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this Contract by any Federal or State department or agency. Contractor shall comply, and shall require its subcontractors to comply, with subpart C of 2 C.F.R. § 180.
22. Entire Agreement/Binding Effect/Amendments: This Contract represents the complete agreement between the Parties and is fully binding upon them and their successors, heirs, and assigns, if any. This Contract terminates any prior agreements, whether written or oral in whole or in part, between the Parties relating to the Work. This Contract may be amended only by a written agreement signed by both Parties.
23. Assignment/Subcontractors: This Contract may not be assigned or subcontracted by Contractor without the prior written consent of the County. If Contractor subcontracts any of its obligations under this Contract, Contractor will remain liable to the County for those obligations and will also be responsible for subcontractor's performance under, and compliance with, this Contract.
24. Governing Law/Venue: The laws of the State of Colorado govern the construction, interpretation, performance, and enforcement of this Contract. Any claim relating to this Contract or breach thereof may only be brought exclusively in the Courts of the 20<sup>th</sup> Judicial District of the State of Colorado and the applicable Colorado Appellate Courts.
25. Breach: The failure of either Party to exercise any of its rights under this Contract will not be deemed to be a waiver of such rights or a waiver of any breach of the Contract. All remedies available to a Party in this Contract are cumulative and in addition to every other remedy provided by law.
26. Severability: If any provision of this Contract becomes inoperable for any reason but the fundamental terms and conditions continue to be legal and enforceable, then the remainder of the Contract will continue to be operative and binding on the Parties.
27. Third-Party Beneficiary: Enforcement of the terms and conditions and all rights and obligations of this Contract are reserved to the Parties. Any other person receiving services or benefits under this Contract is an incidental beneficiary only and has no rights under this Contract. Notwithstanding, where the beneficiary **Department** is led by an Elected Official, such Elected Official shall be considered a third-party beneficiary.
28. Colorado Open Records Act: County may disclose any records that are subject to public release under the Colorado Open Records Act, C.R.S. § 24-72-200.1, et seq.
29. Conflict of Provisions: If there is any conflict between the terms of the main body of this Contract and the terms of any of the **Contract Documents**, the terms of the main body of the Contract will control.
30. Governmental Immunity: Nothing in this Contract shall be construed in any way to be a waiver of the County's immunity protection under the Colorado Governmental Immunity Act, C.R.S. § 24-10-101, et seq., as amended.
31. Representations and Warranties: Contractor represents and warrants the following:
- a. Execution of this Contract and performance thereof is within Contractor's duly authorized powers;
  - b. The individual executing this Contract is authorized to do so by Contractor;
  - c. Contractor is authorized to do business in the State of Colorado and is properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over the Work and the Contractor; and
  - d. Contractor and its subcontractors, if any, are financially solvent, able to pay all debts as they mature, and have sufficient working capital to complete the Work and perform all obligations under the Contract.
32. Legal Compliance: Contractor assumes full responsibility for obtaining and maintaining any permits and licenses required to perform the Work. Contractor is solely responsible for ensuring that its performance under this Contract and the Work itself will comply with all Federal, State, and local laws, regulations, ordinances and codes. County approval of the Work or any aspect of Contractor's performance, such as plans, designs, or other Contractor-drafted documents, shall not be interpreted to mean that Contractor has satisfied its obligations under this Section.

33. Litigation Reporting: Contractor is not currently involved in any action before a court or other administrative decision-making body that could affect Contractor's ability to perform the Work. Contractor will promptly notify the County if Contractor is served with a pleading or other document in connection with any such action.
34. Tax Exemption: County is exempt from payment of Federal, State, and local government taxes. Contractor shall collect no tax from the County, and the County shall not be liable to pay any taxes imposed on Contractor. County shall provide its tax exemption status information to Contractor upon request.
35. Delegation of Authority: The Parties acknowledge that the Board of County Commissioners has delegated authority to the Department Head or Elected Official that leads the beneficiary **Department** and their designees to act on behalf of the County under the terms of this Contract, including but not limited to the authority to terminate this Contract.
36. Ownership of Work Product: All work product, property, data, documentation, information or materials conceived, discovered, developed or created by Contractor pursuant to this Contract ("Work Product") will be owned exclusively by the County. To the extent possible, any Work Product will be deemed to be a work made for hire. Contractor unconditionally and irrevocably transfers and assigns to the County all right, title and interest in and to any Work Product.
37. Publicity Releases: Contractor will not refer to this Contract or the County in commercial advertising without prior written consent of the County. This provision shall survive expiration or termination of this Contract.
38. Execution by Counterparts; Electronic Signatures: This Contract may be executed in multiple counterparts, each of which will be deemed an original, but all of which will constitute one agreement. The Parties approve the use of electronic signatures, governed by the Uniform Electronic Transactions Act, C.R.S. §§ 24 71.3 101 to 121. The Parties will not deny the legal effect or enforceability of this Contract solely because it is in electronic form or because an electronic record was used in its creation. The Parties will not object to the admissibility of this Contract in the form of electronic record, or paper copy of an electronic document, or paper copy of a document bearing an electronic signature, because it is not in its original form or is not an original.
39. Limitation on Public Statements and Lobbying Activity. During the term of this Contract, Contractor may receive from the County its confidential data, work product, or other privileged or confidential information that is protected by law. To maintain the fact and appearance of absolute objectivity, Contractor shall not, without the prior written consent of the County, which shall not be unreasonably withheld, do any of the following: (a) disclose information obtained because of this contractual relationship to any third party; (b) lobby any State or Federal agency on any pending matter while this Contract is effective; or (c) make any public statements or appear at any time to give testimony at any public meeting on the subject matters regarding which Contractor is or was retained by the County. County may set reasonable conditions on any disclosure authorized by the County under this provision. Notwithstanding, Contractor may make disclosures as required by law, and to law enforcement officials in connection with any criminal justice investigation.
40. Sustainability: County encourages Contractor to consider the procurement and use of environmentally preferable products and services while performing services under this Contract. "Environmentally preferable purchasing" means making purchasing choices for products and services that have a lesser or reduced adverse effect on human health and the environment when compared with competing products and services that serve the same purpose. Environmentally preferable purchasing is consistent with the County's commitment to protecting our air, water, soil, and climate for current and future generations. County encourages Contractor to incorporate the following actions into Contractor's performance of the Work: environmentally preferable supplies and services; conservation of water; efficient energy use; waste prevention; reuse and recycle construction and de-construction materials in a manner that maximizes reuse of materials; sustainable transportation choices, including consideration to business communication software such as Skype alternative to air travel and public transit or carpooling for in-person meetings; pollution prevention; low toxicity for public health & safety; and reduced emissions to address climate change.
41. Limitation of Liability: COUNTY SHALL NOT BE LIABLE TO CONTRACTOR FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, PUNITIVE, OR INDIRECT DAMAGES ARISING FROM OR RELATING TO THIS CONTRACT, REGARDLESS OF ANY NOTICE OF THE POSSIBILITY OF SUCH DAMAGES. COUNTY'S AGGREGATE LIABILITY, IF ANY, ARISING FROM OR RELATED TO THIS CONTRACT, WHETHER IN CONTRACT, OR IN TORT, OR OTHERWISE, IS LIMITED TO, AND SHALL NOT EXCEED,

THE AMOUNTS PAID OR PAYABLE HEREUNDER BY COUNTY TO CONTRACTOR. ANY CONTRACTUAL LANGUAGE LIMITING CONTRACTOR'S LIABILITY SHALL BE VOID.

42. Legal Interpretation. Each Party recognizes that this Contract is legally binding and acknowledges that it has had the opportunity to consult with legal counsel of its choice about this Contract. The rule of construction providing that any ambiguities are resolved against the drafting Party will not apply in interpreting the terms of this Contract.

43. Insurance: Prior to commencing the Work, Contractor will provide a Certificate of Insurance to the County demonstrating adequate insurance coverage as required by this Section. All policies evidencing coverage required by the Contract will be issued by insurance companies satisfactory to the County. Contractor will forward Certificates of Insurance directly to the **County Department** and **Contact** listed in the **Details Summary**.

a. Boulder County as Additional Insured: Boulder County shall be named as an additional insured for General Liability, Umbrella/Excess Liability, and Pollution Liability, as designated in this Contract. Additional insured shall be endorsed to the policy.

**THE ADDITIONAL INSURED WORDING SHOULD BE AS FOLLOWS:** *County of Boulder, State of Colorado, a body corporate and politic, is named as Additional Insured.*

b. Notice of Cancellation: Each insurance policy required by this Contract shall provide the required coverage and shall not be suspended, voided or canceled except after thirty (30) days' prior written notice has been given to the County except when cancellation is for non-payment of premium, then ten (10) days' prior notice may be given. If any insurance company refuses to provide the required notice, Contractor or its insurance broker shall notify the County any cancellation, suspension, or nonrenewal of any insurance policy within seven (7) days of receipt of insurers' notification to that effect.

c. Insurance Obligations of County: County is not required to maintain or procure any insurance coverage beyond the coverage maintained by the County in its standard course of business. Any insurance obligations placed on the County in any of the **Contract Documents** shall be null and void.

d. Deductible: Any and all deductibles contained in any insurance policy shall be assumed by and at the sole risk of Contractor.

e. Primacy of Coverage: Coverage required of Contractor and its subcontractors, if any, shall be primary over any insurance or self-insurance program carried by the County.

f. Subrogation Waiver: All insurance policies in any way related to this Contract secured or maintained by Contractor as required herein shall include clauses stating that each carrier shall waive all rights of recovery, under subrogation or otherwise, against County, its organizations, officers, agents, employees, and volunteers.

g. Requirements: For the entire duration of this Contract including any extended or renewed terms, and longer as may be required by this Contract, Contractor shall procure and maintain at its own expense, and without cost to the County, the following kinds and minimum amounts of insurance to insure the liability risks that Contractor has assumed under this Contract:

**Commercial General Liability**

This coverage should be provided on an Occurrence Form, ISO CG001 or equivalent, with Minimum limits of \$1,000,000 Each Occurrence, \$2,000,000 General Aggregate and \$2,000,000 Products Completed Operations Aggregate.

**Automobile Liability**

Bodily Injury and Property Damage for any owned, hired, and non-owned vehicles used in the performance of the Contract. Minimum limits \$1,000,000 Each Accident.

**Workers' Compensation and Employer's Liability**

Workers' Compensation must be maintained with the statutory limits. Employer's Liability is required for minimum limits of \$100,000 Each Accident/\$500,000 Disease-Policy Limit/\$100,000 Disease-Each Employee.

**[Signature Page to Follow]**

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

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

# BOULDER COUNTY PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION

APPROVED FOR CONSTRUCTION:

MICHAEL A. THOMAS, P.E. DATE:  
COUNTY ENGINEER

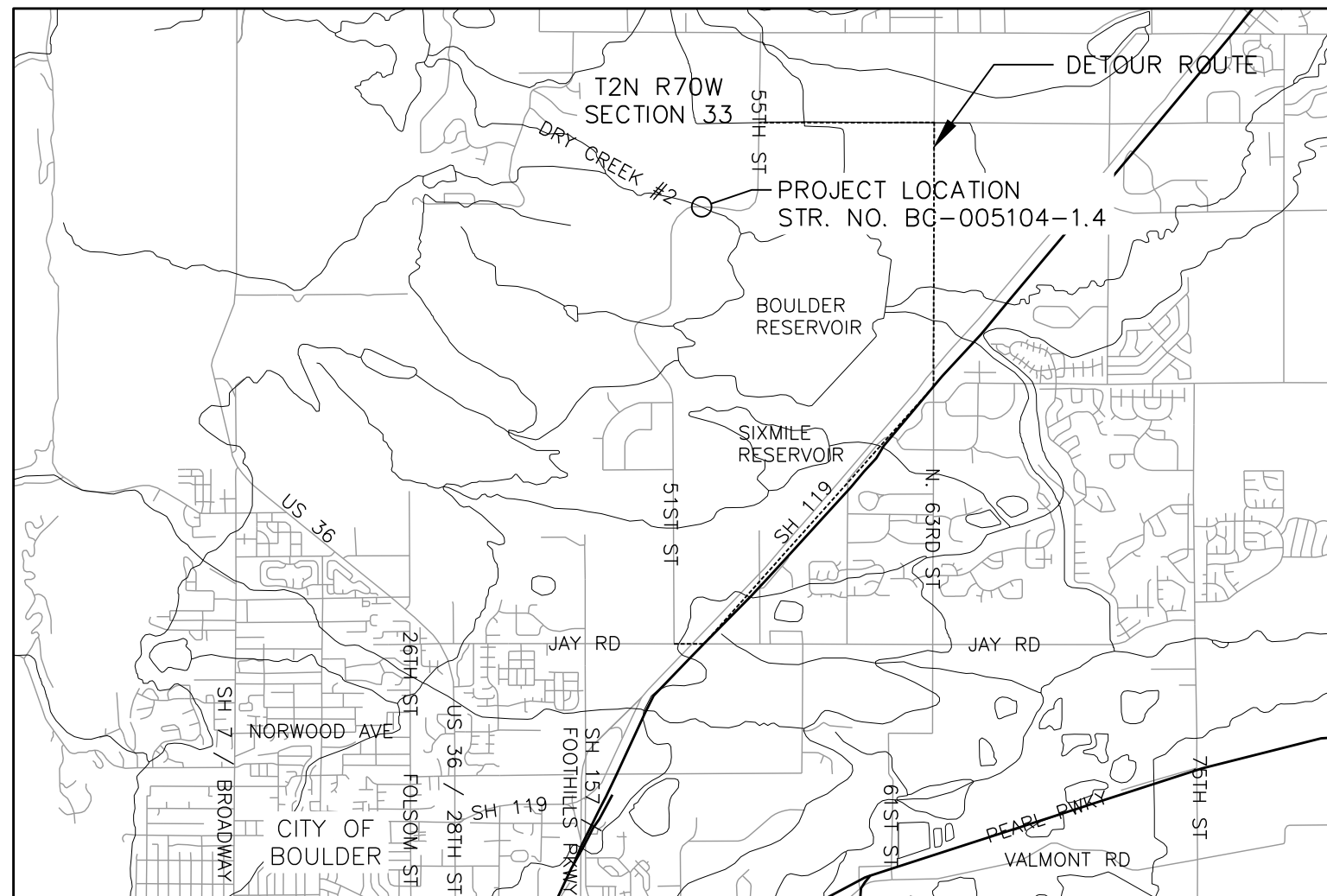


## N. 51ST STREET AT DRY CREEK #2 MINOR STRUCTURE REPLACEMENT PROJECT - BC-005104-1.4

TABULATION OF LENGTH & DESIGN DATA		
STATION	LINEAR FEET	
	ROADWAY	MAJOR STR.
BEGIN PROJECT STA 21+25		
END PROJECT STA 23+45	220.00	
TOTAL	220.00	0.00
SUMMARY OF PROJECT LENGTH	FEET	MILES
ROADWAY	220.00	0.04
MAJOR STRUCTURE	0.00	0.00
PROJECT GROSS LENGTH	220.00	0.04

### N. 51ST STREET MINOR STRUCTURE REPLACEMENT - PROJECT SCOPE OF WORK:

PROJECT CONSISTS OF THE REPLACEMENT OF A CORRUGATED METAL PIPE CULVERT WITH CONCRETE PIPE, INCLUDING HEADWALLS, WINGWALLS, EROSION CONTROL AND TRAFFIC CONTROL.

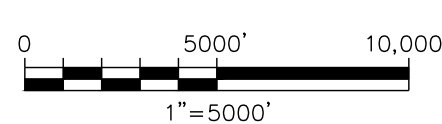


SHEET INDEX	
SHEET NUMBER	SHEET TITLE
1	TITLE SHEET
2	M&S SHEET INDEX
3	GENERAL NOTES
4	TYPICAL SECTIONS
5-6	SUMMARY OF APPROXIMATE QUANTITIES
7	EXISTING TOPOGRAPHIC SURVEY
8	SUBSURFACE UTILITY ENGINEERING PLAN
9	ROADWAY PLAN & PROFILE
10	CULVERT PLAN AND PROFILE
11	EROSION CONTROL PLAN
12	TRAFFIC CONTROL TABULATION
13	DETOUR PLAN
14-15	MITIGATION EXHIBIT
16-21	HEADWALL/WINGWALL M&S STANDARDS

DESIGN DATA	N. 51ST STREET
MINIMUM RADIUS OF CURVE	4770'
MINIMUM S.S.D. HORIZONTAL	>305 FT
DESIGN SPEED	40 MPH
2020 TRAFFIC	320 ADT
CLEAR ZONE	10 FEET



**100% PLANS  
FEBRUARY 7, 2023**



Y:\DENVER\1519005\00151901\_00\_BOULDER\_MINOR\_STR\_RP\_ENG\_DOCS\DRAWINGS\51ST\151901-TITLE-51ST - 01 TITLE SHEET.DWG LAST PLOTTED 2/7/2023 8:50 AM



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<input type="checkbox"/> M-100-1	STANDARD SYMBOLS (3 SHEETS).....	1-3
<input checked="" type="checkbox"/> M-100-2	ACRONYMS AND ABBREVIATIONS (4 SHEETS).....	4-7
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<input type="checkbox"/> M-203-11	SUPERELEVATION CROWNED AND DIVIDED HIGHWAYS (3 SHEETS)	10-12
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<input type="checkbox"/> M-206-2	EXCAVATION AND BACKFILL FOR BRIDGES (2 SHEETS)....	17-18
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<input type="checkbox"/> M-603-1	METAL PIPE (4 SHEETS).....	52-55
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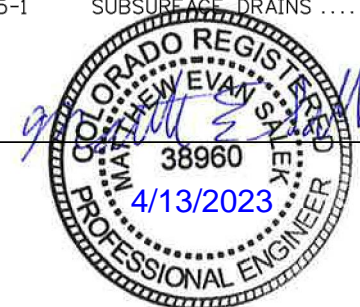
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<input type="checkbox"/> M-606-14	PRECAST TYPE 7 CONCRETE BARRIER (4 SHEETS).....	<del>102-104</del>
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<input type="checkbox"/> S-613-1	ROADWAY LIGHTING (6 SHEETS).....	<del>179-186</del>
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<input type="checkbox"/> S-614-6	CONCRETE FOOTINGS AND SIGN ISLANDS FOR CLASS III SIGNS (2 SHEETS)	196-197
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<input type="checkbox"/> S-614-11	MILEPOST SIGN DETAIL FOR HIGH SNOW AREAS.....	208
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**COLORADO**  
**DEPARTMENT OF TRANSPORTATION**  
**M&S STANDARDS PLANS LIST**  
 July 31, 2019  
 Revised on January 20, 2023

ALL OF THE M&S STANDARD PLANS, AS SUPPLEMENTED AND REVISED, APPLY TO THIS PROJECT WHEN USED BY DESIGNATED PAY ITEM OR SUBSIDIARY ITEM.

THE M&S STANDARD PLANS USED TO DESIGN THIS PROJECT ARE INDICATED BY A MARKED BOX , AND WILL BE ATTACHED TO THE PLANS. ALL OTHER M&S STANDARD PLANS ARE STILL ELIGIBLE FOR USE IN CONSTRUCTION IF APPROVED BY AN APPROPRIATE CDOT ENGINEER.



My responsibility for sealing this sheet only applies to choosing the appropriate standards for this project.



**GENERAL NOTES**

- ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE CDOT STANDARD SPECIFICATION FOR ROAD AND BRIDGE CONSTRUCTION 2021, EXCEPT AS MODIFIED BY THE DESIGN DOCUMENTS.
- A BOULDER COUNTY STORMWATER QUALITY PERMIT (SWQP) IS REQUIRED FOR THIS PROJECT. BECAUSE IT IS WITHIN 100 HORIZONTAL FEET OF A PERMANENT PERENNIAL STREAM OR A MAIN IRRIGATION DITCH. FOR MORE INFORMATION ON QUALIFYING WATERWAYS AND PROJECTS, REFER TO THE GUIDANCE FOR SMALL CONSTRUCTION PROJECTS AVAILABLE ON THE BOULDER COUNTY TRANSPORTATION WEBSITE. THE BOULDER COUNTY STORMWATER QUALITY PERMIT CAN BE ACQUIRED VIA [HTTPS://WWW.BOULDERCOUNTY.ORG/TRANSPORTATION/PERMITS/STORMWATER-QUALITY-PERMIT/](https://www.bouldercounty.org/transportation/permits/stormwater-quality-permit/)
- THE CONTRACTOR IS ADVISED CITY OF BOULDER OPEN SPACE AND MOUNTAIN PARKS (OSMP) HAS A SEASONAL CLOSURE WHICH RESTRICTS ENTRY ON THEIR PROPERTY FROM MARCH 15 TO SEPTEMBER 10. THE CONTRACTOR SHALL CONTACT OSMP PRIOR TO ENTRY OUTSIDE THE RIGHT-OF-WAY ONTO THEIR PROPERTY.
- THE MIGRATORY BIRD TREATY ACT (MBTA) PROTECTS MIGRATORY BIRDS AND THEIR NESTS AND EGGS. FOR PROJECTS THAT COULD POTENTIALLY HAVE AN IMPACT, THE FOLLOWING CONDITIONS APPLY:
  - TREE TRIMMING/REMOVAL ACTIVITIES SHALL BE COMPLETED BEFORE BIRDS BEGIN TO NEST OR AFTER YOUNG HAVE FLEDGED. IN COLORADO, MOST NESTING AND REARING ACTIVITIES OCCUR BETWEEN APRIL 1 AND AUGUST 31. HOWEVER, SINCE SOME BIRDS NEST AS EARLY AS FEBRUARY, A NESTING BIRD SURVEY SHALL BE CONDUCTED BY A BIOLOGIST BEFORE TREE TRIMMING OR REMOVAL ACTIVITIES BEGIN. IT IS ANTICIPATED TREE REMOVAL WILL BE COMPLETED BY OTHERS PRIOR TO CONSTRUCTION.
  - BRIDGE OR BOX CULVERT WORK THAT MAY DISTURB NESTING BIRDS SHALL BE COMPLETED BEFORE BIRDS BEGIN TO NEST OR AFTER THE YOUNG HAVE FLEDGED. NO BRIDGE OR BOX CULVERT WORK MAY TAKE PLACE BETWEEN APRIL 1 AND AUGUST 31. IF WORK ACTIVITIES ARE PLANNED BETWEEN THESE DATES, NESTS SHALL BE REMOVED (BEFORE NESTING BEGINS) AND APPROPRIATE MEASURES TAKEN TO ASSURE NO NEW NESTS ARE CONSTRUCTED. FAILURE TO REMOVE AND KEEP NESTS FROM BEING ESTABLISHED MAY POSTPONE PROJECT CONSTRUCTION.
  - CLEARING AND GRUBBING OF VEGETATION THAT MAY DISTURB GROUND NESTING BIRDS SHALL BE COMPLETED BEFORE BIRDS BEGIN TO NEST OR AFTER THE YOUNG HAVE FLEDGED. IF WORK ACTIVITIES ARE PLANNED BETWEEN APRIL 1 AND AUGUST 31, VEGETATION SHALL BE REMOVED AND/OR TRIMMED TO A HEIGHT OF SIX (6) INCHES OR LESS PRIOR TO APRIL 1. ONCE VEGETATION HAS BEEN REMOVED AND/OR TRIMMED, APPROPRIATE MEASURES, I.E. REPEATED MOWING/TRIMMING, SHALL BE IMPLEMENTED TO ASSURE VEGETATION DOES NOT GROW MORE THAN SIX (6) INCHES. FAILURE TO MAINTAIN VEGETATION HEIGHT OF SIX (6) INCHES OR LESS MAY POSTPONE CONSTRUCTION.
  - FOR BIRDS OF PREY THAT COULD POTENTIALLY NEST NEAR THE PROJECT SITE, PLEASE CONTACT BOULDER COUNTY AND/OR REFER TO THE COLORADO PARKS AND WILDLIFE'S "RECOMMENDED BUFFER ZONES AND SEASONAL RESTRICTIONS FOR COLORADO RAPTORS" GUIDELINES.
- EXCEPT AS SHOWN IN THE PLANS, STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH M-206-1 FOR CAST-IN-PLACE RETAINING WALLS.
- STRUCTURE EXCAVATION AND BACKFILL SHALL BE AS SHOWN ON THE PLANS, EXCEPT SHORING MAY BE REQUIRED FOR EXCAVATION ADJACENT TO THE EXISTING ROADWAY. TEMPORARY EXCAVATION SUPPORT SHALL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
- EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M213.
- AASHTO M-222 (ASTM A-588) MAY BE SUBSTITUTED FOR M270 GRADE 50 (ASTM A-572) AT NO ADDITIONAL COST TO THE PROJECT.
- GRADE 60 REINFORCING STEEL IS REQUIRED.
- ALL REINFORCING STEEL SHALL BE EPOXY COATED UNLESS OTHERWISE NOTED.
- N DENOTES NON-COATED REINFORCING STEEL.
- CONCRETE SULFATE EXPOSURE IS CLASS 0
- WHERE GALVANIZED METALS ARE DAMAGED IN THE FIELD (DUE TO WELDING OR OTHER CIRCUMSTANCES) THE GALVANIZING SHALL BE REPAIRED IN ACCORDANCE WITH ASTM A 780 USING A SPRAY ON COLD GALVANIZING COMPOUND. THE COMPOUND SHALL HAVE A METALLIC ZINC CONTENT OF 95% BY WEIGHT IN DRY FILM, A SOLIDS CONTENT OF 52% BY VOLUME AND SHALL BE APPLIED 1.5 MILS DRY FILM THICKNESS PER COAT WITH TWO COATS APPLIED. REPAIRING GALVANIZED METALS SHALL NOT BE PAID FOR SEPARATELY.
- STATIONS, ELEVATIONS, AND DIMENSIONS CONTAINED IN THESE PLANS ARE CALCULATED FROM A RECENT FIELD SURVEY. THE CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.
- ALL LONGITUDINAL AND TRANSVERSE DIMENSIONS ARE MEASURED HORIZONTALLY AND INCLUDE NO CORRECTION FOR GRADE.

THE FOLLOWING TABLE GIVES THE MINIMUM LAP SPLICE LENGTH FOR EPOXY COATED REINFORCING BARS PLACED IN ACCORDANCE WITH SUBSECTION 602.06. THESE SPLICE LENGTHS SHALL BE INCREASED BY 25% FOR BARS SPACED AT LESS THAN 6" ON CENTER.

BAR SIZE	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH FOR CLASS B&D CONCRETE	1'-3"	1'-6"	2'-5"	2'-10"	3'-9"	4'-8"	5'-11"	7'-4"

WHEN THE CONTRACTOR ELECTS TO SUBSTITUTE EPOXY COATED REINFORCEMENT FOR BLACK REINFORCING BARS, THE MINIMUM LAP SPLICE SHALL BE AS DESCRIBED ABOVE.

THE FOLLOWING TABLE GIVES THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS PLACED IN ACCORDANCE WITH SUBSECTION 602.06. THESE SPLICE LENGTHS SHALL BE INCREASED BY 25% FOR BARS SPACED AT LESS THAN 6" ON CENTER.

BAR SIZE	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH FOR CLASS B&D CONCRETE	1'-1"	1'-4"	1'-7"	1'-11"	2'-6"	3'-2"	4'-0"	4'-11"

- THE CONTRACTOR SHALL CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO AT LEAST 72 HOURS PRIOR TO THE START OF CONSTRUCTION. CALL 811.

- NO WET CONCRETE SHALL BE PERMITTED TO COME IN CONTACT WITH WATER FLOWING IN THE BOULDER & LEFT HAND DITCH AT ANY TIME.
- THE CONTRACTOR SHALL PREPARE AND SUBMIT TO THE ENGINEER FOR APPROVAL, A STORMWATER MANAGEMENT PLAN THAT COMPLIES WITH THE REQUIREMENTS OF SECTION 1300 OF THE BOULDER COUNTY STORM DRAINAGE CRITERIA MANUAL. SEE EROSION CONTROL PLAN FOR NOTES AND OTHER REQUIREMENTS REGARDING THE STORMWATER MANAGEMENT PLAN.

**BEST MANAGEMENT PRACTICES**

- CONTRACTOR/PERMITTEE SHALL PERIODICALLY INSPECT ALL INSTALLED BMPS, PROVIDE MAINTENANCE, AND MAKE REPAIRS AS NECESSARY TO PREVENT THEIR FAILURE.
- PLACE PERIMETER CONTROL ON ALL CONSTRUCTION ACTIVITIES THAT OCCUR ON LAND, UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS, OR OTHERWISE REQUESTED, REMOVE PERIMETER CONTROLS WITHIN 30 DAYS AFTER THE DATE OF WARRANTY PERFORMANCE OF THE WORK OR IN ACCORDANCE WITH BMPS.
- VEHICLE TRACKING CONTROLS SHALL BE USED AT ALL VEHICLE AND EQUIPMENT ACCESS POINTS TO THE SITE TO PREVENT SEDIMENT EXITING THE PROJECT SITE ONTO PAVED PUBLIC ROADS. ACCESS SHALL BE PROVIDED ONLY AT LOCATIONS APPROVED BY THE ENGINEER. VEHICLE TRACKING CONTROL LOCATIONS SHALL BE RECORDED ON THE SWMP SITE MAP.
- ALL INLETS AND CULVERTS SHALL BE PROTECTED DURING ONSITE CONSTRUCTION ACTIVITIES. INLET PROTECTION LOCATIONS SHALL BE RECORDED ON THE SWMP SITE MAP.
- CONCRETE WASTED IN DESIGNATED DEWATERING AREAS SHALL BE COLLECTED, REMOVED FROM THE PROJECT SITE, AND DISPOSED OF PROPERLY. WASTED CONCRETE ALSO INCLUDES EXCESS CONCRETE REMOVED FROM FORMS, SPILLS, SLOP, AND ALL OTHER UNUSED CONCRETE THAT ENDS UP ON THE GROUND.
- THE CONTRACTOR/PERMITTEE MUST MAINTAIN A SPILL KIT ON SITE WHEN WORKING AROUND SURFACE WATERS. IF POLLUTANTS ARE SPILLED INTO ANY SURFACE WATERS DURING THE COURSE OF CONSTRUCTION ACTIVITIES, THE CONTRACTOR/PERMITTEE MUST NOTIFY THE OWNER'S REPRESENTATIVE OR ENGINEER IMMEDIATELY.
- ALL EXISTING MATURE TREES WITHIN THE DESIGNATED PROJECT AREA ARE TO BE FENCE PROTECTED IN PLACE AT DRIPLINE UNLESS OTHERWISE DIRECTED BY THE ENGINEER. PRIOR TO THE INITIATION OF WORK, THE ENGINEER SHALL MARK ANY TREES AND/OR LARGE SHRUBS TO BE REMOVED AS PART OF CONSTRUCTION ACTIVITIES. AREAS OF TREE REMOVAL SHALL BE DETERMINED AND MARKED IN COLLABORATION BETWEEN THE CONTRACTOR/PERMITTEE AND THE ENGINEER.
- ALL EXCAVATION ACTIVITIES OCCURRING WITHIN 10 FEET OF THE DRIPLINE SHALL BE PERFORMED BY HAND AND IF NECESSARY ROOTS SHALL BE CLEANLY CUT NOT TORN OR RIPPED. IF EXPOSED, TREE ROOTS SHALL BE BACKFILLED AND WATERED ON THE SAME DAY OF CUTTING AND APPROVED ROOT STIMULATOR SHALL BE APPLIED. SOILS SHALL NOT BE COMPACTED WITHIN THE DRIPLINE OF MATURE TREES UNLESS OTHERWISE APPROVED BY THE ENGINEER.

**WASTE MANAGEMENT**

- THE CONTRACTOR/PERMITTEE SHALL NOT BURN, BURY, OR OTHERWISE DISCHARGE CONSTRUCTION OR DEMOLITION WASTE ON THE SITE UNLESS SPECIFIED OTHERWISE.
- THE CONTRACTOR/PERMITTEE SHALL PROVIDE A PORTABLE TOILET AND ASSOCIATED MAINTENANCE SCHEDULE FOR THE CONSTRUCTION AREA SUFFICIENT TO ACCOMMODATE THE CONSTRUCTION CREW AND ALL OTHER AUTHORIZED PERSONS TO BE ONSITE DURING CONSTRUCTION ACTIVITIES.

**HAZARDOUS MATERIALS**

- THE CONTRACTOR/PERMITTEE SHALL TRANSPORT, USE, AND STORE HAZARDOUS MATERIALS IN ACCORDANCE WITH ALL REGULATORY REQUIREMENTS. SPILLED HAZARDOUS MATERIALS, INCLUDING HAZARDOUS LIQUID WASTES, SHALL BE REMOVED FROM THE SITE AND THE PROPERTY RESTORED TO ITS PRE-SPILL STATE IN ACCORDANCE WITH REGULATORY REQUIREMENTS.
- THE CONTRACTOR/PERMITTEE SHALL IMMEDIATELY REPORT SPILLS TO THE PROPER REGULATORY AUTHORITY AND SHALL IMMEDIATELY NOTIFY THE ENGINEER.
- HANDLING OF CONSTRUCTION FUELS AND LUBRICANTS:
  - THE CONTRACTOR/PERMITTEE SHALL EMPLOY PERSONS QUALIFIED TO HANDLE CONSTRUCTION EQUIPMENT FUELS AND LUBRICANTS.
  - THE CONTRACTOR/PERMITTEE SHALL REFUEL AND SERVICE EQUIPMENT AWAY FROM FLOODPLAINS OF RIVERS, STREAMS AND OTHER BODIES OF WATER. THE CONTRACTOR/PERMITTEE SHALL ENSURE EQUIPMENT THAT ENTERS THE WATER IS FREE FROM EXTERNAL GREASE, OIL, AND MUD.
  - THE CONTRACTOR/PERMITTEE SHALL PREVENT HANDLING AND FUELING OPERATIONS FROM CONTAMINATING THE GROUND, SURFACE WATER, AND GROUND WATER. THE CONTRACTOR/PERMITTEE SHALL USE CONTAINMENT BERMS AND AN IMPERMEABLE BASE COURSE OR OTHER SYSTEM TO CONTAIN SPILLED FUEL.

**GENERAL CARE OF WATER**

CARE OF WATER SHALL INCLUDE THE DESIGN OF ALL TEMPORARY CARE OF WATER PROVISIONS INCLUDING COFFER DAMS, SUMPS, PUMPING SYSTEMS, PIPELINES, CHANNELS, FLUMES, DRAINS, AND OTHER PROTECTIVE AND DEWATERING WORKS TO ALLOW FOR WORK TO BE PERFORMED UNDER DRY CONDITIONS.

- NO CONSTRUCTION EQUIPMENT SHALL BE OPERATED BELOW THE EXISTING WATER SURFACE UNLESS SPECIFICALLY AUTHORIZED BY THE STORMWATER QUALITY PERMIT ISSUED BY BOULDER COUNTY, AND ANY OTHER APPLICABLE LOCAL, STATE OR FEDERAL LICENSE OR PERMIT.
- THE CONTRACTOR/PERMITTEE IS RESPONSIBLE FOR ALL CARE OF WATER INCLUDING BUT NOT LIMITED TO DESIGNING, SUPPLYING, CONSTRUCTING, OPERATING, AND REMOVING ALL CARE OF WATER PROVISION INCLUDING COFFER DAMS AND SEDIMENT REMOVAL SYSTEMS; DESIGNING, SUPPLYING, INSTALLING, MAINTAINING, AND REMOVING PROTECTIVE WORKS FOR WINTER OPERATIONS OF CARE OF WATER SYSTEMS.
- THE CONTRACTOR/PERMITTEE SHALL COMPLY WITH ALL USACE 404 PERMIT REQUIREMENTS INCLUDING ANY SPECIAL CARE REQUIREMENTS ISSUED FOR THIS PROJECT.
- WHEN REQUIRED THE CONTRACTOR/PERMITTEE SHALL DESIGN TEMPORARY STREAM DIVERSIONS TO FACILITATE UPSTREAM FISH PASSAGE. INSTREAM VELOCITIES SHALL BE LIMITED TO 7 FT/SEC WHEN THIS PROVISION IS REQUIRED.

- CARE OF WATER SHALL INCLUDE PROVISIONS FOR HANDLING GROUNDWATER, RAINSTORM RUNOFF, SNOW, SNOWMELT, AND ICE THAT MAY ENTER THE WORK AREA.
- PROTECTIVE WORKS SHALL BE DESIGNED BY THE CONTRACTOR/PERMITTEE AS NECESSARY TO INCLUDE ENCLOSURES, INSULATION, AND HEATING SYSTEMS TO ENSURE THAT DEWATERING SYSTEMS OPERATE CONTINUOUSLY AND DO NOT BECOME FROZEN DURING COLD WEATHER.
- THE CONTRACTOR/PERMITTEE SHALL PROVIDE AND MAINTAIN SEDIMENT PONDS OR OTHER MEANS, REMOVE SEDIMENT FROM WATERS COLLECTED WITHIN ACTIVE CONSTRUCTION AREAS PRIOR TO ALLOWING IT TO ENTER OR RETURN INTO THE WATERCOURSE. CONTRACTOR/PERMITTEE SHALL DISPOSE OF SEDIMENTS IN A SUITABLE OFF-SITE WASTE DISPOSAL FACILITY.
- THE CONTRACTOR/PERMITTEE SHALL MONITOR WATER TURBIDITY DURING CONSTRUCTION ACTIVITIES AND SHALL SHUT DOWN WORKS AT TIMES OF EXCESS TURBIDITY IN ORDER TO ALLOW THE WATER TO CLEAR PRIOR TO RE-COMMENCEMENT OF IN-STREAM WORK.
- TURBIDITY IS EXPECTED DURING PLACEMENT AND REMOVAL OF WATER CONTROL. IF WATERS BECOME NOTICEABLY TURBID, CONTRACTOR/PERMITTEES SHOULD PROMPTLY HALT OPERATIONS TO ALLOW WATERS TO CLEAR PRIOR TO RESUMING OPERATIONS. FURTHERMORE, SHUTDOWNS FOR SILTY OR TURBID WATER MAY BE SPECIFIED BY THE ENGINEER OR THE OWNER'S REPRESENTATIVE, AT THEIR DISCRETION.
- IN THE EVENT OF UNSCHEDULED CONSTRUCTION ACTIVITY THAT RESULTS IN A VISUALLY CONSPICUOUS PLUME OF SEDIMENT, CONTRACTOR/PERMITTEE SHALL IMMEDIATELY NOTIFY THE ENGINEER AND UNDERTAKE MITIGATION ACTIONS NECESSARY TO COMPLY WITH THE SPECIFIED CLEAN WATER CRITERIA.

**COFFER DAMS**

- THE CONTRACTOR/PERMITTEE IS RESPONSIBLE FOR THE FINAL LAYOUT, CONFIGURATION, MAINTENANCE, AND REMOVAL IN THEIR ENTIRETY OF ALL COFFER DAMS TO BE CONSTRUCTED WITHIN THE PROJECT SITE.
- THE CONTRACTOR/PERMITTEE IS RESPONSIBLE FOR THE RECLAMATION, TO ORIGINAL OR BETTER CONDITION, OF ALL AREAS IMPACTED BY THE CONSTRUCTION OF COFFER DAMS. RECLAMATION MAY INCLUDE BUT IS NOT LIMITED TO THE RESTORATION OF STABLE SLOPES TYPICALLY EQUAL TO OR LESS THAN 3H:1V, INSTALLATION OF APPROVED EROSION CONTROL FABRIC, AND INSTALLATION OF AN APPROVED NATIVE SEED MIX.
- COFFERDAMS LOCATED IN THE WATERWAY SHALL BE PLACED IN A MANNER TO PREVENT THEIR EROSION FROM NORMAL OR EXPECTED HIGH FLOWS. FURTHERMORE, THEY SHOULD BE PLACED TO A SUFFICIENT ELEVATION TO PREVENT THEIR OVERTOPPING DURING REASONABLY ANTICIPATED FLOOD EVENTS THAT MAY COMPROMISE THE DESIGN AND PERFORMANCE OF THE COFFERDAM.
- THE USE OF RIPRAP OR OTHER PROTECTION MEASURES ON THE SURFACES OF THE COFFERDAM, INCLUDING THE TOE OF COFFERDAM SLOPES EXPOSED TO HIGH VELOCITIES, IS REQUIRED.
- ALL TEMPORARY FILLS MUST BE REMOVED IN THEIR ENTIRETY FOLLOWING CONSTRUCTION ACTIVITIES AND AFFECTED AREAS GRADED TO PROPOSED CONDITIONS. COFFER DAMS SHALL PROVIDE A BYPASS WATERWAY THAT IS ARMORED AND OF THE MINIMUM DIMENSIONS SHOWN IN THE TYPICAL WATER CONTROL CHANNEL DETAIL.
- ANY COFFER DAM FAILURES OR OTHER WORKS EFFORTS THAT CAUSE A PLUME OF TURBID WATER TO FLOW DOWNSTREAM SHALL BE REPORTED TO THE ENGINEER.

**HEAVY EQUIPMENT OPERATIONS AND MAINTENANCE**

- EQUIPMENT OPERATED BELOW THE ORDINARY HIGH WATER MARK OF THE DITCH CHANNEL, MUST BE INSPECTED AND CLEAN OF FUEL, LUBRICANT LEAKS, AND INVASIVE AQUATIC SPECIES.
- TO MINIMIZE THE SPREAD OF INVASIVE SPECIES, ALL EQUIPMENT SHALL BE POWER-WASHED AND FREE OF WEEDS PRIOR TO ITS DELIVERY TO THE PROJECT AREA. IF EQUIPMENT WAS USED IN ANOTHER WET AREA WITHIN 10 DAYS OF INITIATING WORK, DECONTAMINATION PRACTICES SHOULD BE EMPLOYED TO MINIMIZE THE SPREAD OF DIDYMOPHENIA, NEW ZEALAND MUD SNAILS, WHIRLING DISEASE, ZEBRA MUSSELS, AND OTHER AQUATIC HITCHHIKERS.
- EQUIPMENT OPERATING WITHIN OR ADJACENT TO ANY SURFACE WATERS SHALL BE FREE OF FLUID LEAKS. BIODEGRADABLE HYDRAULIC FLUIDS SHALL BE UTILIZED FOR ALL EQUIPMENT OPERATING IN SURFACE WATERS. THE CONTRACTOR/PERMITTEE SHALL SUBMIT A LIST OF EQUIPMENT OPERATING WITH CERTIFIED NON-TOXIC, BIODEGRADABLE HYDRAULIC FLUIDS TO THE ENGINEER PRIOR TO USE. ALL FUELING, OILING, OR MAINTENANCE OF EQUIPMENT SHALL BE PERFORMED IN DESIGNATED UPLAND LOCATIONS, WITH ADEQUATE BMPS TO CONTAIN POTENTIAL SPILLS.



**DESIGN DATA**

REINFORCED CONCRETE:

CLASS B CONCRETE:	f'c	=	4,500 psi
CLASS D CONCRETE:	f'c	=	4,500 psi
PRECAST CONCRETE:	f'c	=	5,000 psi
REINFORCING STEEL:	fy	=	60,000 psi
WELDED WIRE FABRIC:	fy	=	65,000 psi

STRUCTURAL STEEL:	AASHTO M270 (ASTM A709)	GRADE 36	fy = 36,000 PSI.
	AASHTO M270 (ASTM A709)	GRADE 50	fy = 50,000 PSI.

ASSUMED BACKFILL SOIL PROPERTIES:

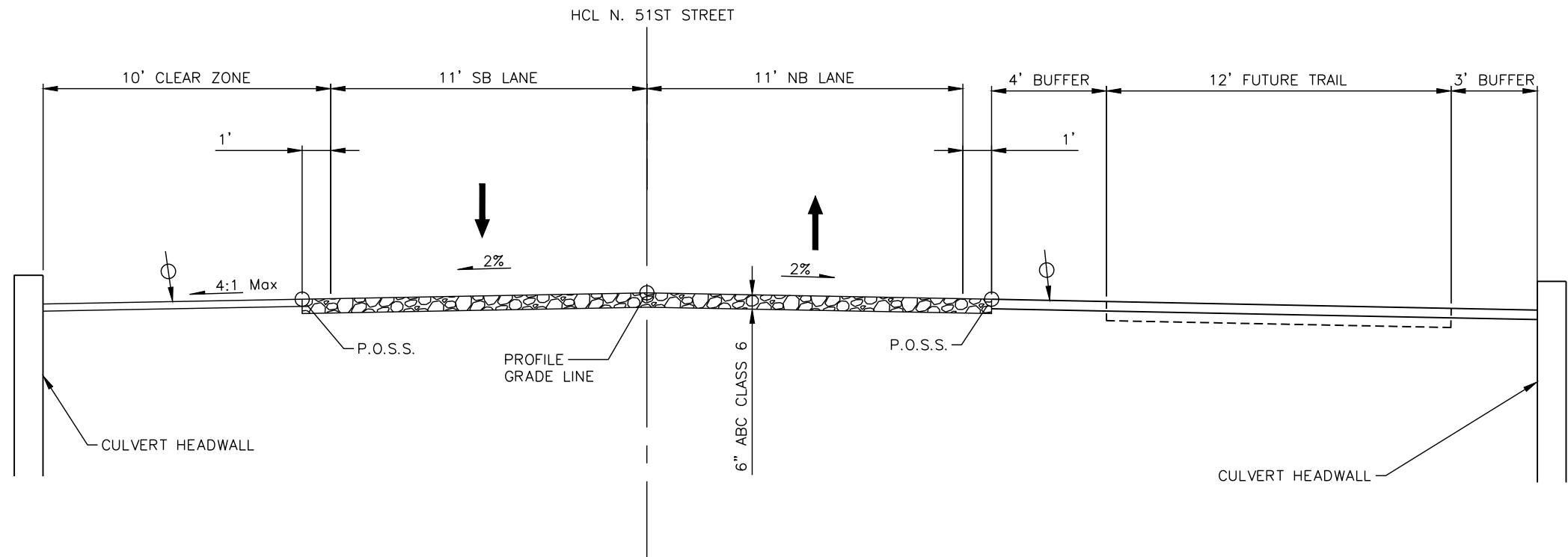
UNIT WEIGHT = 120 PCF  
BACKFILL PRESSURE: 30 PCF MIN. 60 PCF MAX.

Y:\DENVER\1519005\00151901.00\_BOULDER\_DRAWINGS\151901-00NT-51ST.DWG LAST PLOTTED 2/7/2023 8:51 AM

<b>100%</b>	<p style="font-size: 8px;">CALL UTILITY NOTIFICATION CENTER OF COLORADO CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES</p>	<table border="1" style="font-size: 8px;"> <tr> <th>NO.</th> <th>DATE</th> <th>REVISION DESCRIPTION:</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	NO.	DATE	REVISION DESCRIPTION:				<p><b>BOULDER COUNTY PUBLIC WORKS DEPARTMENT</b> <b>ENGINEERING DIVISION</b></p>		<table border="1" style="font-size: 8px;"> <tr> <td>DESIGNED:</td> <td>CAD:</td> <td>CHECKED:</td> <td>DATE:</td> </tr> <tr> <td>MES</td> <td>MES</td> <td>SCB</td> <td>02/07/23</td> </tr> </table>	DESIGNED:	CAD:	CHECKED:	DATE:	MES	MES	SCB	02/07/23	<p>N. 51ST STREET STR. NO. BC-005104-1.4</p> <p><b>GENERAL NOTES</b></p> <p>PROJECT NO: <b>BC-005104-1.4</b> SHEET NO: <b>3</b></p>
NO.	DATE	REVISION DESCRIPTION:																		
DESIGNED:	CAD:	CHECKED:	DATE:																	
MES	MES	SCB	02/07/23																	

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LEGEND	
ABC	AGGREGATE BASE COURSE
HCL	HORIZONTAL CONTROL LINE
P.O.S.S.	POINT OF SLOPE SELECTION
	4" TOPSOIL & NATIVE SEEDING



**N. 51ST STREET TYPICAL SECTION**  
STA 21+25 TO STA 23+45

**SUMMARY OF EARTHWORK**

PAY ITEMS	PROJECT TOTALS	
	PLAN	
UNCLASSIFIED EXCAVATION (CHANNEL GRADING)	CU. YD.	158
STRUCTURE EXCAVATION		304
STRUCTURE BACKFILL (CLASS 1)		485
TOPSOIL (ONSITE)		100
STOCKPILE WETLAND TOPSOIL		51
TOPSOIL (WETLAND)		228

FOR INFORMATION ONLY		
UNCLASSIFIED EXCAVATION	CU. YD.	158
CHANNEL GRADING (FROM SURFACES)		
TOTAL		158
EMBANKMENT MATERIAL	CU. YD.	0
CHANNEL GRADING (FROM SURFACES)		
TOTAL		0
EARTHWORK BALANCE	CU. YD.	0
EMBANKMENT x FACTOR (1.25)		
UNCLASSIFIED EXCAVATION		158
PIPE STRUCTURE EXCAVATION		304
CONTRACTOR'S EXCESS		462

**EARTHWORK NOTES:**

- HAULING WILL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE COST OF THE WORK.
- THERE IS NO DESIGNATED BORROW SITE. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING STRUCTURE BACKFILL BORROW SOURCE.
- TOPSOIL WILL BE REQUIRED TO A DEPTH OF 4 INCHES ON AREAS TO RECEIVE NATIVE SEED. EXISTING TOPSOIL WITHIN THE LIMITS OF DISTURBANCE MAY BE STRIPPED AND REUSED. STRIPPING AND STOCKPILING EXISTING TOPSOIL WILL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE COST OF "TOPSOIL (ONSITE)".
- THE CONTRACTOR IS ADVISED ON-SITE EXCAVATED MATERIAL MAY NOT BE SUITABLE FOR RE-USE ON THE PROJECT.
- EXCESS MATERIAL SHALL BE DISPOSED OF OFFSITE IN ACCORDANCE WITH APPLICABLE REGULATIONS.
- STRUCTURE EXCAVATION AND BACKFILL QUANTITIES ARE ESTIMATED ACCORDING TO M-206-1.



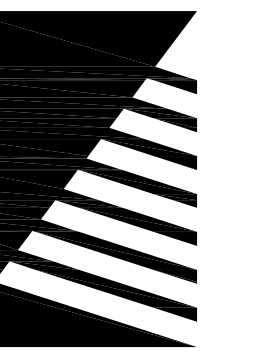
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CONTRACT ITEM NO.	CONTRACT ITEM	UNIT	ROADWAY										PROJECT TOTALS		
			PLAN	AS CONST.	PLAN	AS CONST.	PLAN	AS CONST.	PLAN	AS CONST.	PLAN	AS CONST.	PLAN	AS CONST.	
201-00000	Clearing and Grubbing	LS	1											1	
202-00035	Removal of Pipe	LF	72											72	
202-00155	Removal of Wall	LF	44											44	
202-01000	Removal of Fence	LF	182											182	
203-00015	Unclassified Excavation (Channel Grading)	CY	158											158	
206-00000	Structure Excavation	CY	304											304	
206-00100	Structure Backfill (Class 1)	CY	465											465	
206-00510	Filter Material (Class A)	CY	21											21	
207-00700	Topsoil (Onsite)	CY	100											100	
207-00310	Stockpile Wetland Topsoil	CY	51											51	
207-00703	Topsoil (Wetland)	CY	228											228	
208-00022	Erosion Log Type 3 (9 Inch)	LF	182											182	
208-00041	Rock Check Dam	EACH	1											1	
208-00045	Concrete Washout Structure	EACH	1											1	
208-00070	Vehicle Tracking Pad	EACH	1											1	
211-03005	Dewatering	LS	1											1	
212-00708	Seeding (Native) Broadcast	ACRE	0.19											0.19	
212-00711	Seeding (Wetland) Broadcast	ACRE	0.14											0.14	
213-00002	Mulching (Weed Free Hay)	ACRE	0.19											0.19	
214-01013	Live Willow Stakes	EACH	353											353	
216-00201	Soil Rentention Blanket (Straw-Coconut)(Biodegradeable Class 1)	SY	383											383	
304-06000	Aggregate Base Course (Class 6)	TON	256											256	
506-00212	Riprap (12 Inch)	CY	31											31	
601-03050	Concrete Class D (Wall)	CY	70											70	
602-00000	Reinforcing Steel	LB	5946											5946	
603-10720	72 Inch Reinforced Concrete Pipe (Complete In Place)	LF	214											214	
607-01000	Fence Barbed Wire with Metal Posts	LF	177											177	
607-11580	Fence (Temporary)	LF	291											291	
612-00003	Delineator (Type III)	EACH	2											2	
620-00020	Sanitary Facility	EACH	1											1	







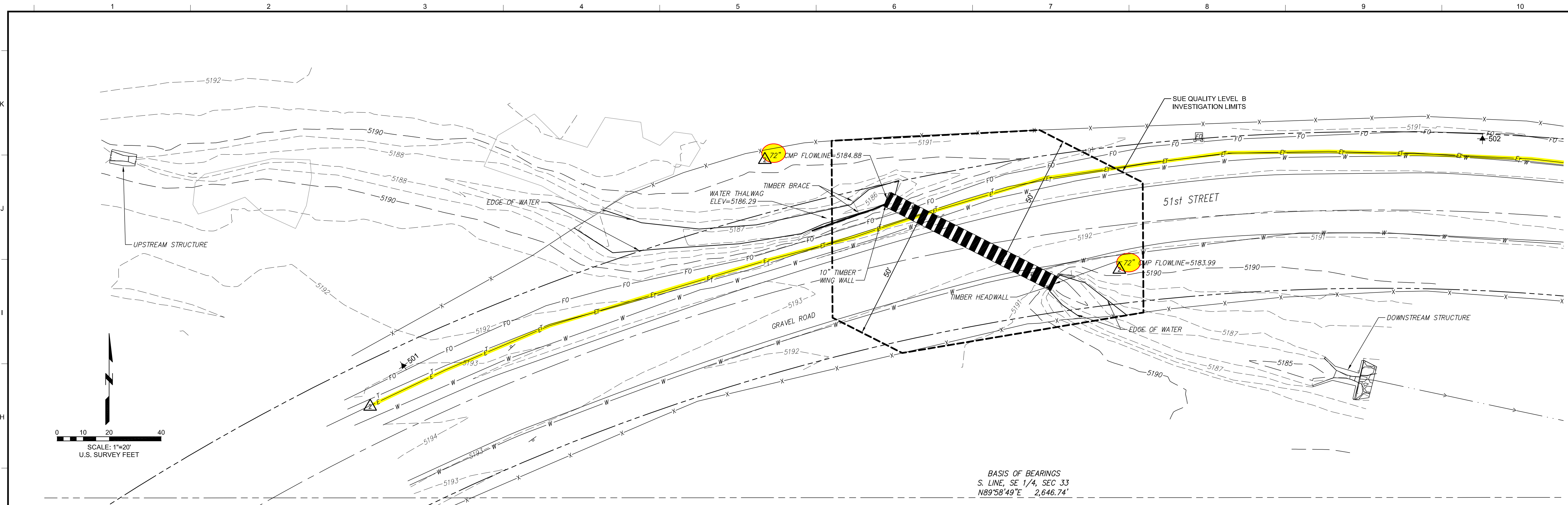


# Farnsworth GROUP

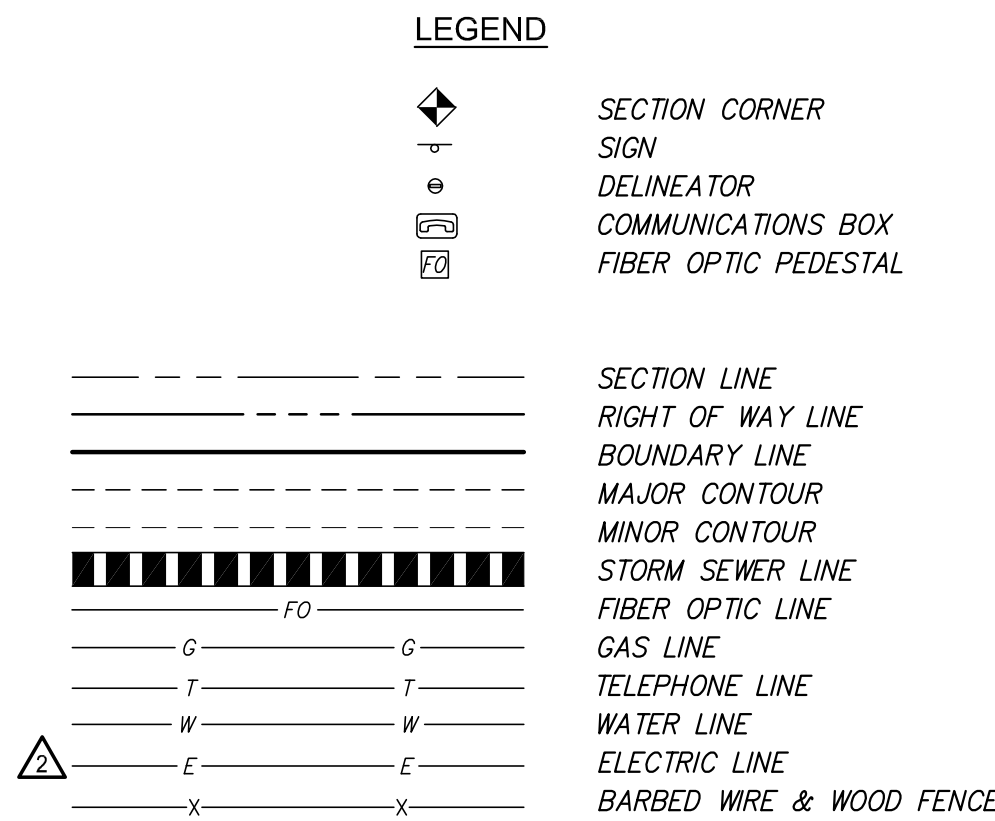
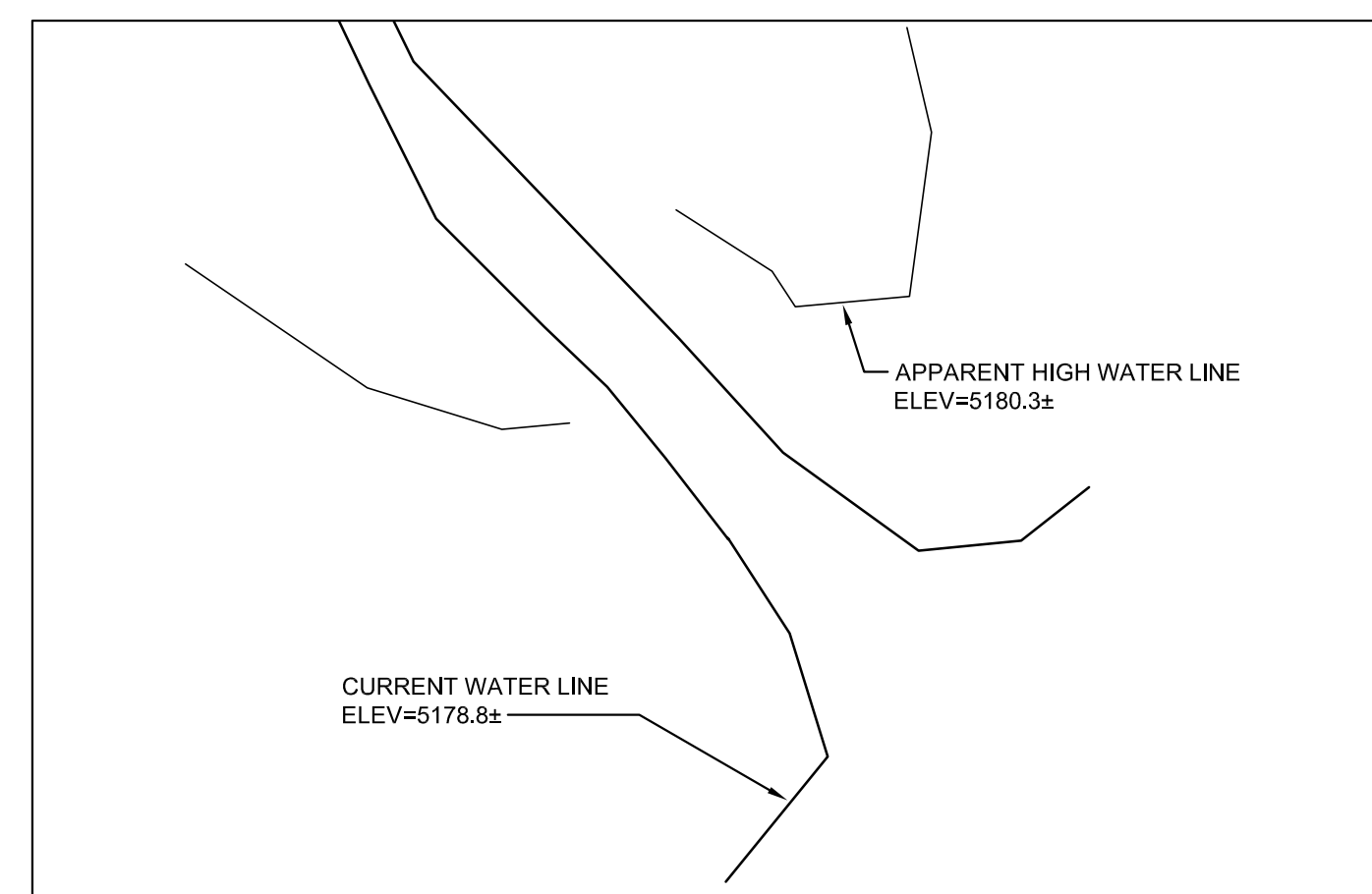
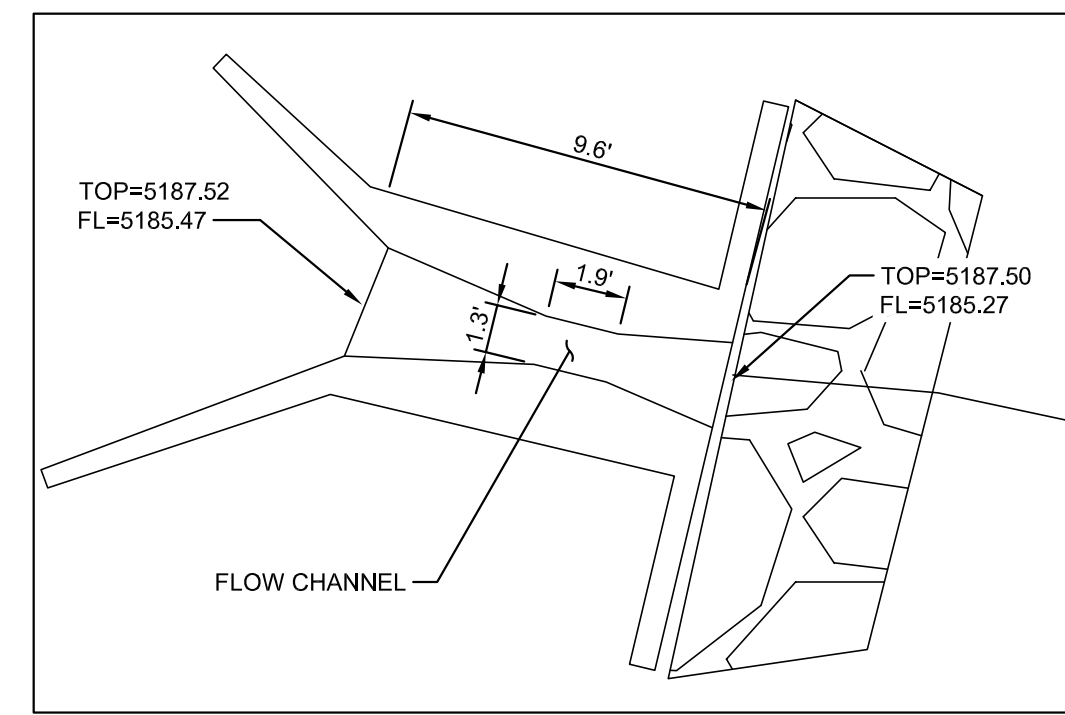
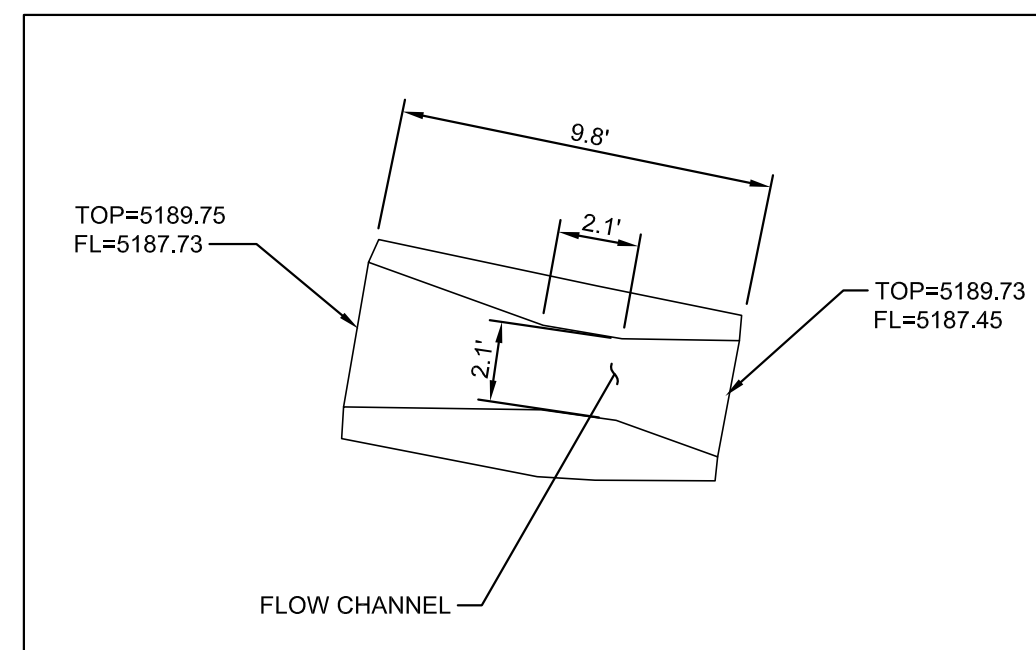
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GREENWOOD VILLAGE, COLORADO 80111  
(303) 692-8838 / info@f-w.com

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ISSUE #	DATE	DESCRIPTION
1	09/24/2019	ADDED TOPO OUTSIDE ROW FENCE
2	10/07/2019	ADDED BURIED ELECTRIC LINE



POINT NUMBER	NORTHING	EASTING	ELEVATION	DESCRIPTION
501	275,134.95	75,467.51	5,193.04	SET REBAR WITH RED PLASTIC CAP MARKED FARNSWORTH CONTROL
502	275,221.96	75,881.41	5,191.52	SET REBAR WITH RED PLASTIC CAP MARKED FARNSWORTH CONTROL
1000	275,085.09	77,608.34		29WC NORTHEAST CORNER, 2-1/2" BRASS CAP IN 6" CONC LS 2149
1001	275,084.18	74,932.60		NORTH 1/4 CORNER, 2-1/2" ALUM CAP, WJS 2-64



### NOTES:

- THE FIELD SURVEY TO LOCATE IMPROVEMENTS WAS PERFORMED ON JUNE 5 - 13, 2019 WITHIN THE RIGHT-OF-WAY FENCE AND ON AUGUST 20, 2019 FOR THE AREA OUTSIDE THE RIGHT-OF-WAY FENCE. FARNSWORTH GROUP AND THE SURVEYOR OF RECORD ARE NOT RESPONSIBLE FOR NOT LOCATING IMPROVEMENTS WHICH WERE NOT VISIBLE ON THE DATES OF THE FIELD SURVEY OR IMPROVEMENTS WHICH WERE ADDED OR REMOVED AFTER THE DATES OF THE SURVEY.
- THIS TOPOGRAPHIC SURVEY IS NOT A MONUMENTED LAND SURVEY, LAND SURVEY PLAT OR IMPROVEMENT SURVEY PLAT AND IS SUBJECT TO ANY INACCURACIES THAT A SUBSEQUENT BOUNDARY SURVEY MAY DISCLOSE.
- RIGHTS OF WAY ARE SHOWN HEREON AS DEPICTED ON LAND SURVEY PLAT BY WILLIAM J. STENDEL, PLS NO. 4846, DATED DECEMBER 1989 AND ON FILE WITH BOULDER COUNTY RECORDS AS LS-90-0063.
- THE LOCATION OF EXISTING FENCES OR OTHER FEATURES INDICATIVE OF POSSESSION IN THE VICINITY OF PROPERTY OR RIGHT-OF-WAY LINES MAY INDICATE OWNERSHIP ACQUIRED OR LOST THROUGH DOCUMENTS NOT SUPPLIED TO THE SURVEYOR OR THROUGH UNRECORDED MEANS.
- THIS SURVEY WAS PERFORMED WITHOUT BENEFIT OF ANY FORM OF TITLE INFORMATION AND/OR VERIFICATION AND DOES NOT CONSTITUTE A TITLE SEARCH BY FARNSWORTH GROUP, INC. TO DETERMINE OWNERSHIP OR EASEMENTS OF RECORD. THERE MAY BE RECORDINGS ESTABLISHING EASEMENTS, BURDENS OR OTHER AGREEMENTS AFFECTING THE PROPERTY WHICH IS THE SUBJECT MATTER OF THIS SURVEY OF WHICH WE ARE NOT AWARE AND ARE NOT SHOWN HEREON.
- BASIS OF BEARINGS: BEARINGS ARE BASED ON AN GPS/OPUS DERIVED MODIFIED STATE PLANE SYSTEM. THE SOUTH LINE OF THE SOUTHEAST QUARTER OF SECTION 33, T. 2 N., R. 70 W., 6TH PM IS ASSUMED TO BEAR N 89°58'49" E, BEING MONUMENTED AS SHOWN HEREON.
- BASIS OF ELEVATIONS: ELEVATIONS ARE BASED ON GPS/OPUS DERIVED NAVD88 DATUM. PROJECT BENCHMARK IS CONTROL POINT 501 AS DESCRIBED HEREON. ELEVATION = 5193.04 NAVD88
- PROJECT CONTROL POINTS WERE ESTABLISHED AS NOTED ON THE CONTROL TABULATION.
- SEE SUBSURFACE UTILITY ENGINEERING PLAN / REPORT BY FARNSWORTH GROUP, INC. FOR UTILITY INFORMATION WITHIN THE SUE QUALITY LEVEL B INVESTIGATION LIMITS.
- UTILITY INFORMATION SHOWN HEREON BEING OUTSIDE THE SUE QUALITY LEVEL B INVESTIGATION LIMITS IS FROM UTILITY COMPANY MAPPING, ELECTROMAGNETIC DETECTION MARKINGS BY KINETIC INDUSTRIES AND APPARENT SURFACE EVIDENCE COLLECTED BY FIELD SURVEY. THIS INFORMATION DOES NOT COMPLY WITH DESIGNATION REQUIREMENTS OF C.R.S. 9-1.5-101 ET SEQ.. UTILITY INFORMATION IN THIS AREA MAY NOT ADDRESS FULL UTILITY INFORMATION OF ALL AVAILABLE UTILITIES. OTHER UTILITIES, IN USE OR ABANDONED, MIGHT EXIST WITHIN THE AREA SHOWN HEREON
- IT IS THE RESPONSIBILITY OF DESIGN PROFESSIONALS TO FIELD VERIFY UTILITY INFORMATION THAT COULD BE CRITICAL TO DESIGN EFFORTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE SIZE, MATERIAL, LOCATION AND ELEVATION OF ALL UTILITIES PRIOR TO COMMENCEMENT OF CONSTRUCTION.
- NOTICE: ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATION SHOWN HEREON.
- ACCORDING TO THE COLORADO STATE BOARD OF LICENSURE FOR ARCHITECTS, PROFESSIONAL ENGINEERS AND PROFESSIONAL LAND SURVEYORS RULE 6.2.2 THE SURVEYOR'S CERTIFICATION IS:
  - BASED UPON THE PROFESSIONAL LAND SURVEYOR'S KNOWLEDGE, INFORMATION AND BELIEF,
  - IN ACCORDANCE WITH APPLICABLE STANDARDS OF PRACTICE, AND
  - NOT A GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED.

PROJECT:  
ALFRED BENESCH & COMPANY

## BOULDER COUNTY - MINOR STRUCTURES REPLACEMENT N. 51ST STREET

NE 1/4, SEC 4, T 1 N, R 70 W, 6PM  
SE 1/4 SEC 33, T 2 N, R 70 W, 6PM

BOULDER, CO

DATE: 06/27/2019

DESIGNED: JAN

DRAWN: JAN

REVIEWED: AGW

FIELD BOOK NO.: 2411

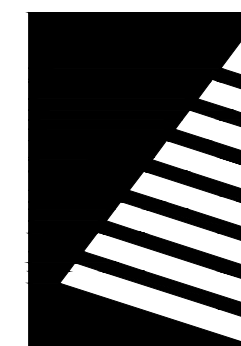
### TOPOGRAPHIC SURVEY

SHEET NUMBER:

1  
OF 1

PROJECT NO.: 0190870.00





**Farnsworth GROUP**

5613 DTC PARKWAY, SUITE 1100  
GREENWOOD VILLAGE, COLORADO 80111  
(303) 692-8838 / info@f-w.com

www.f-w.com  
Engineers | Architects | Surveyors | Scientists

ISSUE:  
# Date: Description:  
1 06/10/2021 ADD POTHOLE DATA

**PRELIMINARY**  
NOT FOR CONSTRUCTION

PROJECT:  
ALFRED BENESCH & COMPANY

**BOULDER COUNTY - MINOR STRUCTURES REPLACEMENT**

SECTION 33, T 2 N, R 70 W  
OF THE 6TH P.M.  
51st STREET  
BOULDER, COLORADO

DATE: 10/08/2019

DESIGNED: GK

DRAWN: JH

REVIEWED: GK

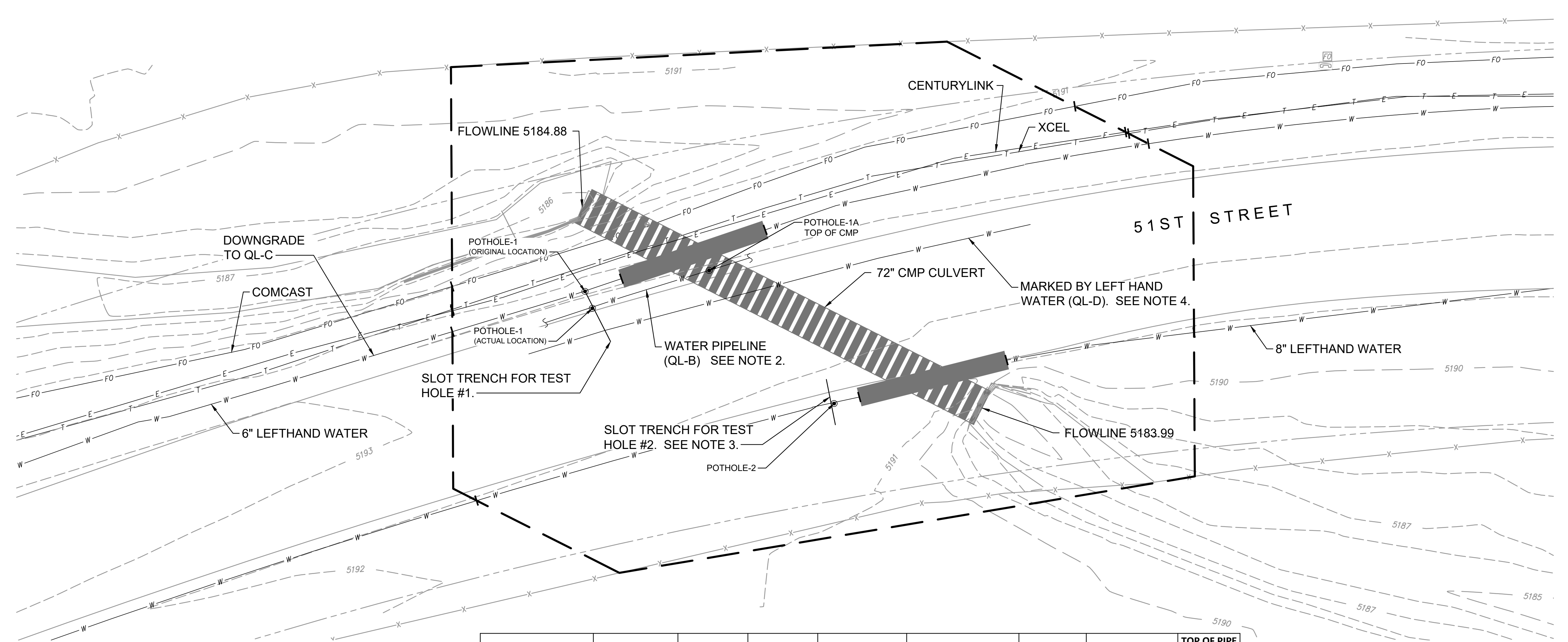
FIELD BOOK NO.:

**SUBSURFACE UTILITY ENGINEERING PLAN**

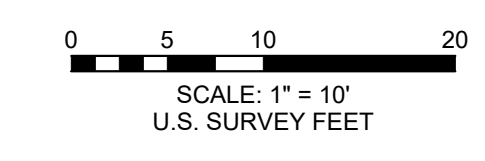
SHEET NUMBER:

**1**  
OF 1

PROJECT NO.: 00190870.00



POTHOLE #	NORTHING	EASTING	ELEVATION	SURFACE DEPTHS	UTIL TYPE	SIZE	MATERIAL	TOP OF PIPE ELEV
PH-1 (ORIGINAL)	275184.691	75653.336	5189.82	N/A	N/A	N/A	N/A	N/A
PH-1 (ACTUAL)	275182.397	75654.511	5192.48	3.5	WATER	6"	ACP	5188.96
PH-1A: TOP OF CMP	275188.551	75673.275	5192.48		CULVERT	72"	CMP	5188.46
PH-1A: TOP OF WATERLINE OVER CULVERT			5192.48	3.1	WATER	6"	ACP	5189.38
PH-2	275167.074	75693.38	5191.67	DIRT/13.5	SEARCHING FOR WATER LINE			N/A



**SURVEY NOTES:**

- UTILITY LOCATION PERFORMED BY KINETIC INDUSTRY AND FIELD SURVEYING AND ENGINEERING INSPECTION PERFORMED BY FARNSWORTH GROUP. ORIGINAL LOCATE PERFORMED ON 6/10/2019, WITH GROUND PENETRATING RADAR SWEEP ON 6/17/19, AND ADDITIONAL XCEL POWER LOCATED ON 10/04/19.

**ENGINEERING NOTES:**

- ALL UTILITIES WITHIN NOTED BOUNDARIES ARE DEPICTED AT QUALITY LEVEL B (QL B) EXCEPT:
  - ALL STORM AND SANITARY SEWERS ARE QUALITY LEVEL C (QL C) UNLESS OTHERWISE NOTED.
  - STORM AND SANITARY SEWER MANHOLE/INLET INVERT ELEVATIONS ARE QUALITY LEVEL A (QL A).

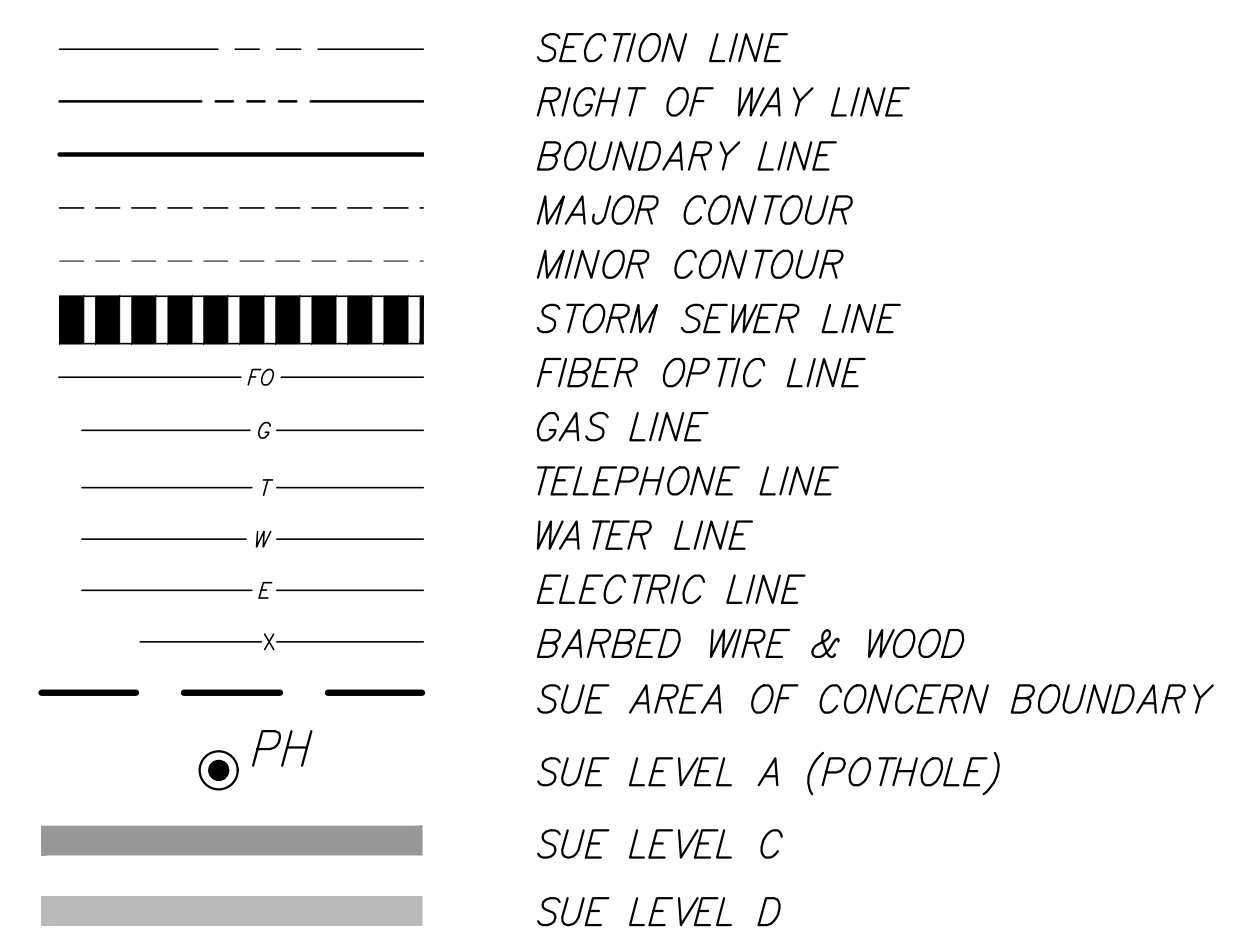
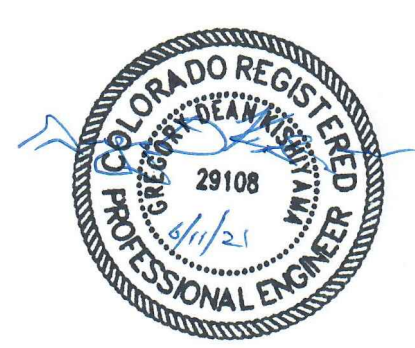
CENTURYLINK AND XCEL LINES ARE SHOWN VERY CLOSE AND CROSSING EACH OTHER. THIS MAY BE DUE TO BLEED-OVER OF RADIO FREQUENCIES DURING LOCATE ACTIVITIES. ASSUME BOTH LINES ARE IN CLOSE PROXIMITY TO EACH OTHER.
- WATER PIPELINE WAS FOUND APPROXIMATELY 3.0' SOUTH OF THE QL-B LOCATED LINE. THE ORIGINAL LINE HAS BEEN DOWNGRADED TO QL-C AND IS POSSIBLY A RESULT OF BLEEDOVER EFFECT FROM THE NEARBY ELECTRICAL LINE. NOTE: THE WATER LINE GOES OVER THE EXISTING CMP CULVERT.
- A SLOTTED TRENCH WAS PERFORMED FOR POTHOLE #2 TO LOCATE THE 8" WATER LINE. THE SLOT WAS 7.4' LONG AND 13.5' DEEP. THE WATER LINE WAS NOT FOUND. GROUNDWATER INFILTRATION PREVENTED FURTHER DEPTH.
- LEFT HAND WATER LOCATORS WERE CALLED TO THE SITE DURING THE POTHOLING ACTIVITIES. THEY MARKED A POSSIBLE WATER LINE IN THE ROAD, BUT WERE NOT CONFIDENT IN ITS LOCATION. POTHOLE #1 WAS SLOTTED OUT TO INTERSECT THESE MARKS AND DID NOT FIND ANYTHING. THE LEFT HAND MARKINGS ARE SHOWN IN THE DRAWING AS QL-D ALTHOUGH IT IS UNLIKELY TO BE CORRECT. THEY ALSO THOUGHT THE LINE WAS WHERE SHOWN ON THE SOUTH SIDE OF THE ROAD.

A PRAGMATIC EFFORT HAS BEEN MADE TO SYSTEMATICALLY DESIGNATE AND DEPICT BURIED UTILITIES WITHIN THE CORRIDOR TO THE EXTENT PRACTICAL FOR THE AUTHORIZED PROJECT BUDGET. FINAL UTILITY PLANS ARE FOR DESIGN PURPOSES ONLY AND REFLECT SUBSURFACE UTILITY CONDITIONS AT THE TIME SURVEYED. EXISTING UTILITY LOCATIONS DEPICTED ON THE PLANS DO NOT SUPERSEDE COLORADO STATE ONE CALL DEMARCATIONS OF BURIED UTILITIES OR RELIEVE THE CONTRACTOR FROM THE LEGAL REQUIREMENT TO CALL ONE CALL TWO WORKING DAYS PRIOR TO CONSTRUCTION. FARNSWORTH GROUP, KINETIC INDUSTRY, AND THE PROJECT DESIGN ENGINEER SHOULD BE NOTIFIED OF ANY DISCREPANCIES BETWEEN THE UTILITY DESIGNATING / LOCATING SURVEY AND ONE CALL MARKINGS, AND THE CONTRACTOR SHALL USE CAUTION UNTIL DISCREPANCIES ARE RESOLVED. EXISTING UTILITIES ARE LOCATED TO A QUALITY LEVEL B, EXCEPT WHERE NOTED, ACCORDING TO ASCE 38-02.

CONTRACTOR SHALL CALL THE UTILITY NOTIFICATION SERVICE BEFORE EXCAVATING AS REQUIRED BY LAW.

I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF COLORADO.

GREGORY DEAN KISHIYAMA, P.E. DATE 10/08/2019 LICENSE NUMBER: 29108



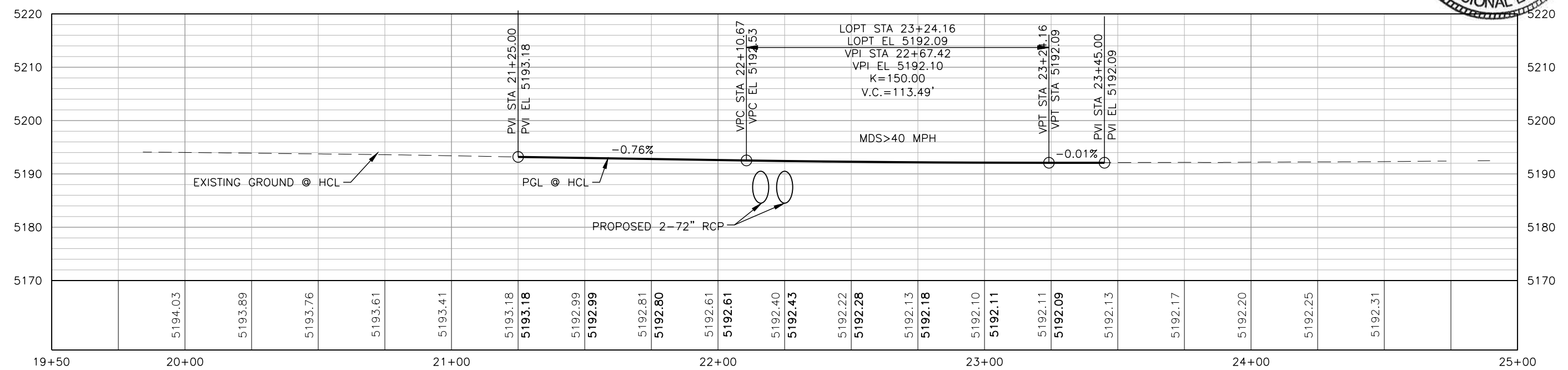
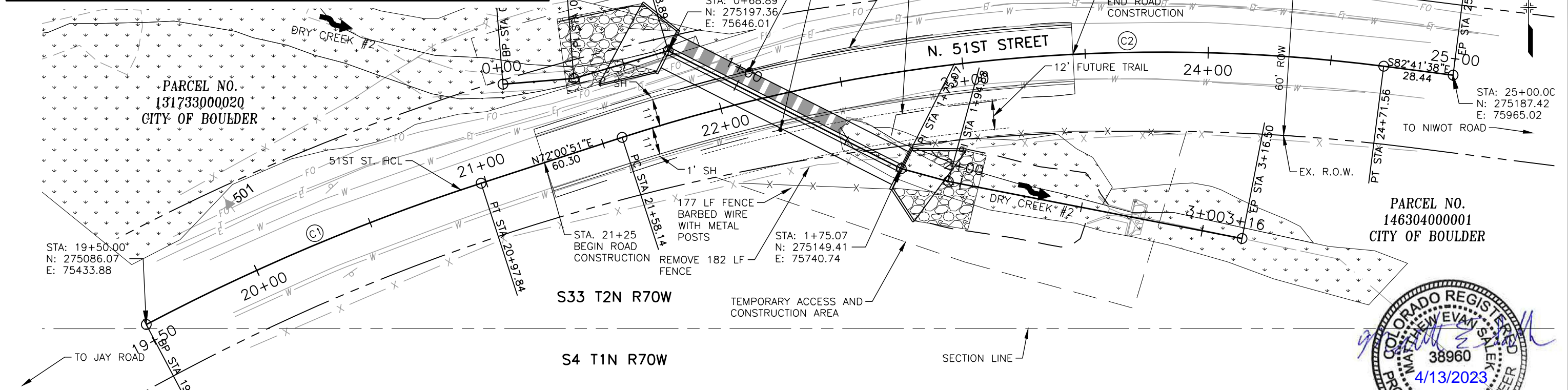
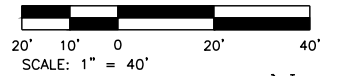
NOTE:  
ALL UTILITIES WITHIN SUE BOUNDARY ARE LEVEL B UNLESS OTHERWISE NOTED.



Curve Table: Alignments

Curve #	PI STA	Radius	Length	Delta	Start Point (X, Y)	End Point (X, Y)
C1	20+24.10	865.00'	147.84'	9°47'34"	(75433.88, 275086.07)	(75569.93, 275143.49)
C2	23+17.45	710.00'	313.41'	25°17'31"	(75627.28, 275162.11)	(75936.81, 275191.04)

LEGEND:



Y:\DENVER\1519005\00151901\_00\_BOULDER\_MINOR\_STR\_RP\_ENG\_DOCS\DRAWINGS\51ST\151901-DRPLOT - DRPPO1-51ST.DWG LAST PLOTTED 2/7/2023 8:51 AM

100%	<p>CALL UTILITY NOTIFICATION CENTER OF COLORADO CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES</p>	NO.	DATE	REVISION DESCRIPTION:		<b>BOULDER COUNTY PUBLIC WORKS DEPARTMENT</b> <b>ENGINEERING DIVISION</b>		N. 51ST STREET STR. NO. BC-005104-1.4 <b>ROADWAY PLAN &amp; PROFILE</b>	
		DESIGNED:	CAD:	CHECKED:		DATE:	PROJECT NO:	SHEET NO:	
		SGH	MDS		02/07/23	BC-005104-1.4	9		



**NOTES:**

- CULVERT HEADWALLS SHALL BE ACCORDING TO CDOT M-601-10. WINGWALLS SHALL BE ACCORDING TO M-601-20.
- CULVERT WINGWALLS SHALL INCLUDE A CONCRETE APRON AND TOE WALL PER DETAILS IN M-601-20.

**LEGEND:**

EXISTING WETLANDS

**WINGWALL DATA**

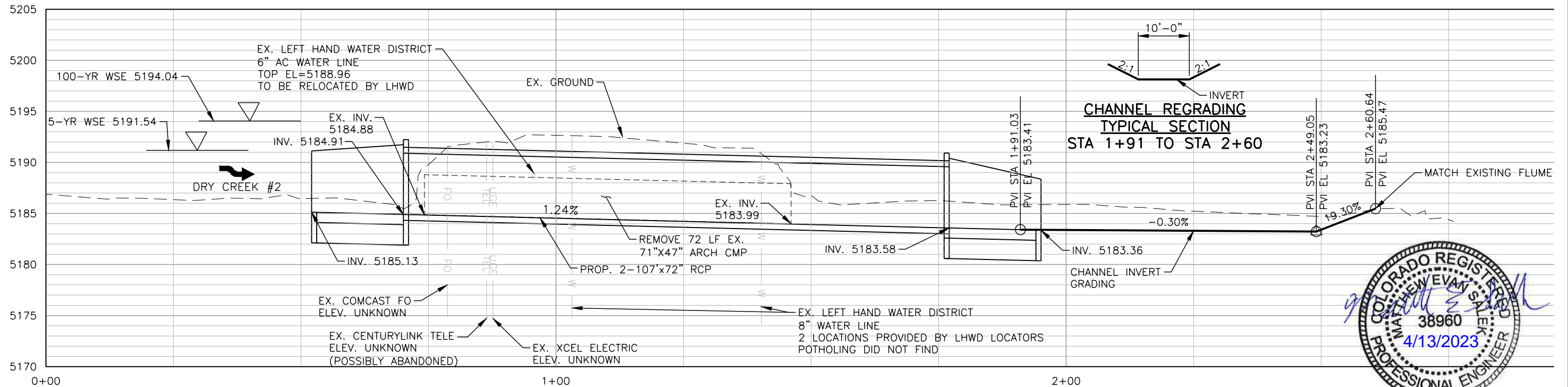
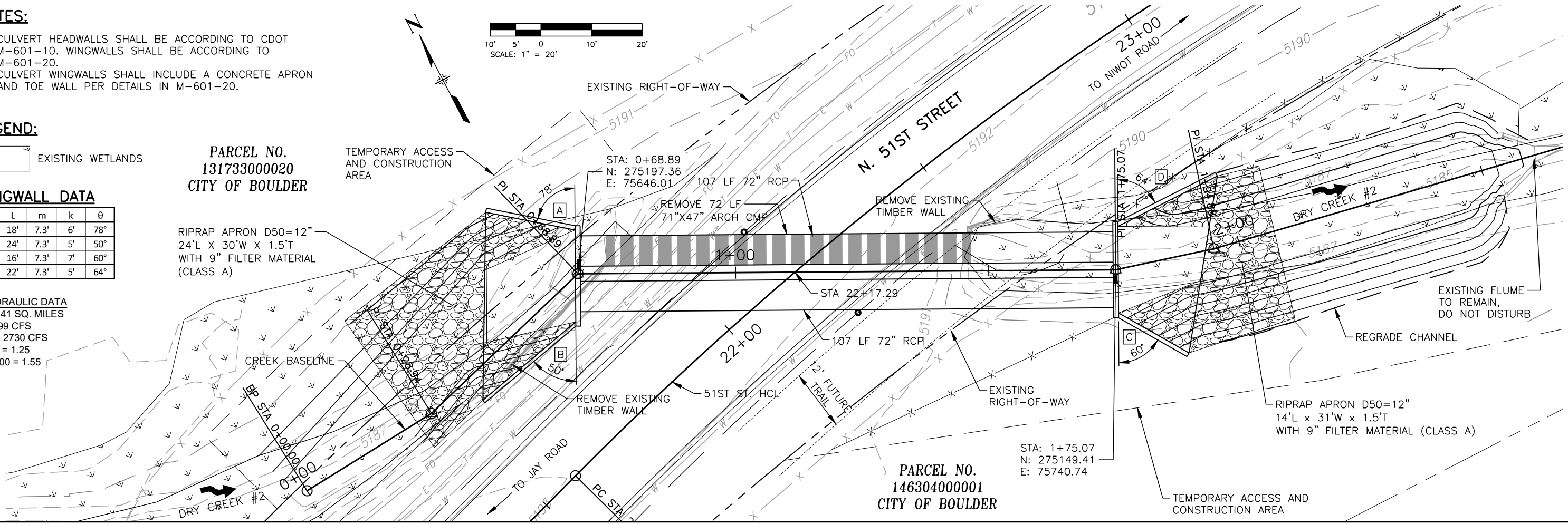
	L	m	k	θ
A	18'	7.3'	6'	78°
B	24'	7.3'	5'	50°
C	16'	7.3'	7'	60°
D	22'	7.3'	5'	64°

**HYDRAULIC DATA**

DA = 4.41 SQ. MILES  
 Q5 = 399 CFS  
 Q100 = 2730 CFS  
 HW/D5 = 1.25  
 HW/D100 = 1.55

PARCEL NO.  
 131733000020  
 CITY OF BOULDER

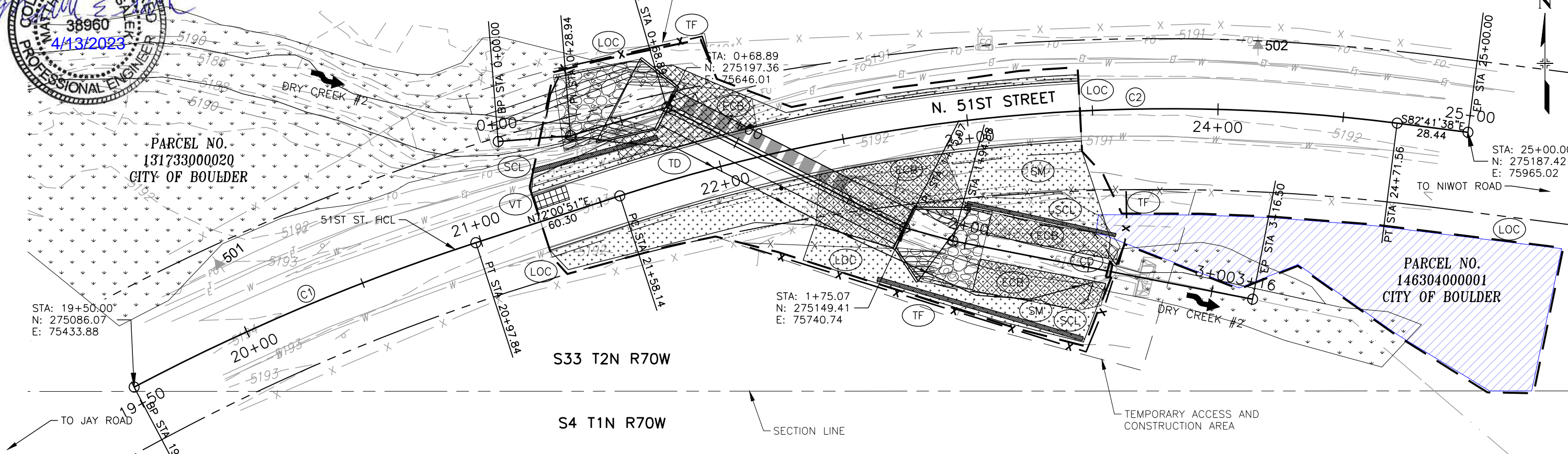
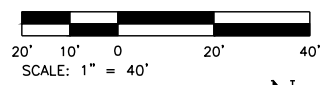
RIPRAP APRON D50=12"  
 24'L X 30'W X 1.5'T  
 WITH 9" FILTER MATERIAL  
 (CLASS A)



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EXISTING WETLANDS  
 WETLAND MITIGATION AREA  
 SEE WETLAND PLANS



**EROSION CONTROL NOTES:**

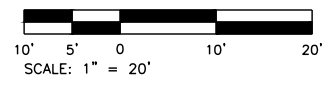
- ALL EROSION CONTROL MEASURES SHALL BE MAINTAINED IN ACCORDANCE WITH SUBSECTION 208.04.
- SEEDING SHALL BE COMPLETED ACCORDING TO THE SCHEDULE IN SECTION 212.03.
- ALL AREAS TO RECEIVE NATIVE SEEDING AND MULCH SHALL HAVE NATIVE TOP SOIL OR APPROVED SOIL AMENDMENTS SPREAD TO A DEPTH OF AT LEAST 6 INCHES (LOOSE DEPTH). HAUL ROADS AND OTHER COMPACTED AREAS SHALL BE LOOSENEED TO A DEPT OF 6 INCHES PRIOR TO SPREADING TOPSOIL.
- SOIL IS TO BE THOROUGHLY LOOSENEED TO A DEPTH OF 6 INCHES PRIOR TO NATIVE SEEDING. THE TOP 6 INCHES OF THE SEED BED SHALL BE GENERALLY FREE OF ROCKS GREATER THAN 4 INCHES AND SOIL CLODS GREATER THAN 2 INCHES. SEEDING OVER ANY COMPACTED AREAS THAT HAVEN'T BEEN THOROUGHLY LOOSENEED SHALL BE REJECTED.
- MULCH SHALL BE WEED FREE HAY. MULCH TACKIFIER SHALL BE USED TO STABILIZE MULCH.
- SEED AND MULCHED AREAS SHALL BE ACCEPTED UNDER THE FOLLOWING CONDITIONS:
  - 70% OF THE EXISTING / PRE-CONSTRUCTION CONDITION
  - FREE OF ERODED AREAS
  - FREE FROM INFESTATION OF NOXIOUS WEEDS.
- RILL AND GULLY EROSION SHALL BE FILLED WITH TOPSOIL PRIOR TO RESEEDING.
- APPLY SEED PRIOR TO COVERING COMPACTED SOIL WITH EROSION CONTROL BLANKET. EROSION CONTROL BLANKET SHALL BE CLASS 1, BIODEGRADABLE STRAW/COCONUT.
- CONSTRUCTION DEWATERING PLAN SHALL BE IN ACCORDANCE WITH THE CDPHE CONSTRUCTION GENERAL PERMIT REQUIREMENTS. THIS WORK IS INCLUDED IN THE WORK AND SHALL NOT BE PAID FOR SEPARATELY.
- WATER MUST BE DIVERTED SUCH THAT ALL CONSTRUCTION RELATING TO CEMENT RELATED ACTIVITIES OCCUR "IN THE DRY" WITH NO WATER FLOWING THROUGH ACTIVE CONSTRUCTION AREA.
- CONTRACTOR SHALL SUBMIT DIVERSION PLAN FOR REVIEW AND APPROVAL BY THE ENGINEER TEN (10) DAYS PRIOR TO IMPLEMENTATION IN ACCORDANCE WITH SUBSECTION 105.02.
- THE DIVERSION PLAN SHALL INCLUDE THE FOLLOWING:
  - METHOD STATEMENT ADDRESSING ALL REQUIREMENTS INCLUDING COPIES OF RELEVANT PERMITS REQUIRED FOR STREAM DIVERSION
  - PLANS AND DESIGN CALCULATIONS, SEALED AND SIGNED BY A PROFESSIONAL ENGINEER REGISTERED TO THE STATE OF COLORADO SUPPORTING THE DIVERSION PLAN INCLUDING BUT NOT LIMITED TO:
    - METHOD FOR DETERMINING DESIGN FLOW,
    - SURFACE WATER PROFILING AND CONVEYANCE CALCULATIONS, AND
    - PHASING PLANS.
- CONTRACTOR TO DETERMINE STAGING AREA.
- ESTIMATED AREAS ARE:
  - LIMITS OF CONSTRUCTION: 0.55 ACRE
  - DISTURBED AREA: 0.36 ACRE

100%

CALL UTILITY NOTIFICATION CENTER OF COLORADO  
  
 CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

NO.	DATE	REVISION DESCRIPTION:

FOOTHILLS SEED MIX (SEEDING RATE 16.95#/ACRE)		
SPECIES	VARIETY	% IN MIX
SIDE OATS GRAMA	VAUGHN	10
BLUE GRAMA	NATIVE, ALMA, OR HACHITA	15
SLENDER WHEATGRASS	SAN LUIS	20
JUNEGRASS	NATIVE	10
WESTERN WHEATGRASS	ARRIBA	10
WESTERN WHEATGRASS	NATIVE	10
SWITCHGRASS	BLACKWELL OR NEBRASKA 28	7
LITTLE BLUESTEM	CIMARRON OR PASTURA	8
GREEN NEEDLEGRASS	LODORM OR NATIVE	10
<b>TOTAL</b>		<b>100</b>



**BMP LEGEND**

- (ECB) EROSION CONTROL BLANKET
- (LOC) LIMITS OF CONSTRUCTION AND DISTURBANCE
- (SCL) SEDIMENT CONTROL LOG
- (SM) NATIVE SEEDING AND MULCHING
- (TF) TEMPORARY FENCE
- (CD) CHECK DAM
- (TD) TEMPORARY DIVERSION
- (VT) VEHICLE TRACKING PAD
- FLOW DIRECTION

A BOULDER COUNTY STORMWATER QUALITY PERMIT (SWQP) IS REQUIRED FOR THIS PROJECT. BECAUSE IT IS WITHIN 100 HORIZONTAL FEET OF A PERMANENT PERENNIAL STREAM OR A MAIN IRRIGATION DITCH. FOR MORE INFORMATION ON QUALIFYING WATERWAYS AND PROJECTS, REFER TO THE GUIDANCE FOR SMALL CONSTRUCTION PROJECTS AVAILABLE ON THE BOULDER COUNTY TRANSPORTATION DEPARTMENT WEBSITE. THE BOULDER COUNTY STORMWATER QUALITY PERMIT CAN BE ACQUIRED VIA [HTTPS://WWW.BOULDERCOUNTY.ORG/TRANSPORTATION/PERMITS/STORMWATER-QUALITY-PERMIT/](https://www.bouldercounty.org/transportation/permits/stormwater-quality-permit/)

**BOULDER COUNTY PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION**  
 DESIGNED: SGH CAD: MDS CHECKED: DATE: 02/07/23  
 PROJECT NO: BC-005104-1.4 SHEET NO: 11

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**TABULATION OF CONSTRUCTION TRAFFIC CONTROL DEVICES**  
TCP DEVICES

ITEM NO.	DESCRIPTION	UNIT	QUANTITY
630-00007	TRAFFIC CONTROL INSPECTION	DAY	36
630-00012	TRAFFIC CONTROL MANAGEMENT	DAY	6
630-80335	BARRICADE (TYPE 3 M-A) (TEMPORARY)	EACH	7
630-80341	CONSTRUCTION TRAFFIC SIGN (PANEL SIZE A)	EACH	13
630-80342	CONSTRUCTION TRAFFIC SIGN (PANEL SIZE B)	EACH	5
630-80344	CONSTRUCTION TRAFFIC SIGN (SPECIAL)	SF	20

**SUMMARY OF CONSTRUCTION TRAFFIC CONTROL SIGNS**  
TCP SIGNS

SIGN CODE	SIGN LEGEND	DIMENSION W X H (IN)	PANEL SIZE	PANEL SIZE TOTALS				
				A		B		SPECIAL
				EACH		EACH		SF
24M4-8A	END DETOUR	24X18	A	2				
30M4-9L	DETOUR LEFT	30X24	A	3				
30M4-9R	DETOUR RIGHT	30X24	A	3				
48M4-10L	DETOUR ARROW LEFT	48X18	A	1				
48M4-10R	DETOUR ARROW RIGHT	48X18	A	1				
48R11-2	ROAD CLOSED	48X30	B			2		
60R11-3A	ROAD CLOSED XX MILES AHEAD LOCAL TRAFFIC ONLY	60X30	B			3		
36W20-2	DETOUR AHEAD	36X36	A	1				
36W20-3	ROAD CLOSED AHEAD	36X36	A	2				
SPECIAL	51ST STREET	30X12	A					20
PROJECT TOTALS				13		5		20

**TRAFFIC CONTROL PLAN GENERAL NOTES**














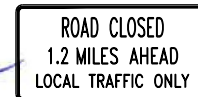



1. FINAL DEVICE PLACEMENT SHALL BE ACCORDING TO THE MUTCD AND STANDARD S-630-1 OF THE CDOT M&S STANDARD PLANS. THE CONTRACTOR IS DIRECTED TO CASE 20 OF S-630-1.
2. ALL SIGNS, INCLUDING EXISTING SIGNS AND CONSTRUCTION SIGNS FROM OTHER PHASES, WHICH CONFLICT WITH CONDITIONS OF THE CURRENT PHASE, SHALL BE COVERED, TURNED OR REMOVED. THIS WORK WILL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCIDENTAL TO OTHER TRAFFIC CONTROL ITEMS.
3. ALL TRAFFIC CONTROL ITEMS SHALL BE CRASH TESTED IN ACCORDANCE WITH FHWA MASH REQUIREMENTS. ITEMS TESTED IN ACCORDANCE WITH NCHRP 350 MAY BE USED IF STILL WITHIN THEIR USEFUL SERVICE LIFE.
4. VERIFY BURIED UTILITIES PRIOR TO PLACING ANY BELOW-GROUND POSTS.
5. SIGN AND DEVICE PLACEMENT SHOWN ON THE PLAN IS SCHEMATIC ONLY. DEVICE PLACEMENT SHALL BE AS REQUIRED BY PHASING AND FIELD CONDITIONS, AND AS DIRECTED BY THE ENGINEER.



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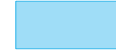





(A)	(B)
  SPECIAL 30M4-9L	  SPECIAL 30M4-9R
(C)	(D)
 36W20-3	  60R11-3A 48M4-10R ON TYPE 3 BARRICADE
(E)	(F)
 48R11-2 ON TYPE 3 BARRICADE	  60R11-3A 48M4-10L ON TYPE 3 BARRICADE
(G)	(H)
  SPECIAL 24M4-8A	 36W20-2
(I)	<b>LEGEND</b>
 60R11-3A ON TYPE 3 BARRICADE	 CONSTRUCTION SIGN PANEL  BARRICADE TYPE 3  DETOUR TRAFFIC FLOW

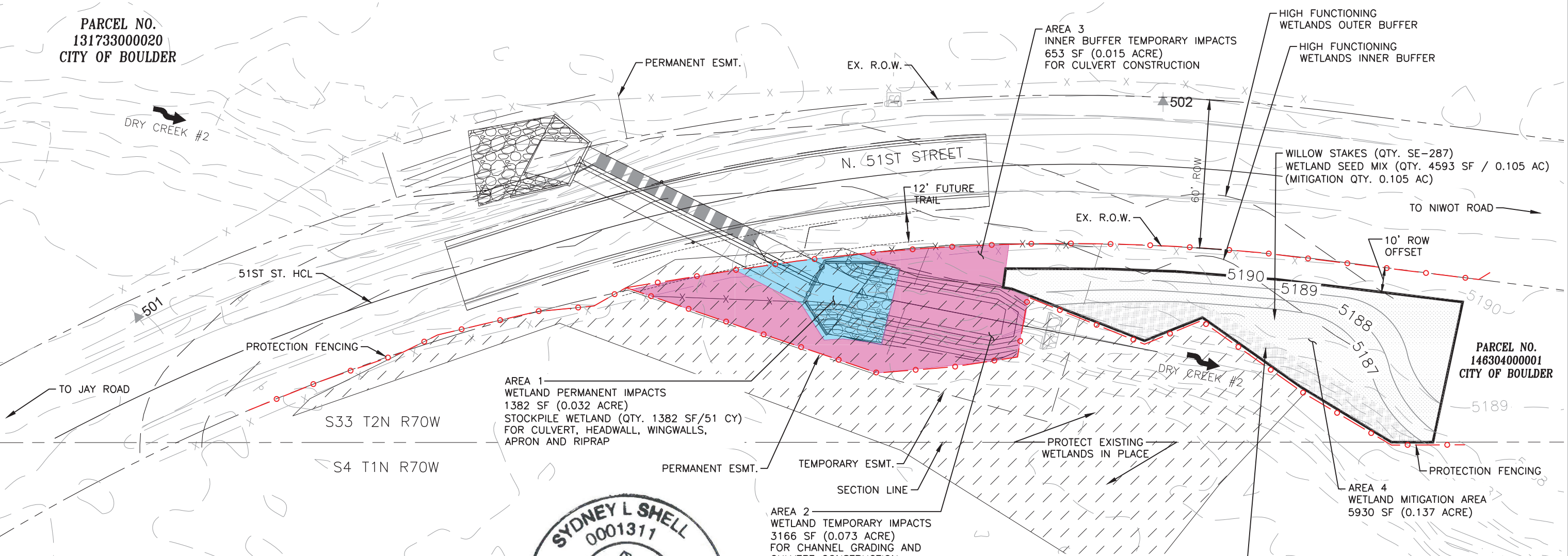




**LEGEND:**

-  EXISTING HIGH FUNCTIONING WETLANDS
-  EXISTING CONTOUR
-  PROPOSED MAJOR CONTOUR
-  PROPOSED MINOR CONTOUR
-  PROTECTION FENCING
-  STOCKPILE WETLAND TOPSOIL (QTY. 1382 SF/51 CY)
-  STOCKPILED/PROTECTED WETLAND TOPSOIL (QTY. 3166 SF/177 CY)  
WETLAND SEED MIX (QTY. 5200 SF/0.12 AC)  
(MITIGATION QTY. 0.12 AC)
-  WILLOW STAKES (QTY. SE- 287)  
WETLAND SEED MIX (QTY. 4593 SF / 0.105 AC)  
(MITIGATION QTY. 0.105 AC)
-  RELOCATED WETLAND TOPSOIL AT 12" DEPTH  
(QTY. 1382 SF/51 CY)  
WILLOW STAKES (QTY. SE- 86)  
WETLAND SEED MIX (QTY. 1382 SF / 0.032 AC)  
(MITIGATION QTY. 0.032 AC)

PERMANENT IMPACTS: MITIGATION TABLE					
IMPACTED AREA	TOTAL IMPACTED AREA (ACRES)	REQUIRED RESTORATION RATIO	REQUIRED RESTORATION (ACRES)	REVEGETATION OF TEMPORARILY IMPACTED AREA (ACRES)	WETLAND MITIGATION AREA PROPOSED (ACRES)
PERMANENTLY IMPACTED WETLANDS	0.104 AC TEMPORARY = 0.073 PERMANENT = 0.031	2 TO 1	0.208 AC	0.073 AC	0.137 AC
INNER & OUTER BUFFER ZONE	0.015 AC TEMPORARY = 0.015 PERMANENT = 0.000	1 TO 1	0.015 AC	0.015 AC	0.000 AC
<b>TOTAL</b>	<b>0.119 AC</b>		<b>0.223 AC</b>	<b>0.088 AC</b>	<b>0.137 AC</b>



**PARCEL NO.  
13173300020  
CITY OF BOULDER**



**PARCEL NO.  
14630400001  
CITY OF BOULDER**

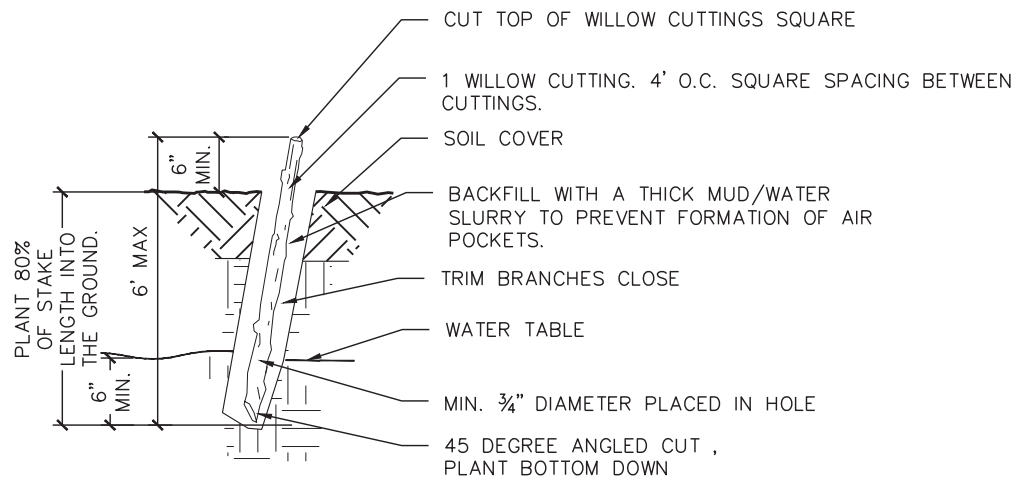
**REVEGETATION NOTES:**

1. LIDAR CONTOUR DATA PROVIDED BY BOULDER COUNTY. IF SITE CONDITIONS AND/OR ELEVATIONS DIFFER FROM PLANS CONTRACTOR SHALL NOTIFY LANDSCAPE ARCHITECT PRIOR TO GRADING WORK IN PROPOSED MITIGATION AREA. ELEVATIONS ARE CRITICAL TO THE CREATION AND ESTABLISHMENT OF WETLAND PLANTINGS.
2. THE LANDSCAPE ARCHITECT SHALL BE ONSITE TO VERIFY GRADES FOR WETLAND TOPSOIL RELOCATION PRIOR TO STOCKPILED WETLAND TOPSOIL BEING PLACED.
3. CONTRACTOR SHALL CONTACT OWNER'S REPRESENTATIVE IF ADDITIONAL IMPACTS TO WETLAND RESOURCES IS ANTICIPATED PRIOR TO DISTURBANCES.



Z:\PROJECTS\2019\119097902\_MINOR\_STRUCTURE REPLACEMENT AT 63RD AND 51ST ST\FIGURES\AUTOCAD\DWG\151901\_51ST\_WETLANDMITIGATIONEXHIBIT.DWG LAST PLOTTED 5/15/2023 10:26 AM

	<p>CALL UTILITY NOTIFICATION CENTER OF COLORADO</p> <p>CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES</p>	<p>NO. DATE</p>	<p>REVISION DESCRIPTION:</p>		<p><b>BOULDER COUNTY PUBLIC WORKS DEPARTMENT</b></p> <p><b>ENGINEERING DIVISION</b></p>	<p>DESIGNED: LAB</p> <p>CAD: LAB</p> <p>CHECKED: SLS</p> <p>DATE: 5/15/23</p>	<p>PROJECT NO: BC-005104-1.4</p> <p>SHEET NO: L-1</p>
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**NOTES:**

- HARVEST AND PLANT CUTTINGS DURING THE DORMANT SEASON, MARCH 1ST TO APRIL 15TH. VARIATION FROM THIS TIME FRAME SHALL BE APPROVED BY THE LANDSCAPE ARCHITECT OR CDOT BIOLOGIST.
- HARVEST WILLOW CUTTING BY MAKING A 45 DEGREE ANGLED CUT TO ENSURE STAKE IS PLANTED CORRECTLY WITH THE BOTTOM DOWN.
- USE HEALTHY, STRAIGHT AND LIVE WOOD AT LEAST ONE YEAR OLD.
- MAKE CLEAN CUTS AND DO NOT DAMAGE CUTTINGS OR SPLIT ENDS DURING INSTALLATION. DAMAGED CUTTINGS MAY BE REJECTED.
- USE A PILOT BAR OR OTHER METHOD WHEN INSTALLING IN FIRM SOILS.
- SOAK CUTTINGS FOR 3 TO 14 DAYS, BY COMPLETELY SUBMERGING IN A COOL/SHADED AREA, PRIOR TO INSTALLATION.
- BACKFILL WITH MUD SLURRY AND TAMP THE SOIL AROUND THE CUTTINGS.
- ALL WILLOW CUTTINGS SHALL BE PLANTED 4' O.C. SQUARE SPACING UNLESS OTHERWISE NOTED.
- WATER SHALL BE APPLIED TO THE LIVE CUTTING PLANTED AREAS UNTIL THE SOIL MASS IS SATURATED.

WETLAND SEED MIX			
Species	Common Name	Variety	Lbs PLS/acre Broadcast Seeding Rate
<i>Asclepias incarnata</i>	Swamp milkweed		3.84
<i>Asclepias speciosa</i>	Showy milkweed		1.20
<i>Calamagrotis canadensis</i>	Bluejoint Reedgrass		3.20
<i>Carex nebrascensis</i>	Nebraska sedge		0.86
<i>Carex pellita</i>	Wooly sedge		3.32
<i>Eleocharis palustris</i>	Spikerush		0.42
<i>Glyceria striata</i>	Fowl mannagrass		0.16
<i>Helianthus nuttallii</i>	Marsh sunflower		1.20
<i>Juncus balticus</i>	Baltic rush		1.43
<i>Panicum virgatum</i>	Switchgrass		1.90
<i>Schoenoplectus acutus</i>	Hardstem bulrush		1.95
<i>Schoenoplectus pungens</i>	Common three square		2.42
<i>Scripus microcarpus</i>	Panicled bulrush		0.07
<i>Verbena hastata</i>	Swamp verbena		0.05
		TOTAL lbs/PLS/acre	22.47

**REVEGETATION SEEDING NOTES:**

- LAB REPORTS FOR THE SEED LOTS TO USE SHOULD BE REVIEWED BY THE LANDSCAPE ARCHITECT FOR APPROVAL OF ALL SEED LOTS PRIOR TO PURCHASE AND MIXING.
- DOUBLE SEEDING RATES FOR HAND BROADCASTING.
- CONTRACTOR SHALL SUBMIT ALL SEED LOT TESTS WITH SPECIES FOR REVIEW AND APPROVAL BY CITY OF BOULDER OSMP.

**PLANTING SCHEDULE**

QTY	ID	COMMON NAME	SCIENTIFIC NAME	SPACING	TYPE
373	SE	COYOTE WILLOW	SALIX EXIGUA	4' O.C. SQUARE	STAKES

**REVEGETATION NOTES:**

- LIDAR CONTOUR DATA PROVIDED BY BOULDER COUNTY. IF SITE CONDITIONS AND/OR ELEVATIONS DIFFER FROM PLANS CONTRACTOR SHALL NOTIFY LANDSCAPE ARCHITECT PRIOR TO GRADING WORK IN PROPOSED MITIGATION AREA. ELEVATIONS ARE CRITICAL TO THE CREATION AND ESTABLISHMENT OF WETLAND PLANTINGS.
- CONTRACTOR SHALL STOCKPILE 12" DEPTH OF TEMPORARILY IMPACTED WETLAND TOPSOIL TO BE REPLACED IN PLACE.
- CONTRACTOR SHALL STOCKPILE 12" DEPTH OF PERMANENTLY IMPACTED WETLAND TOPSOILS TO BE RELOCATED PER PLANS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING THE STOCKPILED WETLAND SOIL WITH A SILT FENCE.
- THE LANDSCAPE ARCHITECT SHALL BE ONSITE TO VERIFY GRADES FOR WETLAND TOPSOIL RELOCATION PRIOR TO STOCKPILED WETLAND TOPSOIL BEING PLACED.
- CONTRACTOR SHALL CONTACT OWNER'S REPRESENTATIVE IF ADDITIONAL IMPACTS TO WETLAND RESOURCES IS ANTICIPATED PRIOR TO DISTURBANCES.
- THE LANDSCAPE ARCHITECT SHALL BE ONSITE AND NOTIFIED FOR PLANT MATERIAL INSPECTION, PLANT HARVEST, PLANT INSTALLATION, AND SEEDING ACTIVITIES.
- CONTRACTOR SHALL PRIORITIZE WILLOW HARVEST IN PROJECT AREAS WITH PERMANENT IMPACTS WHERE HARVESTING/PLANTING TIMING IS APPROPRIATE, FOLLOWED BY AREAS WITHIN THE CORRIDOR. CONTRACTOR SHALL NOT HARVEST MORE THAN 50% OF ANY WILLOW STAND THAT IS NOT BEING IMPACTED AND AVOID WILLOW STANDS THAT APPEAR TO BE RECOVERING.
- PROPOSED WILLOW STAKES SHALL BE FIELD-LOCATED AND APPROVED BY LANDSCAPE ARCHITECT. PLANTING AREA SHALL BE STAKED FOR APPROVAL BY LANDSCAPE ARCHITECT.
- PLANT SPACING IS FOR INFORMATION AND WILLOW STAKE CAN BE PLANTED WITH VARIED SPACING FOR NATURAL AESTHETIC.
- ALL DISTURBED AREAS SHALL BE RESEEDED WITH APPROPRIATE SEED MIX.
- REFER TO SWMP FOR SOIL AMENDMENTS, APPLICATION RATES, AND HYDROMULCHING INFORMATION.



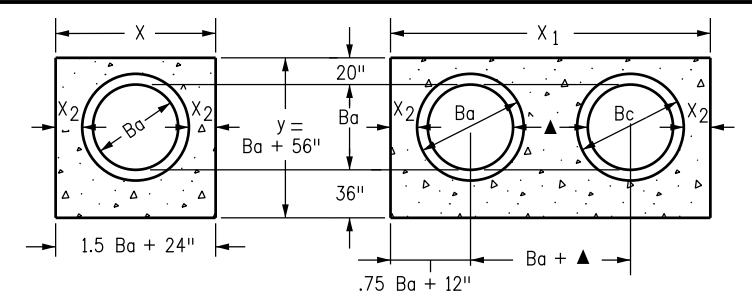
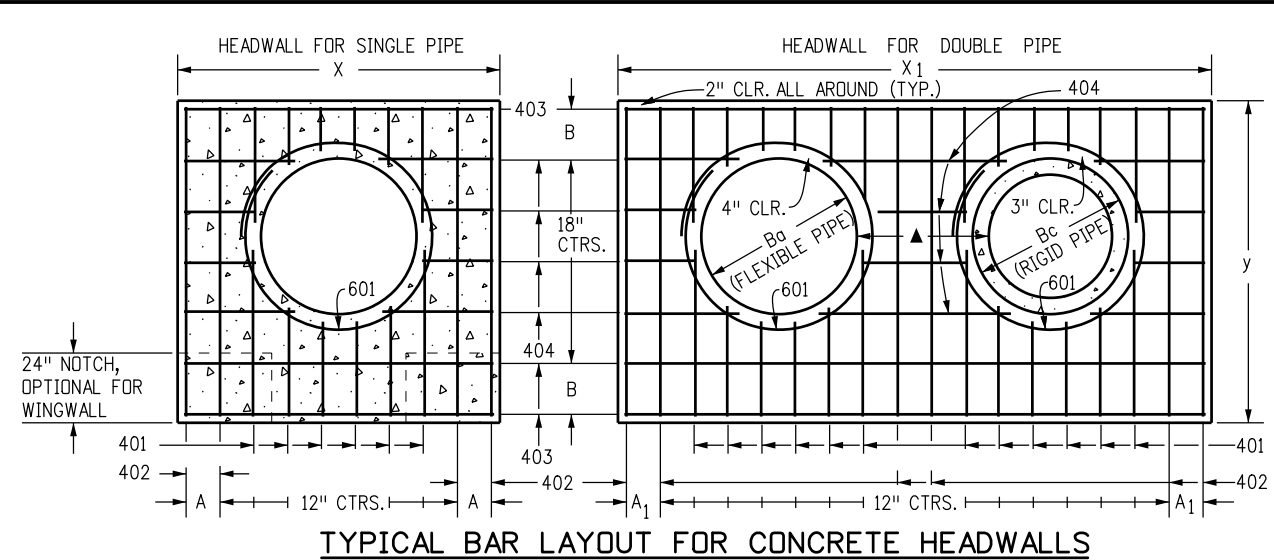
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NO.	DATE	REVISION DESCRIPTION:



**BOULDER COUNTY PUBLIC WORKS DEPARTMENT**  
**ENGINEERING DIVISION**  
**Pinyon** Environmental, Inc.  
 DESIGNED: LAB    CAD: LAB    CHECKED: SLS    DATE: 5/15/23

N. 51ST STREET STR. NO. BC-005104-1.4  
**MITIGATION EXHIBIT**  
 PROJECT NO: BC-005104-1.4    SHEET NO: L-2

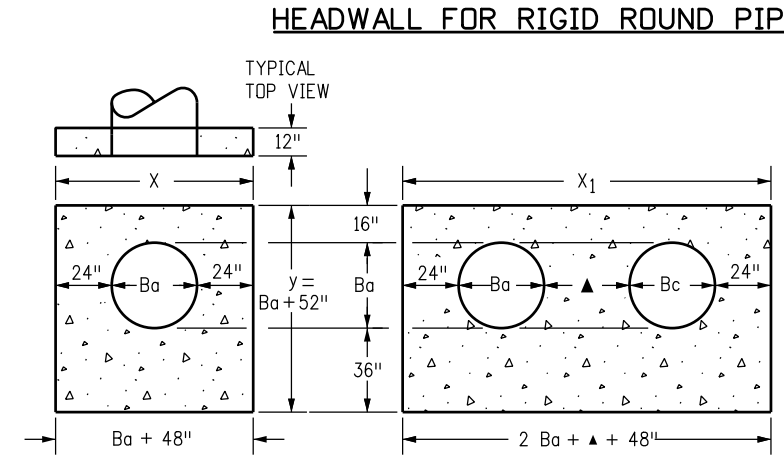
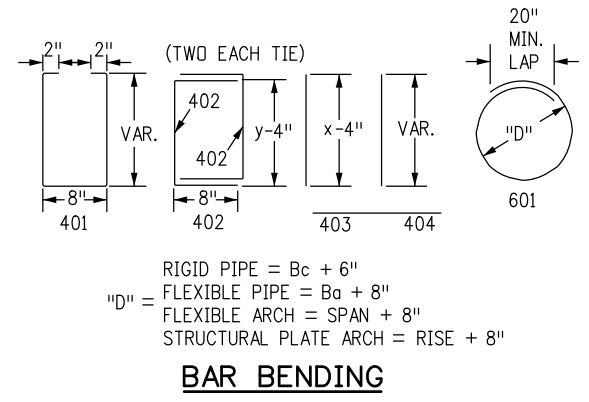
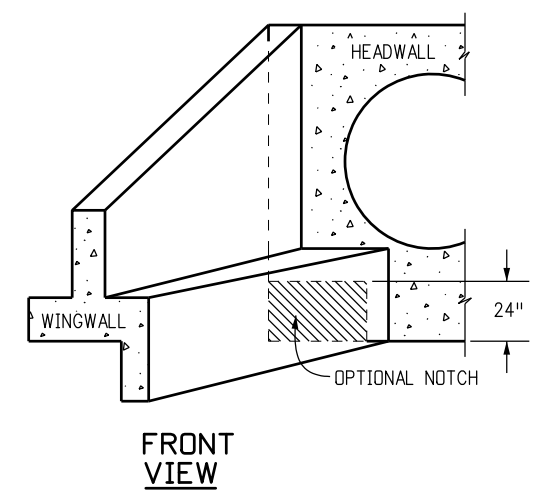


**DIMENSIONS**

Ba IN.	Bc IN.	X FT.-IN.	A IN.	X <sub>1</sub> FT.-IN.	A <sub>1</sub> IN.	y FT.-IN.	B IN.	X <sub>2</sub> IN.	CONCRETE SGL CU. YD.	CONCRETE DBL CU. YD.	STEEL SGL LBS.	STEEL DBL LBS.
54	65	8-9	8 1/2	15-6	7	9-2	17	20	2.12	3.55	209	364
60	72	9-6	7	17-0	10	9-8	11	21	2.35	3.99	236	414
66	79	10-3	11 1/2	18-6	7	10-2	14	22	2.60	4.44	249	453
72	86	11-0	10	20-0	10	10-8	17	23	2.85	4.91	270	476
78	93	11-9	8 1/2	21-3	11	11-2	11	24	3.11	5.29	306	527
84	100	12-6	7	22-6	7	11-8	14	25	3.38	5.68	333	572
90	107	13-3	11 1/2	23-9	8 1/2	12-2	17	26	3.66	6.08	335	593
96	114	14-0	10	25-0	10	12-8	11	27	3.94	6.48	379	649
102	121	14-9	8 1/2	26-3	11 1/2	13-2	14	28	4.24	6.89	400	664
108	128	15-6	7	27-6	7	13-8	17	29	4.54	7.30	424	707

**QUANTITIES**

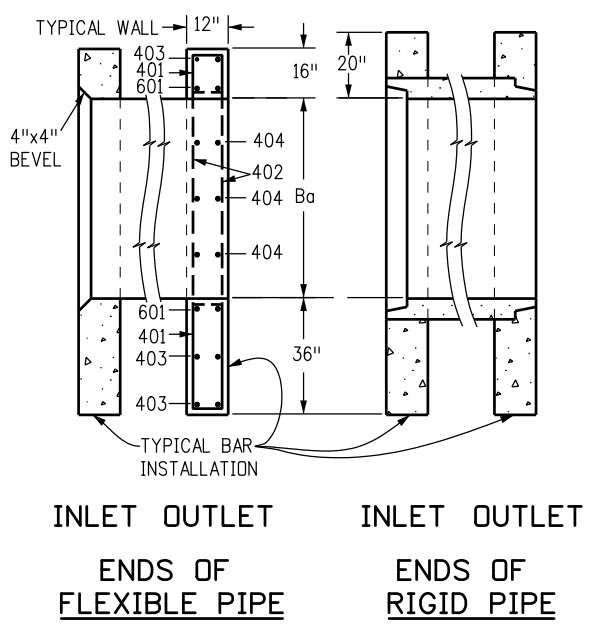
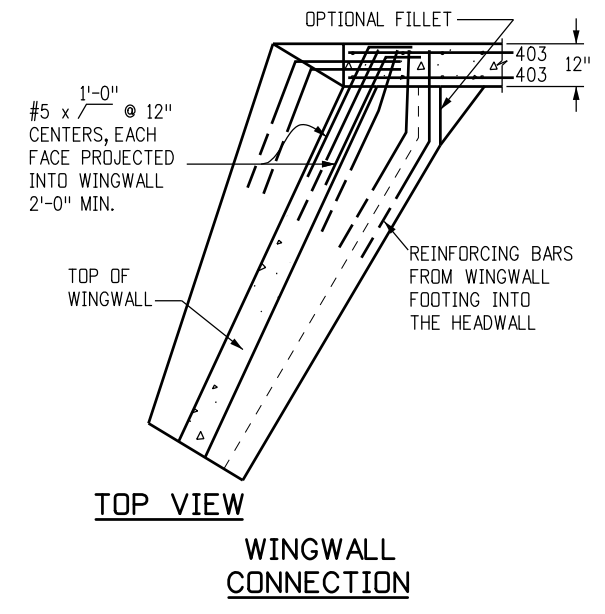
- GENERAL NOTES**
- CONCRETE SHALL BE CLASS B.
  - HEADWALL SHALL BE PERPENDICULAR TO THE PIPE C UNLESS OTHERWISE SHOWN ON THE PLANS. TABULATED DIMENSIONS AND QUANTITIES MUST BE ADJUSTED FOR SKEWED INSTALLATIONS.
  - FOR WINGWALL DETAILS, SEE STANDARD PLAN M-601-20.
  - VOLUME OCCUPIED BY PIPE HAS BEEN DEDUCTED FROM STEEL AND CONCRETE QUANTITIES.
  - EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4 IN.
  - ALL REINFORCING BARS SHALL HAVE A 2 IN. MINIMUM CLEARANCE.
- ▲ WHEN TWO OR MORE PIPES ARE LAID SIDE BY SIDE, THEY SHALL BE PLACED SO THAT THE ADJACENT PIPES WILL BE 1/2 INSIDE DIAMETER APART, OR 1/2 INSIDE SPAN APART, OR 3 FT. APART (INCLUDING WALL THICKNESS), WHICHEVER IS LESS.
- ADD 0.89 x (X OR X<sub>1</sub>) (LB.) WHEN APRON IS REQUIRED.



**DIMENSIONS**

EQUIV. Ba IN.	SPAN IN.	RISE IN.	X FT.-IN.	A IN.	X <sub>1</sub> FT.-IN.	A <sub>1</sub> IN.	y FT.-IN.	B IN.	CONCRETE SGL CU. YD.	CONCRETE DBL CU. YD.	STEEL SGL LBS.	STEEL DBL LBS.
72	81	59	10-9	8 1/2	20-6	7	9-3	17 1/2	2.72	5.10	250	467
78	87	63	11-3	11 1/2	21-6	7	9-7	10 1/2	2.85	5.34	275	531
84	95	67	11-9	8 1/2	22-10	9	9-11	12 1/2	3.08	5.79	290	547
90	103	71	12-7	7 1/2	24-2	11	10-3	15	3.30	6.21	321	591
96	112	75	13-4	12	25-8	8	10-7	16 1/2	3.52	6.65	314	606
102	117	79	13-9	8 1/2	26-6	7	10-11	9 1/2	3.63	6.86	356	672
108	128	83	14-8	8	28-4	12	11-3	11 1/2	3.96	7.51	376	699

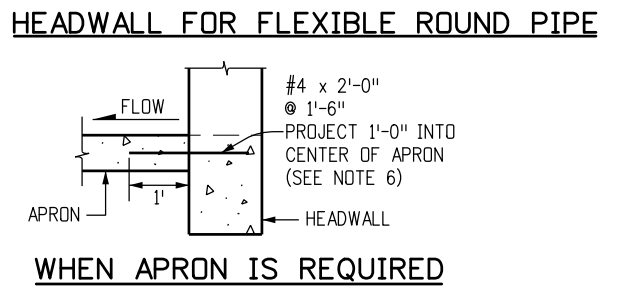
**QUANTITIES**



**DIMENSIONS**

Ba IN.	X FT.-IN.	A IN.	X <sub>1</sub> FT.-IN.	A <sub>1</sub> IN.	y FT.-IN.	B IN.	CONCRETE SGL CU. YD.	CONCRETE DBL CU. YD.	STEEL SGL LBS.	STEEL DBL LBS.
54	8-6	7	15-3	11 1/2	8-10	15	2.19	3.81	211	358
60	9-0	10	16-6	7	9-4	18	2.38	4.25	217	396
66	9-6	7	17-9	8 1/2	9-10	12	2.58	4.70	252	454
72	10-0	10	19-0	10	10-4	15	2.78	5.17	255	472
78	10-6	7	20-0	10	10-10	18	2.98	5.56	276	499
84	11-0	10	21-0	10	11-4	12	3.19	5.95	297	553
90	11-6	7	22-0	10	11-10	15	3.40	6.36	317	517
96	12-0	10	23-0	10	12-4	18	3.62	6.79	321	597
102	12-6	7	24-0	10	12-10	12	3.84	7.21	364	663
108	13-0	10	25-0	10	13-4	15	4.06	7.63	362	678

**QUANTITIES**



**DIMENSIONS**

EQUIV. Ba IN.	SPAN FT.-IN.	RISE FT.-IN.	X FT.-IN.	A IN.	X <sub>1</sub> FT.-IN.	A <sub>1</sub> IN.	y FT.-IN.	B IN.	CONCRETE SGL CU. YD.	CONCRETE DBL CU. YD.	STEEL SGL LBS.	STEEL DBL LBS.
66	6-1	4-7	10-1	10 1/2	19-2	11	8-11	15 1/2	2.52	4.70	232	424
75	7-0	5-1	11-0	10	21-0	10	9-5	9 1/2	2.80	5.25	282	509
84	7-11	5-7	11-11	9 1/2	22-10	9	9-11	12 1/2	3.08	5.79	291	540
93	8-10	6-1	12-10	9	24-8	8	10-5	15 1/2	3.36	6.33	309	622
102	9-9	6-7	13-9	8 1/2	26-6	7	10-11	9 1/2	3.63	6.86	379	673
111	10-11	7-1	14-11	9 1/2	28-10	9	11-5	12 1/2	4.05	7.67	377	711
120	11-10	7-7	15-10	9	30-8	8	11-11	15 1/2	4.36	8.28	395	731
132	12-10	8-4	16-10	9	32-8	8	12-8	11	4.75	9.03	441	839
141	14-1	8-9	18-1	10 1/2	35-2	11	13-1	13 1/2	5.17	9.86	448	931
150	15-4	9-3	19-4	12	37-8	8	13-7	16 1/2	5.69	10.88	490	953
159	15-10	9-10	19-10	9	38-8	8	14-2	11	5.89	11.25	534	1019

**QUANTITIES**

**SKEW FACTOR TABLE**

SKEW ANGLE A°	90	85	80	75	70	65	60	55	50	45	40	35	30
FACTOR (cosec A°)	1.000	1.004	1.015	1.035	1.064	1.103	1.155	1.221	1.305	1.414	1.556	1.743	2.000

**Computer File Information**

Creation Date: 07/31/19

Designer Initials: JBK

Last Modification Date: 07/31/19

Detailer Initials: LTA

CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English

**Sheet Revisions**

Date:	Comments
(R-X)	
(R-X)	
(R-X)	
(R-X)	

Colorado Department of Transportation

2829 West Howard Place  
 CDDT HQ, 3rd Floor  
 Denver, CO 80204  
 Phone: 303-757-9021 FAX: 303-757-9868

Project Development Branch **JBK**

**HEADWALL FOR PIPES**

Issued by the Project Development Branch: July 31, 2019

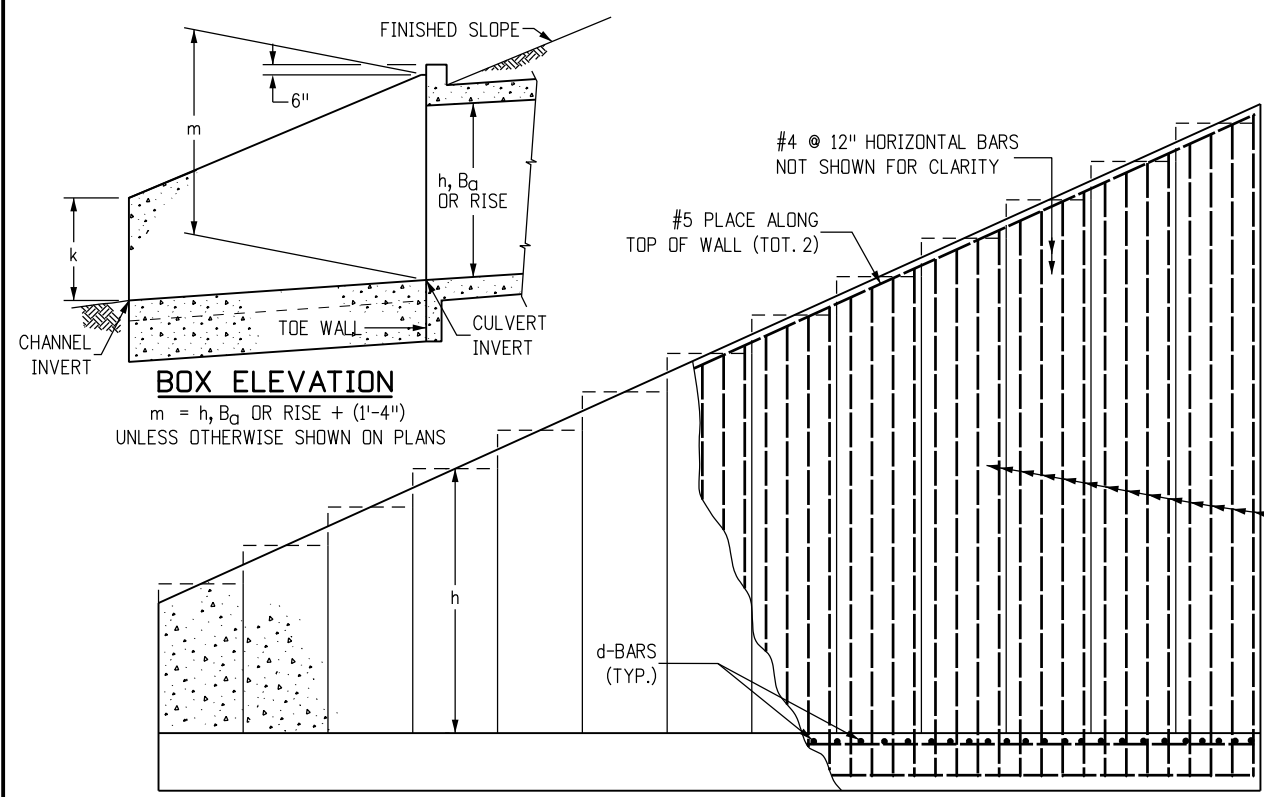
**STANDARD PLAN NO.**

**M-601-10**

**Standard Sheet No. 1 of 1**

Project Sheet Number: **16**





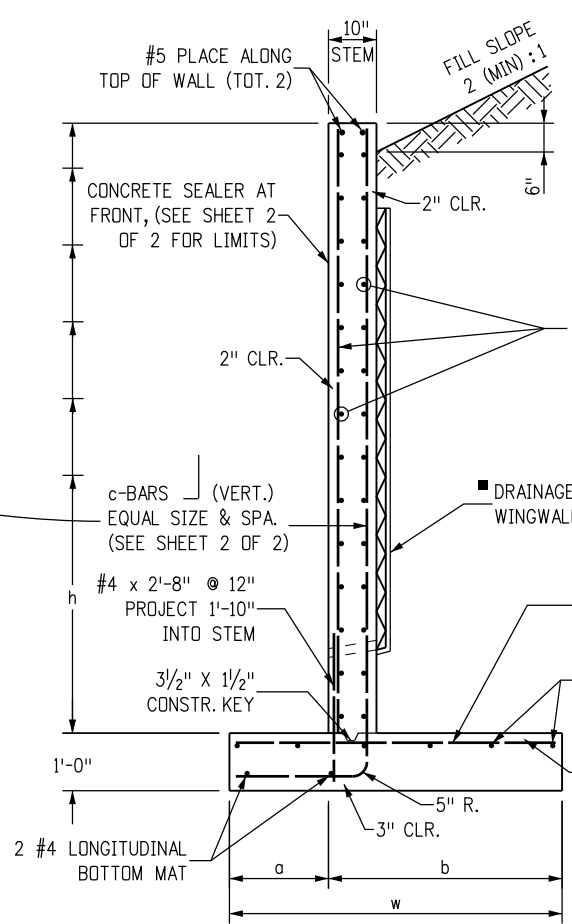
**BOX ELEVATION**

$m = h, B_a \text{ OR RISE} + (1'-4'')$   
UNLESS OTHERWISE SHOWN ON PLANS

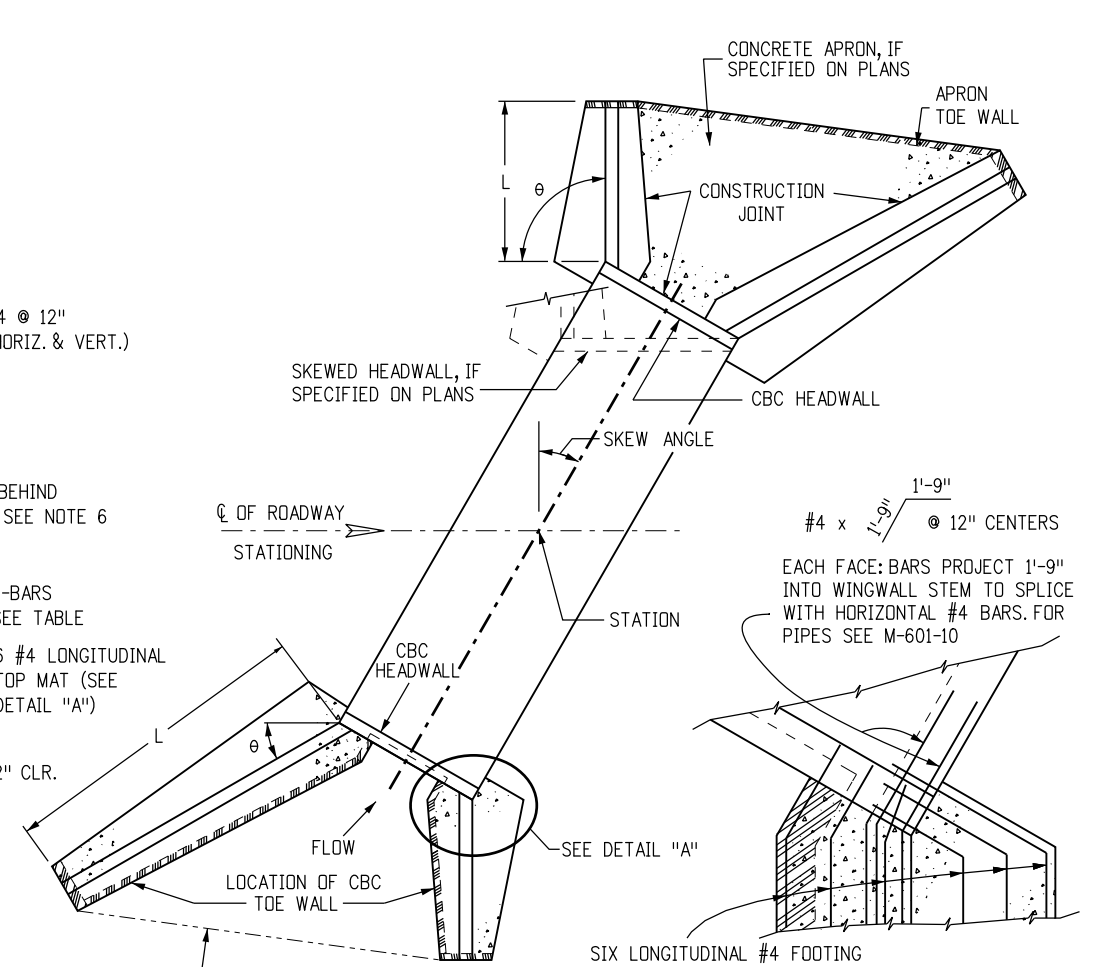
h =	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'
a =	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	2'-10"	3'-0"
b =	1'-8"	2'-0"	2'-4"	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"	4'-4"	4'-8"	5'-0"	5'-4"	5'-8"
w =	2'-8"	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-2"	8'-8"
d-BARS	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#5 @ 11"	#5 @ 10"	#5 @ 10"	#5 @ 8"	#6 @ 8"	#7 @ 9"	#7 @ 7"
* CONC. CY/LF	0.161	0.210	0.259	0.309	0.358	0.407	0.457	0.506	0.556	0.605	0.654	0.704	0.753

\* DOES NOT INCLUDE TOE WALL QUANTITIES SEE SHEET 2 OF 2 FOR REINFORCING STEEL QUANTITY

■ REQUIRED DRAINAGE BEHIND WINGWALLS SEE NOTE 6



**TYPICAL SECTION**



**TYPICAL CULVERT LAYOUT**

**DESIGN DATA:**

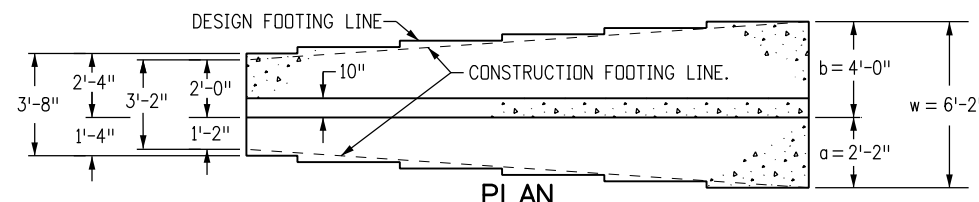
AASHTO LRFD EIGHTH EDITION, 2017  
DESIGN METHOD: LOAD AND RESISTANCE FACTOR DESIGN, YIELD LINE METHOD

REINFORCED CONCRETE:  
CONCRETE CLASS D (BOX CULVERT):  $f'_c = 4,500 \text{ PSI}$   
REINFORCING STEEL:  $f_y = 60,000 \text{ PSI}$

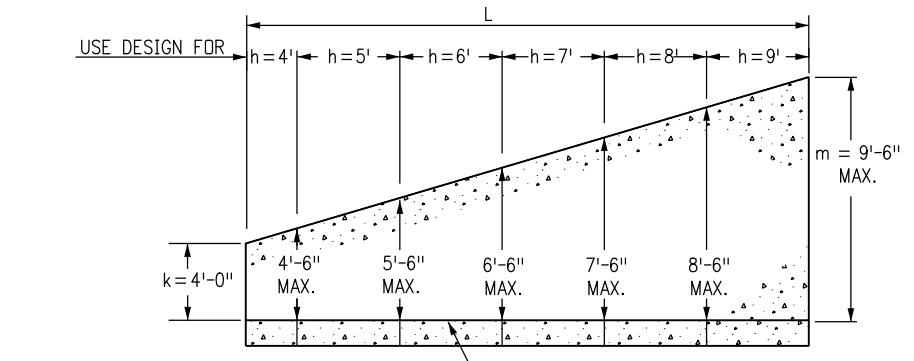
LOADING:  
AT-REST EARTH (FLUID) PRESSURE FOR CONCRETE STEM DESIGN = 55 PCF FOR 2 (MIN.):1 SLOPED BACKFILL  
ACTIVE EARTH (FLUID) PRESSURE FOR CONCRETE FOOTING DESIGN = 40 PCF FOR 2 (MIN.):1 SLOPED BACKFILL  
LIVE LOAD SURCHARGE = 2'  
MINIMUM RESISTANCE FOR SOIL BEARING = 5.5 KSF  
SOIL BEARING RESISTANCE FACTOR = 0.45

**GENERAL NOTES:**

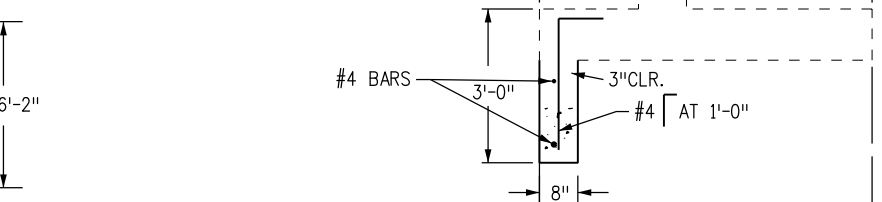
- ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED  $\frac{3}{4}$  IN.
- WINGWALL FOOTING AND FLOOR OF BOX CULVERT SHALL BE PLACED MONOLITHICALLY.
- DIMENSIONS "h", "k", "L", "m" AND ANGLE "θ" FOR WINGWALL SHALL BE AS SHOWN ON THE PLANS.
- MINIMUM CLASS B LAP SPLICE LENGTH FOR BLACK REINFORCING BARS:  
BAR SIZE: #4 #5 #6 #7  
SPLICE LENGTH: 1'-6" 1'-11" 2'-3" 2'-7"
- DESIGN DOES NOT CONSIDER ANY SCOUR EFFECTS.
- WINGWALL DRAIN SHALL BE REQUIRED IF "h" ≥ 12.0 FT., SEE SHEET 2 OF 2 FOR DETAILS.



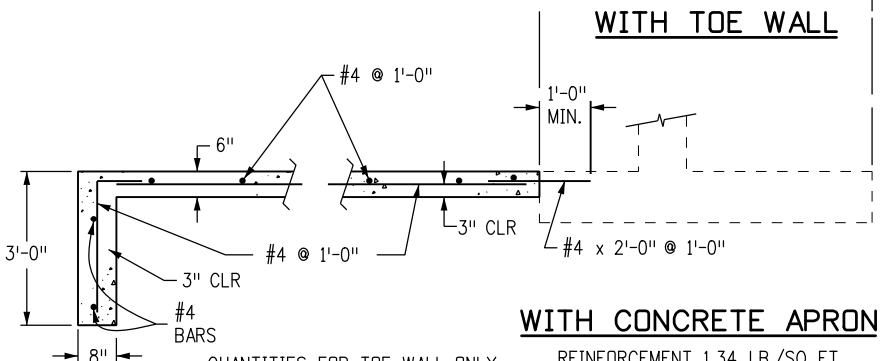
**PLAN**



**ELEVATION DESIGN EXAMPLE**



**WITH TOE WALL**



**WITH CONCRETE APRON**

QUANTITIES FOR TOE WALL ONLY  
CONCRETE 0.049 CU. YD./LIN. FT.  
REINFORCEMENT 5.1 LB./LIN. FT.

REINFORCEMENT 1.34 LB./SQ. FT.

**Computer File Information**

Creation Date: 07/31/19	(R-X)
Designer Initials: JBK	(R-X)
Last Modification Date: 07/31/19	(R-X)
Detailer Initials: LTA	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

**Sheet Revisions**

Date:	Comments

Colorado Department of Transportation

2829 West Howard Place  
CDDT HQ, 3rd Floor  
Denver, CO 80204  
Phone: 303-757-9021 FAX: 303-757-9868

Project Development Branch JBK

**WINGWALLS FOR PIPE OR BOX CULVERTS**

Issued by the Project Development Branch: July 31, 2019

**STANDARD PLAN NO.**

**M-601-20**

**Standard Sheet No. 1 of 2**

Project Sheet Number: 17

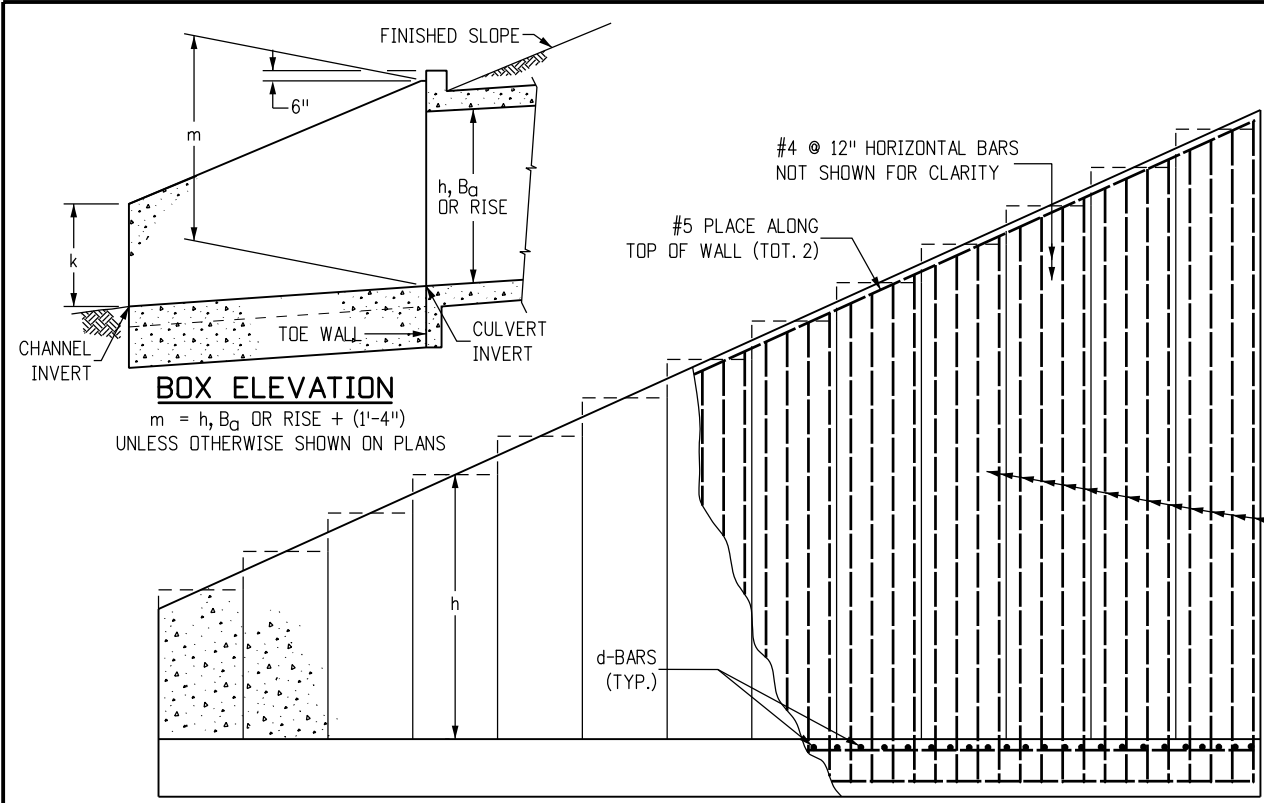


**c-BARS AND REINFORCING STEEL QUANTITY (EXCLUDE TOE WALL)**

\* REINFORCING STEEL QUANTITY INCLUDES STEM AND FOOTING QUANTITIES, BUT DOES NOT INCLUDE TOE WALL QUANTITIES.

L (MULTIPLE OF m)		≤ (1.0 x m)		≤ (1.25 x m)		≤ (1.5 x m)		≤ (1.75 x m)		≤ (2.0 x m)		≤ (2.25 x m)		≤ (2.5 x m)		≤ (2.75 x m)		≤ (3.0 x m)		≤ (3.25 x m)		≤ (3.5 x m)	
m (FT)	k (FT)	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.
14	4	#4 @ 10"	53.60	#5 @ 10"	57.95	#5 @ 10"	57.10	#5 @ 8"	60.22	#5 @ 7"	62.43	#5 @ 7"	62.09	#5 @ 6"	65.38	#5 @ 6"	65.15	#6 @ 8"	67.10	#6 @ 8"	66.94	#6 @ 7"	70.66
	5	#4 @ 10"	55.86	#5 @ 10"	60.46	#5 @ 10"	59.60	#5 @ 8"	62.89	#5 @ 7"	65.23	#5 @ 7"	64.88	#5 @ 6"	68.34	#5 @ 6"	68.11	#6 @ 8"	70.17	#6 @ 8"	70.00	#6 @ 7"	73.90
	6	#5 @ 10"	64.43	#6 @ 10"	70.60	#6 @ 10"	69.69	#6 @ 8"	74.93	#6 @ 8"	74.45	#6 @ 7"	78.30	#6 @ 6"	83.64	#6 @ 6"	83.40	#6 @ 6"	83.22	#6 @ 6"	83.05	#7 @ 7"	89.64
	7	#5 @ 10"	67.29	#6 @ 10"	73.76	#6 @ 10"	72.83	#6 @ 8"	78.32	#6 @ 8"	77.84	#6 @ 7"	81.87	#6 @ 6"	87.45	#6 @ 6"	87.21	#6 @ 6"	87.02	#6 @ 6"	86.86	#7 @ 7"	93.73
	8	#5 @ 8"	74.71	#6 @ 8"	83.46	#6 @ 7"	87.09	#6 @ 6"	92.54	#7 @ 7"	99.47	#7 @ 7"	99.08	#7 @ 6"	107.11	#7 @ 6"	106.86	#7 @ 6"	106.66	#7 @ 6"	106.49	#7 @ 6"	106.35
9	#5 @ 8"	78.10	#6 @ 8"	87.23	#6 @ 7"	91.03	#6 @ 6"	96.72	#7 @ 7"	103.93	#7 @ 7"	103.54	#7 @ 6"	111.90	#7 @ 6"	111.65	#7 @ 6"	111.45	#7 @ 6"	111.28	#7 @ 6"	111.13	
13	4	#4 @ 10"	50.51	#4 @ 10"	49.25	#5 @ 10"	53.71	#5 @ 10"	53.09	#5 @ 10"	52.36	#5 @ 9"	53.85	#5 @ 8"	55.54	#5 @ 7"	57.85	#5 @ 7"	57.67	#5 @ 7"	57.51	#6 @ 9"	59.93
	5	#4 @ 10"	52.66	#4 @ 10"	51.37	#5 @ 10"	56.09	#5 @ 10"	55.46	#5 @ 10"	54.99	#5 @ 9"	56.29	#5 @ 8"	58.08	#5 @ 7"	60.51	#5 @ 7"	60.33	#5 @ 7"	60.17	#6 @ 9"	62.72
	6	#4 @ 10"	54.92	#5 @ 10"	59.48	#5 @ 9"	60.31	#6 @ 9"	67.56	#6 @ 9"	67.08	#6 @ 9"	66.70	#6 @ 8"	69.53	#6 @ 8"	69.28	#6 @ 7"	73.12	#6 @ 7"	72.95	#6 @ 7"	72.81
	7	#4 @ 10"	57.36	#5 @ 10"	62.16	#5 @ 9"	63.05	#6 @ 9"	70.66	#6 @ 9"	70.16	#6 @ 9"	69.78	#6 @ 8"	72.75	#6 @ 8"	72.50	#6 @ 7"	76.52	#6 @ 7"	76.35	#6 @ 7"	76.20
	8	#5 @ 10"	66.39	#6 @ 10"	72.82	#6 @ 8"	77.97	#6 @ 7"	81.68	#6 @ 7"	81.19	#6 @ 6"	86.67	#6 @ 6"	86.37	#7 @ 7"	93.18	#7 @ 7"	92.97	#7 @ 7"	92.80	#7 @ 7"	92.64
9	#5 @ 10"	69.37	#6 @ 10"	76.10	#6 @ 8"	81.49	#6 @ 7"	85.37	#6 @ 7"	84.87	#6 @ 6"	90.59	#6 @ 6"	90.29	#7 @ 7"	97.39	#7 @ 7"	97.18	#7 @ 7"	97.00	#7 @ 7"	96.85	
12	2	#4 @ 10"	43.91	#4 @ 10"	42.65	#4 @ 10"	41.82	#4 @ 10"	41.22	#4 @ 10"	40.78	#4 @ 9"	41.29	#5 @ 10"	44.61	#5 @ 10"	44.37	#5 @ 10"	44.18	#5 @ 10"	44.01	#5 @ 10"	43.87
	3	#4 @ 10"	45.82	#4 @ 10"	44.55	#4 @ 10"	43.71	#4 @ 10"	43.11	#4 @ 10"	42.66	#4 @ 9"	43.22	#5 @ 10"	46.75	#5 @ 10"	46.51	#5 @ 10"	46.32	#5 @ 10"	46.15	#5 @ 10"	46.01
	4	#4 @ 10"	47.80	#4 @ 10"	46.51	#4 @ 10"	45.65	#5 @ 10"	50.06	#5 @ 10"	49.59	#5 @ 10"	49.23	#5 @ 10"	48.94	#5 @ 10"	48.69	#5 @ 9"	50.00	#5 @ 8"	51.72	#5 @ 8"	51.57
	5	#4 @ 10"	49.84	#4 @ 10"	48.53	#4 @ 10"	47.66	#5 @ 10"	52.33	#5 @ 10"	51.85	#5 @ 10"	51.48	#5 @ 10"	51.19	#5 @ 10"	50.94	#5 @ 9"	52.33	#5 @ 8"	54.14	#5 @ 8"	54.00
	6	#4 @ 10"	51.99	#4 @ 10"	50.65	#5 @ 10"	55.34	#5 @ 8"	58.41	#5 @ 8"	57.93	#6 @ 10"	60.60	#6 @ 10"	60.29	#6 @ 9"	62.42	#6 @ 9"	62.22	#6 @ 9"	62.04	#6 @ 8"	64.89
	7	#4 @ 10"	54.30	#5 @ 10"	58.80	#5 @ 10"	57.87	#5 @ 8"	61.10	#5 @ 8"	60.61	#6 @ 10"	63.43	#6 @ 10"	63.11	#6 @ 9"	65.35	#6 @ 9"	65.15	#6 @ 9"	64.97	#6 @ 8"	67.96
	8	#5 @ 10"	62.91	#5 @ 10"	61.45	#5 @ 7"	67.46	#5 @ 6"	70.68	#5 @ 6"	70.20	#6 @ 7"	76.44	#6 @ 7"	76.13	#6 @ 7"	75.87	#6 @ 6"	81.30	#6 @ 6"	81.12	#6 @ 6"	80.98
	9	#5 @ 10"	65.64	#5 @ 10"	64.15	#5 @ 7"	70.44	#5 @ 6"	73.82	#5 @ 6"	73.33	#6 @ 7"	79.86	#6 @ 7"	79.54	#6 @ 7"	79.28	#6 @ 6"	84.95	#6 @ 6"	84.77	#6 @ 6"	84.62
	11	2	#4 @ 10"	41.70	#4 @ 10"	40.42	#4 @ 10"	39.57	#4 @ 10"	38.96	#4 @ 10"	38.50	#4 @ 10"	38.15	#4 @ 10"	37.87	#4 @ 10"	37.63	#4 @ 9"	38.25	#5 @ 10"	41.46	#5 @ 10"
3		#4 @ 10"	43.57	#4 @ 10"	42.27	#4 @ 10"	41.40	#4 @ 10"	40.79	#4 @ 10"	40.33	#4 @ 10"	39.97	#4 @ 10"	39.69	#4 @ 10"	39.45	#4 @ 9"	40.12	#5 @ 10"	43.54	#5 @ 10"	43.39
4		#4 @ 10"	45.48	#4 @ 10"	44.16	#4 @ 10"	43.28	#4 @ 10"	42.66	#4 @ 9"	43.09	#5 @ 10"	46.57	#5 @ 10"	46.27	#5 @ 10"	46.02	#5 @ 10"	45.82	#5 @ 10"	45.65	#5 @ 10"	45.50
5		#4 @ 10"	47.46	#4 @ 10"	46.10	#4 @ 10"	45.21	#4 @ 10"	44.58	#4 @ 9"	45.06	#5 @ 10"	48.74	#5 @ 10"	48.44	#5 @ 10"	48.19	#5 @ 10"	47.99	#5 @ 10"	47.81	#5 @ 10"	47.67
6		#4 @ 10"	49.52	#4 @ 10"	48.14	#4 @ 9"	48.23	#5 @ 10"	51.88	#5 @ 10"	51.38	#5 @ 9"	52.57	#5 @ 9"	52.27	#5 @ 8"	53.99	#5 @ 8"	53.79	#5 @ 7"	56.16	#5 @ 7"	56.01
7		#4 @ 10"	51.73	#4 @ 10"	50.31	#4 @ 9"	50.43	#5 @ 10"	54.29	#5 @ 10"	53.78	#5 @ 9"	55.04	#5 @ 9"	54.73	#5 @ 8"	56.55	#5 @ 8"	56.35	#5 @ 7"	58.84	#5 @ 7"	58.70
8		#4 @ 10"	54.00	#5 @ 10"	58.44	#5 @ 10"	57.45	#5 @ 8"	60.64	#5 @ 7"	62.92	#5 @ 6"	66.25	#5 @ 6"	65.94	#5 @ 6"	65.69	#6 @ 8"	67.76	#6 @ 8"	67.57	#6 @ 7"	71.45
9		#4 @ 10"	56.20	#5 @ 10"	60.87	#5 @ 10"	59.85	#5 @ 8"	63.21	#5 @ 7"	65.60	#5 @ 6"	69.09	#5 @ 6"	68.78	#5 @ 6"	68.52	#6 @ 8"	70.69	#6 @ 8"	70.51	#6 @ 7"	74.57
10		2	#4 @ 10"	39.84	#4 @ 10"	38.53	#4 @ 10"	37.65	#4 @ 10"	37.03	#4 @ 10"	36.57	#4 @ 10"	36.20	#4 @ 10"	35.91	#4 @ 10"	35.67	#4 @ 10"	35.48	#4 @ 9"	36.07	#4 @ 9"
	3	#4 @ 10"	41.68	#4 @ 10"	40.35	#4 @ 10"	39.47	#4 @ 10"	38.84	#4 @ 10"	38.36	#4 @ 10"	38.00	#4 @ 10"	37.71	#4 @ 10"	37.46	#4 @ 10"	37.27	#4 @ 9"	37.91	#4 @ 9"	37.76
	4	#4 @ 10"	43.58	#4 @ 10"	42.22	#4 @ 10"	41.31	#4 @ 10"	40.67	#4 @ 10"	40.19	#4 @ 10"	39.82	#4 @ 10"	39.53	#4 @ 10"	39.28	#4 @ 10"	39.08	#4 @ 9"	39.77	#4 @ 9"	39.63
	5	#4 @ 10"	45.53	#4 @ 10"	44.14	#4 @ 10"	43.21	#4 @ 10"	42.56	#4 @ 10"	42.07	#5 @ 10"	46.44	#5 @ 10"	46.13	#5 @ 10"	45.87	#5 @ 10"	45.67	#5 @ 10"	45.49	#5 @ 10"	45.34
	6	#4 @ 10"	47.58	#4 @ 10"	46.14	#4 @ 10"	45.20	#4 @ 10"	44.53	#4 @ 10"	44.03	#5 @ 10"	48.67	#5 @ 10"	48.35	#5 @ 10"	48.08	#5 @ 10"	47.88	#5 @ 10"	47.69	#5 @ 10"	47.54
	7	#4 @ 10"	49.79	#4 @ 10"	48.31	#4 @ 10"	47.34	#5 @ 10"	51.97	#5 @ 10"	51.45	#5 @ 10"	51.04	#5 @ 9"	52.29	#5 @ 9"	52.03	#5 @ 8"	53.79	#5 @ 8"	53.61	#5 @ 7"	56.00
	8	#4 @ 10"	52.06	#4 @ 10"	50.54	#4 @ 10"	49.54	#5 @ 10"	54.43	#5 @ 10"	53.89	#5 @ 10"	53.47	#5 @ 9"	54.80	#5 @ 9"	54.53	#5 @ 8"	56.39	#5 @ 8"	56.20	#5 @ 7"	58.72
	9	#4 @ 10"	54.43	#4 @ 10"	52.84	#4 @ 10"	51.78	#5 @ 10"	55.83	#5 @ 10"	55.29	#5 @ 10"	54.86	#5 @ 9"	56.19	#5 @ 9"	55.91	#5 @ 8"	57.60	#5 @ 8"	57.41	#5 @ 7"	59.74
9	2	#4 @ 10"	38.01	#4 @ 10"	36.75	#4 @ 10"	35.85	#4 @ 10"	35.21	#4 @ 10"	34.73	#4 @ 10"	34.36	#4 @ 10"	34.06	#4 @ 10"	33.81	#4 @ 10"	33.61	#4 @ 10"	33.44	#4 @ 10"	33.30
	3	#4 @ 10"	39.93	#4 @ 10"	38.56	#4 @ 10"	37.64	#4 @ 10"	36.99	#4 @ 10"	36.51	#4 @ 10"	36.13	#4 @ 10"	35.83	#4 @ 10"	35.58	#4 @ 10"	35.38	#4 @ 10"	35.21	#4 @ 10"	35.06
	4	#4 @ 10"	41.81	#4 @ 10"	40.40	#4 @ 10"	39.47	#4 @ 10"	38.81	#4 @ 10"	38.31	#4 @ 10"	37.93	#4 @ 10"	37.63	#4 @ 10"	37.37	#4 @ 10"	37.17	#4 @ 10"	36.99	#4 @ 10"	36.84
	5	#4 @ 10"	43.75	#4 @ 10"	42.30	#4 @ 10"	41.35	#4 @ 10"	40.67	#4 @ 10"	40.17	#4 @ 10"	39.78	#4 @ 10"	39.47	#4 @ 10"	39.20	#4 @ 9"	39.86	#5 @ 10"	43.28	#5 @ 10"	43.12
	6	#4 @ 10"	45.79	#4 @ 10"	44.30	#4 @ 10"	43.31	#4 @ 10"	42.62	#4 @ 10"	42.10	#4 @ 10"	41.71	#4 @ 10"	41.39	#4 @ 10"	41.12	#4 @ 9"	41.82	#5 @ 10"	45.46	#5 @ 10"	45.30
	7	#4 @ 10"	48.04	#4 @ 10"	46.50	#4 @ 10"	45.49	#4 @ 10"	44.77	#5 @ 10"	49.29	#5 @ 10"	48.86	#5 @ 10"	48.53	#5 @ 10"	48.24	#5 @ 10"	48.03	#5 @ 10"	47.84	#5 @ 10"	47.67
	8	#4 @ 10"	50.43	#4 @ 10"	48.84	#4 @ 10"	47.80	#4 @ 10"	47.06	#5 @ 10"	51.83	#5 @ 10"	51.40	#5 @ 10"	51.05	#5 @ 10"	50.77	#5 @ 10"	50.54	#5 @ 10"	50.35	#5 @ 10"	50.18
8	2	#4 @ 10"	36.41	#4 @ 10"	35.01	#4 @ 10"	34.08	#4 @ 10"	33.42	#4 @ 10"	32.92	#4 @ 10"	32.54	#4 @ 10"	32.23	#4 @ 10"	31.97	#4 @ 10"	31.77	#4 @ 10"	31.59	#4 @ 10"	31.44
	3	#4 @ 10"	38.23	#4 @ 10"	36.80	#4 @ 10"	35.85	#4 @ 10"	35.18	#4 @ 10"	34.67	#4 @ 10"	34.28	#4 @ 10"	33.97	#4 @ 10"	33.70	#4 @ 10"	33.50	#4 @ 10"	33.32	#4 @ 10"	33.17
	4	#4 @ 10"	40.09	#4 @ 10"	38.61	#4 @ 10"	37.64	#4 @ 10"	36.95	#4 @ 10"	36.44	#4 @ 10"	36.04	#4 @ 10"	35.72	#4 @ 10"	35.45	#4 @ 10"	35.25	#4 @ 10"	35.07	#4 @ 10"	34.91
	5	#4 @ 10"	41.99	#4 @ 10"	40.47	#4 @ 10"	39.47	#4 @ 10"	38.76	#4 @ 10"	38.24	#4 @ 10"	37.83	#4 @ 10"	37.50	#4 @ 10"	37.23	#4 @ 10"	37.02	#4 @ 10"	36.84	#4 @ 10"	36.68
	6	#4 @ 10"	43.97	#4 @ 10"	42.40	#4 @ 10"	41.36	#4 @ 10"	40.64	#4 @ 10"	40.10	#4 @ 10"	39.68	#4 @ 10"	39.35	#4 @ 10"	39.07	#4 @ 9"	43.33	#5 @ 10"	43.13	#5 @ 10"	42.96
	7	#4 @ 10"	46.19	#4 @ 10"	44.56	#4 @ 10"	43.49	#4 @ 10"	42.74	#4 @ 10"	42.18	#4 @ 10"	41.75	#4 @ 10"	41.41	#4 @ 10"	41.13	#4 @ 9"	45.65	#5 @ 10"	45.45	#5 @ 10"	45.28
	8	#4 @ 10"	48.64	#4 @ 10"	46.91	#4 @ 10"	45.73	#4 @ 10"	44.88	#5 @ 10"	49.64	#5 @ 10"	49.19	#5 @ 10"	48.74	#5 @ 10"	48.37	#5 @ 10"	48.06	#5 @ 10"	47.85	#5 @ 10"	47.68
7	2	#4 @ 10"	34.90	#4 @ 10"	33.44	#4 @ 10"	32.47	#4 @ 10"	31.78	#4 @ 10"	31.27	#4 @ 10"	30.86	#4 @ 10"	30.54	#4 @ 10"	30.27	#4 @ 10"	30.06	#4 @ 10"	29.88	#4 @ 10"	29.72
	3	#4 @ 10"	36.73	#4 @ 10"	35.23	#4 @ 10"	34.23	#4 @ 10"	33.53														





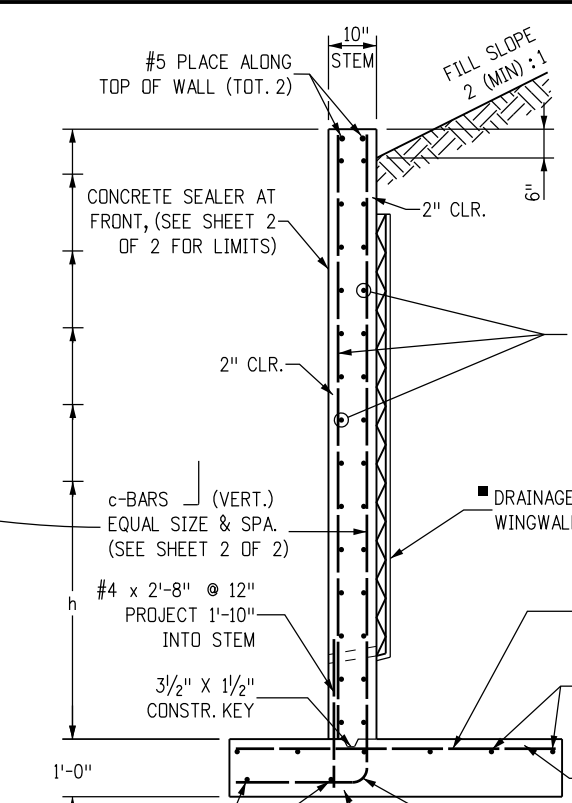
**BOX ELEVATION**

$m = h, B_a \text{ OR RISE} + (1'-4'')$   
UNLESS OTHERWISE SHOWN ON PLANS

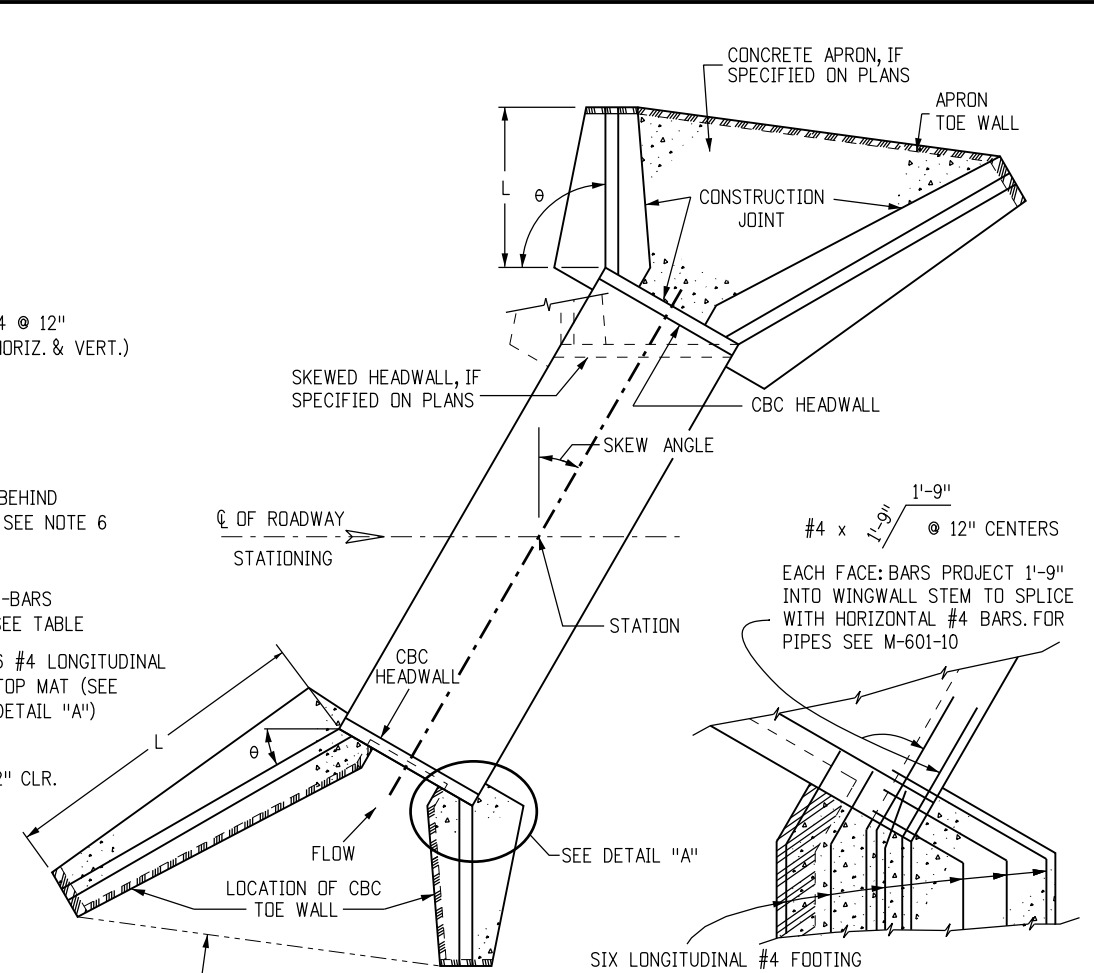
h =	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'
a =	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	2'-10"	3'-0"
b =	1'-8"	2'-0"	2'-4"	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"	4'-4"	4'-8"	5'-0"	5'-4"	5'-8"
w =	2'-8"	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-2"	8'-8"
d-BARS	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#5 @ 11"	#5 @ 10"	#5 @ 10"	#5 @ 8"	#6 @ 8"	#7 @ 9"	#7 @ 7"
* CONC. CY/LF	0.161	0.210	0.259	0.309	0.358	0.407	0.457	0.506	0.556	0.605	0.654	0.704	0.753

\* DOES NOT INCLUDE TOE WALL QUANTITIES SEE SHEET 2 OF 2 FOR REINFORCING STEEL QUANTITY

■ REQUIRED DRAINAGE BEHIND WINGWALLS SEE NOTE 6



**TYPICAL SECTION**



**TYPICAL CULVERT LAYOUT**

**DESIGN DATA:**

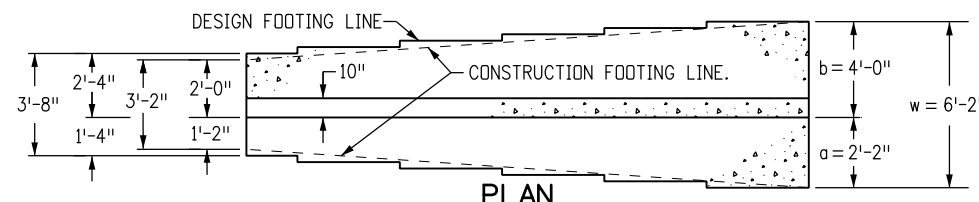
AASHTO LRFD EIGHTH EDITION, 2017  
DESIGN METHOD: LOAD AND RESISTANCE FACTOR DESIGN, YIELD LINE METHOD

REINFORCED CONCRETE:  
CONCRETE CLASS D (BOX CULVERT):  $f'_c = 4,500 \text{ PSI}$   
REINFORCING STEEL:  $f_y = 60,000 \text{ PSI}$

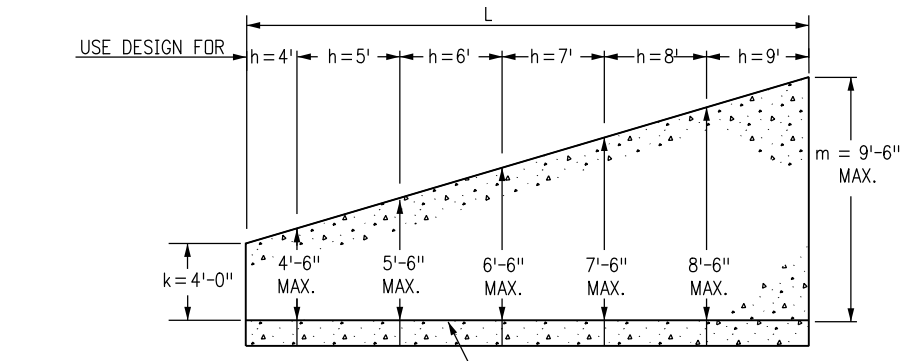
LOADING:  
AT-REST EARTH (FLUID) PRESSURE FOR CONCRETE STEM DESIGN = 55 PCF FOR 2 (MIN.):1 SLOPED BACKFILL  
ACTIVE EARTH (FLUID) PRESSURE FOR CONCRETE FOOTING DESIGN = 40 PCF FOR 2 (MIN.):1 SLOPED BACKFILL  
LIVE LOAD SURCHARGE = 2'  
MINIMUM RESISTANCE FOR SOIL BEARING = 5.5 KSF  
SOIL BEARING RESISTANCE FACTOR = 0.45

**GENERAL NOTES:**

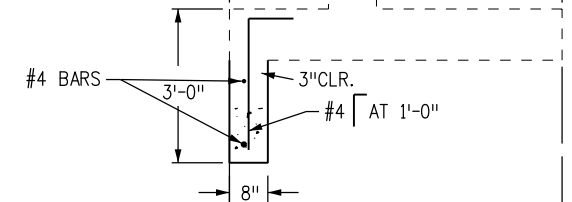
- ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED  $\frac{3}{4}$  IN.
- WINGWALL FOOTING AND FLOOR OF BOX CULVERT SHALL BE PLACED MONOLITHICALLY.
- DIMENSIONS "h", "k", "L", "m" AND ANGLE "θ" FOR WINGWALL SHALL BE AS SHOWN ON THE PLANS.
- MINIMUM CLASS B LAP SPLICE LENGTH FOR BLACK REINFORCING BARS:  
BAR SIZE: #4 #5 #6 #7  
SPLICE LENGTH: 1'-6" 1'-11" 2'-3" 2'-7"
- DESIGN DOES NOT CONSIDER ANY SCOUR EFFECTS.
- WINGWALL DRAIN SHALL BE REQUIRED IF "h" ≥ 12.0 FT., SEE SHEET 2 OF 2 FOR DETAILS.



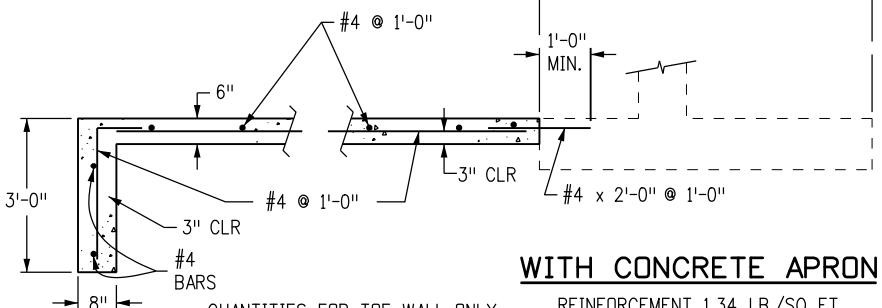
**PLAN**



**ELEVATION DESIGN EXAMPLE**



**WITH TOE WALL**



**WITH CONCRETE APRON**

QUANTITIES FOR TOE WALL ONLY  
CONCRETE 0.049 CU. YD./LIN. FT.  
REINFORCEMENT 5.1 LB./LIN. FT.

REINFORCEMENT 1.34 LB./SQ. FT.

**Computer File Information**

Creation Date: 07/31/19	(R-X)
Designer Initials: JBK	(R-X)
Last Modification Date: 07/31/19	(R-X)
Detailer Initials: LTA	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

**Sheet Revisions**

Date:	Comments

Colorado Department of Transportation

2829 West Howard Place  
CDOT HQ, 3rd Floor  
Denver, CO 80204  
Phone: 303-757-9021 FAX: 303-757-9868

Project Development Branch JBK

**WINGWALLS FOR PIPE OR BOX CULVERTS**

Issued by the Project Development Branch: July 31, 2019

**STANDARD PLAN NO.**

M-601-20

**Standard Sheet No. 1 of 2**

Project Sheet Number: 20



**c-BARS AND REINFORCING STEEL QUANTITY (EXCLUDE TOE WALL)**

\* REINFORCING STEEL QUANTITY INCLUDES STEM AND FOOTING QUANTITIES, BUT DOES NOT INCLUDE TOE WALL QUANTITIES.

L (MULTIPLE OF m)		≤ (1.0 x m)		≤ (1.25 x m)		≤ (1.5 x m)		≤ (1.75 x m)		≤ (2.0 x m)		≤ (2.25 x m)		≤ (2.5 x m)		≤ (2.75 x m)		≤ (3.0 x m)		≤ (3.25 x m)		≤ (3.5 x m)	
m (FT)	k (FT)	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.
14	4	#4 @ 10"	53.60	#5 @ 10"	57.95	#5 @ 10"	57.10	#5 @ 8"	60.22	#5 @ 7"	62.43	#5 @ 7"	62.09	#5 @ 6"	65.38	#5 @ 6"	65.15	#6 @ 8"	67.10	#6 @ 8"	66.94	#6 @ 7"	70.66
	5	#4 @ 10"	55.86	#5 @ 10"	60.46	#5 @ 10"	59.60	#5 @ 8"	62.89	#5 @ 7"	65.23	#5 @ 7"	64.88	#5 @ 6"	68.34	#5 @ 6"	68.11	#6 @ 8"	70.17	#6 @ 8"	70.00	#6 @ 7"	73.90
	6	#5 @ 10"	64.43	#6 @ 10"	70.60	#6 @ 10"	69.69	#6 @ 8"	74.93	#6 @ 8"	74.45	#6 @ 7"	78.30	#6 @ 6"	83.64	#6 @ 6"	83.40	#6 @ 6"	83.22	#6 @ 6"	83.05	#7 @ 7"	89.64
	7	#5 @ 10"	67.29	#6 @ 10"	73.76	#6 @ 10"	72.83	#6 @ 8"	78.32	#6 @ 8"	77.84	#6 @ 7"	81.87	#6 @ 6"	87.45	#6 @ 6"	87.21	#6 @ 6"	87.02	#6 @ 6"	86.86	#7 @ 7"	93.73
	8	#5 @ 8"	74.71	#6 @ 8"	83.46	#6 @ 7"	87.09	#6 @ 6"	92.54	#7 @ 7"	99.47	#7 @ 7"	99.08	#7 @ 6"	107.11	#7 @ 6"	106.86	#7 @ 6"	106.66	#7 @ 6"	106.49	#7 @ 6"	106.35
13	4	#4 @ 10"	50.51	#4 @ 10"	49.25	#5 @ 10"	53.71	#5 @ 10"	53.09	#5 @ 10"	52.36	#5 @ 9"	53.85	#5 @ 8"	55.54	#5 @ 7"	57.85	#5 @ 7"	57.67	#5 @ 7"	57.51	#6 @ 9"	59.93
	5	#4 @ 10"	52.66	#4 @ 10"	51.37	#5 @ 10"	56.09	#5 @ 10"	55.46	#5 @ 10"	54.99	#5 @ 9"	56.29	#5 @ 8"	58.08	#5 @ 7"	60.51	#5 @ 7"	60.33	#5 @ 7"	60.17	#6 @ 9"	62.72
	6	#4 @ 10"	54.92	#5 @ 10"	59.48	#5 @ 9"	60.31	#6 @ 9"	67.56	#6 @ 9"	67.08	#6 @ 9"	66.70	#6 @ 8"	69.53	#6 @ 8"	69.28	#6 @ 7"	73.12	#6 @ 7"	72.95	#6 @ 7"	72.81
	7	#4 @ 10"	57.36	#5 @ 10"	62.16	#5 @ 9"	63.05	#6 @ 9"	70.66	#6 @ 9"	70.16	#6 @ 9"	69.78	#6 @ 8"	72.75	#6 @ 8"	72.50	#6 @ 7"	76.52	#6 @ 7"	76.35	#6 @ 7"	76.20
	8	#5 @ 10"	66.39	#6 @ 10"	72.82	#6 @ 8"	77.97	#6 @ 7"	81.68	#6 @ 7"	81.19	#6 @ 6"	86.67	#6 @ 6"	86.37	#7 @ 7"	93.18	#7 @ 7"	92.97	#7 @ 7"	92.80	#7 @ 7"	92.64
12	2	#4 @ 10"	43.91	#4 @ 10"	42.65	#4 @ 10"	41.82	#4 @ 10"	41.22	#4 @ 10"	40.78	#4 @ 9"	41.29	#5 @ 10"	44.61	#5 @ 10"	44.37	#5 @ 10"	44.18	#5 @ 10"	44.01	#5 @ 10"	43.87
	3	#4 @ 10"	45.82	#4 @ 10"	44.55	#4 @ 10"	43.71	#4 @ 10"	43.11	#4 @ 10"	42.66	#4 @ 9"	43.22	#5 @ 10"	46.75	#5 @ 10"	46.51	#5 @ 10"	46.32	#5 @ 10"	46.15	#5 @ 10"	46.01
	4	#4 @ 10"	47.80	#4 @ 10"	46.51	#4 @ 10"	45.65	#5 @ 10"	50.06	#5 @ 10"	49.59	#5 @ 10"	49.23	#5 @ 10"	48.94	#5 @ 10"	48.69	#5 @ 9"	50.00	#5 @ 8"	51.72	#5 @ 8"	51.57
	5	#4 @ 10"	49.84	#4 @ 10"	48.53	#4 @ 10"	47.66	#5 @ 10"	52.33	#5 @ 10"	51.85	#5 @ 10"	51.48	#5 @ 10"	51.19	#5 @ 10"	50.94	#5 @ 9"	52.33	#5 @ 8"	54.14	#5 @ 8"	54.00
	6	#4 @ 10"	51.99	#4 @ 10"	50.65	#5 @ 10"	55.34	#5 @ 8"	58.41	#5 @ 8"	57.93	#6 @ 10"	60.60	#6 @ 10"	60.29	#6 @ 9"	62.42	#6 @ 9"	62.22	#6 @ 9"	62.04	#6 @ 8"	64.89
	7	#4 @ 10"	54.30	#5 @ 10"	58.80	#5 @ 10"	57.87	#5 @ 8"	61.10	#5 @ 8"	60.61	#6 @ 10"	63.43	#6 @ 10"	63.11	#6 @ 9"	65.35	#6 @ 9"	65.15	#6 @ 9"	64.97	#6 @ 8"	67.96
	8	#5 @ 10"	62.91	#5 @ 10"	61.45	#5 @ 7"	67.46	#5 @ 6"	70.68	#5 @ 6"	70.20	#6 @ 7"	76.44	#6 @ 7"	76.13	#6 @ 7"	75.87	#6 @ 6"	81.30	#6 @ 6"	81.12	#6 @ 6"	80.98
	9	#5 @ 10"	65.64	#5 @ 10"	64.15	#5 @ 7"	70.44	#5 @ 6"	73.82	#5 @ 6"	73.33	#6 @ 7"	79.86	#6 @ 7"	79.54	#6 @ 7"	79.28	#6 @ 6"	84.95	#6 @ 6"	84.77	#6 @ 6"	84.62
	11	2	#4 @ 10"	41.70	#4 @ 10"	40.42	#4 @ 10"	39.57	#4 @ 10"	38.96	#4 @ 10"	38.50	#4 @ 10"	38.15	#4 @ 10"	37.87	#4 @ 10"	37.63	#4 @ 9"	38.25	#5 @ 10"	41.46	#5 @ 10"
3		#4 @ 10"	43.57	#4 @ 10"	42.27	#4 @ 10"	41.40	#4 @ 10"	40.79	#4 @ 10"	40.33	#4 @ 10"	39.97	#4 @ 10"	39.69	#4 @ 10"	39.45	#4 @ 9"	40.12	#5 @ 10"	43.54	#5 @ 10"	43.39
4		#4 @ 10"	45.48	#4 @ 10"	44.16	#4 @ 10"	43.28	#4 @ 10"	42.66	#4 @ 9"	43.09	#5 @ 10"	46.57	#5 @ 10"	46.27	#5 @ 10"	46.02	#5 @ 10"	45.82	#5 @ 10"	45.65	#5 @ 10"	45.50
5		#4 @ 10"	47.46	#4 @ 10"	46.10	#4 @ 10"	45.21	#4 @ 10"	44.58	#4 @ 9"	45.06	#5 @ 10"	48.74	#5 @ 10"	48.44	#5 @ 10"	48.19	#5 @ 10"	47.99	#5 @ 10"	47.81	#5 @ 10"	47.67
6		#4 @ 10"	49.52	#4 @ 10"	48.14	#4 @ 9"	48.23	#5 @ 10"	51.88	#5 @ 10"	51.38	#5 @ 9"	52.57	#5 @ 9"	52.27	#5 @ 8"	53.99	#5 @ 8"	53.79	#5 @ 7"	56.16	#5 @ 7"	56.01
7		#4 @ 10"	51.73	#4 @ 10"	50.31	#4 @ 9"	50.43	#5 @ 10"	54.29	#5 @ 10"	53.78	#5 @ 9"	55.04	#5 @ 9"	54.73	#5 @ 8"	56.55	#5 @ 8"	56.35	#5 @ 7"	58.84	#5 @ 7"	58.70
8		#4 @ 10"	54.00	#5 @ 10"	58.44	#5 @ 10"	57.45	#5 @ 8"	60.64	#5 @ 7"	62.92	#5 @ 6"	66.25	#5 @ 6"	65.94	#5 @ 6"	65.69	#6 @ 8"	67.76	#6 @ 8"	67.57	#6 @ 7"	71.45
9		#4 @ 10"	56.20	#5 @ 10"	60.87	#5 @ 10"	59.85	#5 @ 8"	63.21	#5 @ 7"	65.60	#5 @ 6"	69.09	#5 @ 6"	68.78	#5 @ 6"	68.52	#6 @ 8"	70.69	#6 @ 8"	70.51	#6 @ 7"	74.57
10		2	#4 @ 10"	39.84	#4 @ 10"	38.53	#4 @ 10"	37.65	#4 @ 10"	37.03	#4 @ 10"	36.57	#4 @ 10"	36.20	#4 @ 10"	35.91	#4 @ 10"	35.67	#4 @ 10"	35.48	#4 @ 9"	36.07	#4 @ 9"
	3	#4 @ 10"	41.68	#4 @ 10"	40.35	#4 @ 10"	39.47	#4 @ 10"	38.84	#4 @ 10"	38.36	#4 @ 10"	38.00	#4 @ 10"	37.71	#4 @ 10"	37.46	#4 @ 10"	37.27	#4 @ 9"	37.91	#4 @ 9"	37.76
	4	#4 @ 10"	43.58	#4 @ 10"	42.22	#4 @ 10"	41.31	#4 @ 10"	40.67	#4 @ 10"	40.19	#4 @ 10"	39.82	#4 @ 10"	39.53	#4 @ 10"	39.28	#4 @ 10"	39.08	#4 @ 9"	39.77	#4 @ 9"	39.63
	5	#4 @ 10"	45.53	#4 @ 10"	44.14	#4 @ 10"	43.21	#4 @ 10"	42.56	#4 @ 10"	42.07	#5 @ 10"	46.44	#5 @ 10"	46.13	#5 @ 10"	45.87	#5 @ 10"	45.67	#5 @ 10"	45.49	#5 @ 10"	45.34
	6	#4 @ 10"	47.58	#4 @ 10"	46.14	#4 @ 10"	45.20	#4 @ 10"	44.53	#4 @ 10"	44.03	#5 @ 10"	48.67	#5 @ 10"	48.35	#5 @ 10"	48.08	#5 @ 10"	47.88	#5 @ 10"	47.69	#5 @ 10"	47.54
	7	#4 @ 10"	49.79	#4 @ 10"	48.31	#4 @ 10"	47.34	#5 @ 10"	51.97	#5 @ 10"	51.45	#5 @ 10"	51.04	#5 @ 9"	52.29	#5 @ 9"	52.03	#5 @ 8"	53.79	#5 @ 8"	53.61	#5 @ 7"	56.00
	8	#4 @ 10"	52.06	#4 @ 10"	50.54	#4 @ 10"	49.54	#5 @ 10"	54.43	#5 @ 10"	53.89	#5 @ 10"	53.47	#5 @ 9"	54.80	#5 @ 9"	54.53	#5 @ 8"	56.39	#5 @ 8"	56.20	#5 @ 7"	58.72
	9	2	#4 @ 10"	38.01	#4 @ 10"	36.75	#4 @ 10"	35.85	#4 @ 10"	35.21	#4 @ 10"	34.73	#4 @ 10"	34.36	#4 @ 10"	34.06	#4 @ 10"	33.81	#4 @ 10"	33.61	#4 @ 10"	33.44	#4 @ 10"
3		#4 @ 10"	39.93	#4 @ 10"	38.56	#4 @ 10"	37.64	#4 @ 10"	36.99	#4 @ 10"	36.51	#4 @ 10"	36.13	#4 @ 10"	35.83	#4 @ 10"	35.58	#4 @ 10"	35.38	#4 @ 10"	35.21	#4 @ 10"	35.06
4		#4 @ 10"	41.81	#4 @ 10"	40.40	#4 @ 10"	39.47	#4 @ 10"	38.81	#4 @ 10"	38.31	#4 @ 10"	37.93	#4 @ 10"	37.63	#4 @ 10"	37.37	#4 @ 10"	37.17	#4 @ 10"	36.99	#4 @ 10"	36.84
5		#4 @ 10"	43.75	#4 @ 10"	42.30	#4 @ 10"	41.35	#4 @ 10"	40.67	#4 @ 10"	40.17	#4 @ 10"	39.78	#4 @ 10"	39.47	#4 @ 10"	39.20	#4 @ 9"	39.86	#5 @ 10"	43.28	#5 @ 10"	43.12
6		#4 @ 10"	45.79	#4 @ 10"	44.30	#4 @ 10"	43.31	#4 @ 10"	42.62	#4 @ 10"	42.10	#4 @ 10"	41.71	#4 @ 10"	41.39	#4 @ 10"	41.12	#4 @ 9"	41.82	#5 @ 10"	45.46	#5 @ 10"	45.30
7		#4 @ 10"	48.04	#4 @ 10"	46.50	#4 @ 10"	45.49	#4 @ 10"	44.77	#5 @ 10"	49.29	#5 @ 10"	48.86	#5 @ 10"	48.53	#5 @ 10"	48.24	#5 @ 10"	48.03	#5 @ 10"	47.84	#5 @ 10"	47.67
8		#4 @ 10"	50.43	#4 @ 10"	48.84	#4 @ 10"	47.80	#4 @ 10"	47.06	#5 @ 10"	51.83	#5 @ 10"	51.40	#5 @ 10"	51.05	#5 @ 10"	50.77	#5 @ 10"	50.54	#5 @ 10"	50.35	#5 @ 10"	50.18
8		2	#4 @ 10"	36.41	#4 @ 10"	35.01	#4 @ 10"	34.08	#4 @ 10"	33.42	#4 @ 10"	32.92	#4 @ 10"	32.54	#4 @ 10"	32.23	#4 @ 10"	31.97	#4 @ 10"	31.77	#4 @ 10"	31.59	#4 @ 10"
	3	#4 @ 10"	38.23	#4 @ 10"	36.80	#4 @ 10"	35.85	#4 @ 10"	35.18	#4 @ 10"	34.67	#4 @ 10"	34.28	#4 @ 10"	33.97	#4 @ 10"	33.70	#4 @ 10"	33.50	#4 @ 10"	33.32	#4 @ 10"	33.17
	4	#4 @ 10"	40.09	#4 @ 10"	38.61	#4 @ 10"	37.64	#4 @ 10"	36.95	#4 @ 10"	36.44	#4 @ 10"	36.04	#4 @ 10"	35.72	#4 @ 10"	35.45	#4 @ 10"	35.25	#4 @ 10"	35.07	#4 @ 10"	34.91
	5	#4 @ 10"	41.99	#4 @ 10"	40.47	#4 @ 10"	39.47	#4 @ 10"	38.76	#4 @ 10"	38.24	#4 @ 10"	37.83	#4 @ 10"	37.50	#4 @ 10"	37.23	#4 @ 10"	37.02	#4 @ 10"	36.84	#4 @ 10"	36.68
	6	#4 @ 10"	43.97	#4 @ 10"	42.40	#4 @ 10"	41.36	#4 @ 10"	40.64	#4 @ 10"	40.10	#4 @ 10"	39.68	#4 @ 10"	39.35	#4 @ 10"	39.07	#4 @ 9"	43.33	#5 @ 10"	43.13	#5 @ 10"	42.96
	7	#4 @ 10"	46.19	#4 @ 10"	44.56	#4 @ 10"	43.49	#4 @ 10"	42.74	#4 @ 10"	42.18	#4 @ 10"	41.75	#4 @ 10"	41.41	#4 @ 10"	41.13	#4 @ 9"	45.65	#5 @ 10"	45.45	#5 @ 10"	45.28
	7	2	#4 @ 10"	34.90	#4 @ 10"	33.44	#4 @ 10"	3															