



Town of Berthoud Planning Commission
Town Hall
807 Mountain Avenue
Thursday, August 10, 2023, at 6:00 p.m.

1. Call Meeting To Order
2. Pledge Of Allegiance
3. Roll Call
4. Approval Of Minutes
Introduction By: Tawn Hillenbrand

Documents:

[JUNE 22 2023 PC MEETING MINUTES.PDF](#)
[JULY 27 2023 PC MEETING MINUTES.PDF](#)

5. Ludlow Annexation And Rezoning - Public Hearing
Introduction By: Tawn Hillenbrand

Documents:

[PC INFORMATION SHEET.PDF](#)
[LUDLOW SLIVER COZ STAFF REPORT_2023 07 31.PDF](#)
[LUDLOW SLIVER COZ ORDINANCE_2023 07 31.PDF](#)
[ATTACHMENT 1 - APPLICATION FORM.PDF](#)
[ATTACHMENT 2 - ZONING MAP.PDF](#)
[ATTACHMENT 3 - REFERRAL AGENCY COMMENTS.PDF](#)

6. Vantage 7th Filing Final Plat - Public Hearing
Introduction By: Tawn Hillenbrand

Documents:

[PC INFORMATION SHEET.PDF](#)
[FINAL PLAT STAFF REPORT.PDF](#)
[APPLICATION FORM.PDF](#)
[APPROVED NEIGHBORHOOD MASTER PLAN.PDF](#)
[PRELIMINARY PLAT.PDF](#)
[FINAL PLAT.PDF](#)

LANDSCAPE PLANS.PDF
UTILITY PLANS.PDF

7. Westside Crossing Commercial Preliminary Plat - Public Hearing
Introduction By: Tawn Hillenbrand

Documents:

PC INFORMATION SHEET.PDF
PRELIMINARY PLAT STAFF REPORT.PDF
APPLICATION FORM.PDF
PRELIMINARY PLAT.PDF
NEIGHBORHOOD MASTER PLAN.PDF
TRAFFIC IMPACT STUDY.PDF
PRELIMINARY DRAINAGE STUDY.PDF
REFERRAL COMMENTS - OUTSTANDING.PDF

8. Report By Staff

9. Adjourn

Join Zoom Meeting <https://us02web.zoom.us/j/86049631362> Meeting ID: 860 4963 1362
One tap mobile +17193594580,,86049631362# US

Individuals needing special accommodation may request assistance by contacting the Town Clerk at 807 Mountain Avenue, Berthoud, Colorado 80513, 970-532-2643 at least 24 hours in advance.



Planning Commission Minutes – June 22, 2023

- 1. Call to Order** – The Planning Commission convened a regular meeting on June 22, 2023. Commissioner Anderson called the meeting to order at 6:00 p.m.

- 2. Roll Call** – Members present: Karen Anderson (Chairperson)
John Van Benthem (Secretary)
- Members Absent: Chris Kurtz (Vice Chairperson)
Melissa Feldbush (Commissioner)
Abigail Smith (Commissioner)
Brett Wing (Commissioner)
- Staff present: Anne Johnson (Community Development Director)
Christian Samora (Town Clerk)
Tawn Hillenbrand (Senior Planner)
Jonathan Mitchell (Permit Technician)

- 3. Public Hearing: PrairieStar 5th Filing, 4th Addition, Final Plat**

MOTION made by Commissioner Van Benthem to MOVE TO CONTINUE the Final Plat hearing for PrairieStar 5th Filing, 4th Addition to the Planning Commission hearing on July 27, 2023. Due to a lack of quorum this evening, the hearing cannot be held.

SECONDED by Commissioner Anderson.

With all in favor, THE MOTION CARRIED.

- 8. Adjourn –**

The meeting was adjourned at 6:01 p.m.

CHAIRPERSON

SECRETARY



Planning Commission Minutes – July 27, 2023

1. **Call to Order** – The Planning Commission convened a regular meeting on July 27, 2023. Commissioner Anderson called the meeting to order at 6:00 p.m.

2. **Pledge of Allegiance**

3. **Roll Call** – Members present: Karen Anderson (Chairperson)
Chris Kurtz (Vice Chairperson)
John Van Benthem (Secretary)
Melissa Feldbush (Commissioner)
Abigail Smith (Commissioner)

Members Absent: Brett Wing (Commissioner)

Staff present: Anne Johnson (Community Development Director)
Christian Samora (Town Clerk)
Tawn Hillenbrand (Senior Planner)
Jonathan Mitchell (Permit Technician)

4. **Approval of Minutes** – Minutes from the June 08, 2023 Planning Commission Meeting.
MOTION made by Commissioner Kurtz to APPROVE the Minutes for June 08, 2023.
SECONDED by Commissioner Smith.
With those all in favor, THE MOTION CARRIED.

5. **Public Hearing: PrairieStar 5th Filing, 4th Addition, Final Plat**

Director Anne introduced the Applicant's request for a Final Plat to subdivide the property into 15 lots for residential and commercial uses.

Public Comment was opened at 6:21 p.m.

Public Comment was closed at 6:21 p.m.

MOTION made by Commissioner Smith to MOVE TO APPROVE the application for PrairieStar 5th Filing, 4th Addition due to the findings in the Staff Report, including compliance with the Land Use Code, the Criteria for Approval found in Section 30-6-108(c), and the Comprehensive Plan. The Motion for Approval includes the Findings and Recommendations in the Staff Report on page 3 as well as adding the following Condition of Approval: The Applicant shall amend the Development Agreement to include this property prior to recording the Final Plat.

SECONDED by Commissioner Van Benthem.

With all in favor, THE MOTION CARRIED.

6. Reports by Staff

August 10 – There will be three (3) Agenda items for Planning Commission.

August 24 – Planning Commission: Flood Code, Land Use Code, etc.

Planning Commission Applications are being submitted.

Code Amendment changes will be coming before to the Planning Commission soon.

Welcome Tawn Hillenbrand to the Town of Berthoud Team as the new Senior Planner!

7. Adjourn –

The meeting was adjourned at 6:38 p.m.

CHAIRPERSON

SECRETARY

PLANNING COMMISSION INFORMATION

COMMUNITY DEVELOPMENT DEPARTMENT



Meeting Date:	August 10, 2023
Agenda Title/Subject:	Public Hearing to consider a request for a Change of Zone should the Town Trustees approve the Annexation of property known as the Ludlow Sliver located between State highway 287 and South Berthoud Parkway and approximately one mile south of the intersection of South Berthoud Parkway and Mountain Avenue
Type of Item:	Public Hearing
Purpose:	Request for approval of a Change of Zone
Presented by:	Anne Johnson, Community Development Director Tawn Hillenbrand, Senior Planner Will Charles, Planner, Baseline Engineering

ATTACHMENTS:

- Staff Report
- Application materials
- Presentation materials

BACKGROUND:

The 0.436-acre parcel was inadvertently omitted from the original Ludlow Annexation in 2010. Should the Town Board of Trustees approve the annexation, the Trustees are able to consider the Planning Commission recommendation for zoning.

UPDATE/NEXT STEPS:

After the Planning Commission public hearing, the Board of Trustees will hear the Annexation and Zoning request in on September 12, 2023. If approved, the small parcel of land shall be incorporated into the overall Ludlow project and included in future application submittals.

FISCAL IMPACT AND FUND SOURCE:

There is no negative impact to the Town in consideration of this request.

COMMUNITY TOUCHSTONES:

Consideration of this request does not negatively impact community touchstones. The request seeks to correct an omission from 2010.

RECOMMENDED ACTION(S):

Staff recommends approval of the request. See suggested motions in the Staff Report.



STAFF REPORT: LUDLOW SLIVER REZONING

DATE: August 10, 2023

GENERAL INFORMATION

Applicant:	Ludlow Farms, LLC – JM Hinson, Manager	Size: 0.436 acres
Site Location:	This property is located between State Highway 287 and South Berthoud Parkway, approximately one mile south of the intersection of South Berthoud Parkway and Mountain Avenue.	
Applicant's Request:	The Applicant is requesting a rezoning to Suburban Residential (SR) from Larimer County RR-2 Rural Residential in conjunction with an annexation request.	
Current Zoning:	Larimer County RR2 Rural Residential.	

PROPOSED ZONING DISTRICT INFORMATION

	<u>Suburban Residential (SR)</u>
Max Density	N/A
Min. Lot Size	3,000 sq.ft.
Min. Lot Width	20'
Front Setback	10' rear loaded
Side Setback	5'
Rear Setback	5'
Building Height:	30'

SURROUNDING ZONING, LAND USE AND REQUIRED BUFFERS

	<u>Adjacent Zoning</u>	<u>Adjacent Land Uses</u>	<u>Setbacks for Adjacent Zoning/ Buffer required if rezoned</u>
North	SR	Vacant (Planned for future residential development)	N/A
South	County RR-2	Vacant	N/A
East	SR and R1	Vacant (Planned for future residential development)	N/A
West	County RR-2	Vacant	N/A

Proposal

The applicant requests to rezone from County RR-2 Rural Residential to SR - Suburban Residential. The Rezone request is in conjunction with an Annexation request.

Background

This proposed Rezone is south of and adjacent to the Ludlow Farms property which was annexed to the Town of Berthoud in 2010 and received approval of a final plat in 2011. The 0.436-acre subject property was inadvertently left out of the original Ludlow Farms property annexation in 2010, as seen in the image below. The proposed Rezone, in conjunction with the Annexation request, would address that inadvertent omission. The proposed zoning request is in alignment with the rezoning completed in early 2023.



Images 1 and 2: Approved Neighborhood Master Plan. Omitted strip of land outlined in red.

Rezoning

The applicant has requested to rezone the property from County RR-2 Rural Residential to SR – Suburban Residential. If approved, the resultant zoning would be consistent with the remainder of the Ludlow Farms property to the north. Additionally, the subject property would be incorporated into the overall Ludlow Farms development project and thereby, reflected in the Rezoning and Neighborhood Master Plan approved by the Town in early 2023. The property would be incorporated into the proposed open space for the development. Obligations for the overall development project would include this sliver of land.

Rezoning is addressed through an official zoning map amendment. Section 30-3-110(D) states for the purpose of establishing and maintaining sound stable and desirable development within the Town, the Zoning Map shall not be amended except when it addresses one or more of the criteria in the following table.

30-3-110(D) Zoning Map Amendment Criteria	Finding	Rationale
1. To correct a manifest error in an ordinance establishing the zoning for a specific property; or 2. To rezone an area or extend the boundary of an existing district because of changed or changing conditions in a particular area or in the Town generally; or 3. The land to be rezoned was zoned in error and as presently zoned is inconsistent with the policies and goals of the Town Comprehensive Plan; or 4. The proposed rezoning is necessary to provide land for a community-related use that was not anticipated at the time of the adoption of the Town Comprehensive Plan, and the rezoning will be consistent with the policies and goals of the Comprehensive Plan; or 5. The area requested for rezoning has changed or is changing to such a degree that it is in the public interest to encourage development or redevelopment of the area	Yes	Staff finds that the proposed rezoning meets criterion 2. The proposed request is in conjunction with an Annexation request and will address an inadvertent omission made at the time of the original annexation of Ludlow Farms in 2010. The proposed zoning district is consistent with the current zoning of Ludlow Farms to the north.

PUBLIC NOTICE AND COMMENT

Notice of the Planning Commission Public Hearing was mailed to property owners within 500 feet of the subject property, a legal ad published, and the property was posted as required by the Development Code on July 24, 2023. The application was sent out to all property owners within 500 feet, with an invitation to comment on the request within two weeks of receipt. As of the date of this packet, no neighbor comments have been received.

REFERRAL AGENCY COMMENT

The application was referred to a variety of referral agencies. Responses were received from the following agencies:

- Baseline Engineering (Town of Berthoud)
- Little Thompson Water District
- Larimer County Engineering
- Xcel Energy
- Berthoud Fire Protection District
- CDOT
- Larimer County Planning

With the exception of Baseline Engineering, the responding agencies expressed that they had no concerns with the proposed request. Baseline Engineering requested some minor corrections to the Annexation and Rezone Map, which are currently being addressed by the applicant. Referral agency comments can be found in the attachments.

FINDINGS AND RECOMMENDATION

Rezoning

Findings:

The Planning Team has no concerns with the proposed rezoning and finds that the SR – Suburban Residential zoning district meets the intent of the Code.

Recommendation:

Staff recommends that Planning Commission recommend approval of the request to rezone 0.436 acres of property to SR – Suburban Residential, as per the findings of the Staff Report should the Town Board of Trustees approve the Annexation request.

Attachments

1. Application form
2. Rezoning map
3. Referral Agency Comments

TOWN OF BERTHOUD

ORDINANCE NO. **XX**

AN ORDINANCE AMENDING THE ZONING MAP OF THE TOWN OF BERTHOUD TO ESTABLISH THE ZONING OF PROPERTY KNOWN AS THE “LUDLOW SLIVER ANNEXATION” NEWLY ANNEXED TO THE TOWN OF BERTHOUD

WHEREAS, an ordinance approving the annexation of certain property known as the “Ludlow Sliver,” as more particularly described in Exhibit A attached hereto (the “Property”), to the Town of Berthoud by Ordinance No. 2023 - ____ was passed by the Board of Trustees of the Town of Berthoud on September 12, 2023; and,

WHEREAS, Section 31-12-115, Colorado Revised Statutes, requires that newly annexed property be zoned within 90 days of the effective date of the annexation ordinance; and,

WHEREAS, the Planning Commission previously has considered the zoning request related to Resolution No. **XX** and pending Annexation Ordinance 2023-____, and has recommended that the Property be zoned “**Suburban Residential (SR)**” upon its annexation into the Town; and,

WHEREAS, notice previously has been posted and published as required by law and a public hearing was conducted before the Board of Trustees on **September 12, 2023**, at which time the zoning of the Property to “**Suburban Residential (SR)**” was approved by the Board, to become effective upon the completion of the annexation of the Property into the Town; and

WHEREAS, the Board desires to ratify and confirm the zoning approval for the Property to become effective concurrent with the legal effectiveness of Annexation **Ordinance 2023-____**.

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF TRUSTEES OF THE TOWN OF BERTHOUD, COLORADO:

Section 1. Upon the legal effectiveness of the annexation of the Property to the Town of Berthoud in accordance with Section 31-12-113(2)(b), Colorado Revised Statutes, the official zoning map of the Town of Berthoud shall be amended by the inclusion of the Property zoned as “**Suburban Residential (SR)**.”

Section 2. The Property known as the “**Ludlow Sliver Annexation**” is hereby zoned “**Suburban Residential (SR)**,” subject to the terms and conditions approved by the Town.

Section 3. Interpretation. This Ordinance shall be so interpreted and construed to effectuate its general purpose.

Section 4. Publication. The Town Clerk shall certify to the passage of this Ordinance, cause its contents to be published, and, when the annexation of the Property becomes effective in accordance with section 31-12-113(2) (b), Colorado Revised Statutes, shall cause the appropriate change to be made to the official Berthoud Zoning District Map.

Section 5. Effective Date: The effective date of this ordinance shall be the later of the effective date of the Annexation of “**Ludlow Sliver**” and thirty days after publication of this ordinance.

PASSED, ADOPTED, SIGNED, AND APPROVED this the 12th day of September, 2023.

TOWN OF BERTHOUD

By _____

William Karspeck, Mayor

ATTEST:

By: _____

Christian Samora, Town Clerk

EXHIBIT A: LEGAL DESCRIPTION

A parcel of land being a part of the Southeast Quarter of Section 22, Township 4 North, Range 69 West of the 6th P.M., Town of Berthoud, County of Larimer, State of Colorado, being more particularly described as follows:

Considering the South line of the Southeast Quarter of said Section 22, as bearing South 89°06'41" West, with the South Quarter corner of Section 22 being monumented by a 3-1/4" aluminum cap and the Southeast corner of Section 22 being monumented by a 2-1/2" aluminum cap stamped LS 12374, and with all bearings contained herein relative thereto:

COMMENCING at the South Quarter corner of said Section 22, thence along the South line of the Southeast Quarter of Section 22, North 89°06'41" East, a distance of 223.67 feet to a point on the Easterly right-of-way line U.S. Highway 287, said point being the POINT OF BEGINNING;

THENCE North 07°21'53" West, a distance of 25.76 feet to the Southwest corner of Lot 9, Ludlow Farms - Conveyance Plat, recorded at Reception No. 2011008205, Larimer County Clerk and Recorder;

THENCE along the Southerly line of Lot 9 the following seven (7) courses and distances:

South 88°00'48" East, a distance of 107.18 feet;

THENCE North 89°17'36" East, a distance of 232.13 feet;

THENCE North 89°35'38" East, a distance of 219.93 feet;

THENCE North 89°49'13" East, a distance of 204.24 feet;

THENCE South 89°36'42" East, a distance of 152.83 feet;

THENCE North 88°06'10" East, a distance of 188.67 feet;

THENCE South 00°08'00" West, a distance of 15.02 feet to said South line of the Southeast Quarter of Section 22;

THENCE departing said South line of Lot 9, along the South line of the Southeast Quarter of said Section 22, South 89°06'41" West a distance of 1101.58 feet to the POINT OF BEGINNING.

The above-described parcel of land contains 19,011 square feet or 0.436 acres, more or less ($\pm$), and may be subject to easements and rights-of-way now on record or existing.

EXHIBIT B: CHANGE OF ZONE MAP



Town of Berthoud
807 Mountain Ave.
P.O. Box 1229
Berthoud, CO 80513
970.532.2643

DEVELOPMENT REVIEW APPLICATION

All required information must be provided before submittal will be accepted and deemed complete.
To be complete, the application must include all items identified on the submittal checklist.
Please complete both sides of application form.

Parcel Number(s): Parcel number not available		
Site Address: SW Corner of Mountain Avenue & Berthoud Parkway		
Project Name: Ludlow Farms		
Brief description of project: Residential and mixed-use subdivision.		
APPLICATION TYPE (Check as appropriate):		
☒ Annexation	☐ Preliminary Subdivision Plat	☐ Final Site Plan
☐ Rezoning	☐ Final Subdivision Plat	☐ PUD Amendment
☐ Concept Plan	☐ Plat Amendment	☐ PUD Preliminary Development Plan
☐ Minor Subdivision	☐ Oil and Gas	☐ PUD Final Development Plan
☐ Special Use Review	☐ ROW Vacation	☐ Other _____
APPLICANT		
Name: Ludlow Farms, LLC - JM Hinson, Manager		
E-mail: jmhinson@me.com	Mailing Address: 700 Ken Pratt Blvd Suite 113	
Phone: 1-904-945-8636	City/State/Zip: Longmont, CO 80501	
CONTACT PERSON (will receive correspondence from Town Staff/Referral Agencies)		
Name: Kristin Turner - TB Group		
E-mail: kristin@tbgroup.us	Mailing Address: 444 Mountain Avenue	
Phone: 970.532.5891	City/State/Zip: Berthoud, CO 80513	
OWNER(S) (If different than applicant)		
Name: Greg Ludlow - Manager Smilin' 11 LLC		
E-mail: greg.ludlow5@gmail.com	Mailing Address: 1909 Sundance Drive	
Phone: (970) 302-9332	City/State/Zip: Longmont, Colorado 80504	
CONSULTANT (Engineer, Surveyor, or Planner)		
Name:		
E-mail:	Mailing Address:	
Phone:	City/State/Zip:	

LAND USE INFORMATION	
Existing Use: Vacant Proposed Use: Residential, Commercial, Mi Existing Zoning: Larimer County RR2 Proposed Zoning: (if applicable): SR Number of acres: 0.436 AC Proposed Access: Berthoud Parkway & Mc	
Adjacent zoning / land use:	
East Side: BERTHOUD PARKWAY	North Side: SR
West Side: HWY 287	South Side: LARIMER COUNTY RR2
UTILITY SERVICE INFORMATION	
Water: Town of Berthoud	Sewer: Town of Berthoud
PROJECT INFORMATION	
Number of proposed units: N/A Number of phases: N/A Number of Units per phase: N/A Number of lots proposed: N/A Lot size minimum: N/A Lot size maximum: N/A Lot size average: N/Af Gross density (units/acre): N/A Net density (units/acre): N/A Area and percent open space: N/A	Non-Residential Building Area (Sq. Ft.) Proposed: N/A Non-Residential Construction Floor Area Ratio Proposed: N/A Total Number of Parking Spaces: N/A <u>Acreage of Site:</u> a. Gross: 0.436 AC b. Right-of-Way: N/A c. Net (a-b)
Type of Housing Proposed (please check):	
☐ Future Single Family ☐ Duplex ☐ Multi-family (# of units: TBD)	☐ Townhouse ☒ Condominium

Signatures are required for ALL Property Owners and the Applicant

I hereby certify that I am the lawful owner of the parcel(s) of land that this application concerns and consent to the action. I hereby permit Town of Berthoud staff to enter upon the property for the purposes of inspection relating to the application. Building Permits will not be accepted while this application is in process.

DocuSigned by:
 Property Owner(s): Greg Ludlow Manager - Smilin' 11 LLC Date: 6/29/2023
D8BEF5D68CD544C...

Property Owner(s): _____ Date: _____

In submitting the application materials and signing this application agreement, I acknowledge and agree that the application is subject to the applicable processing and public hearing requirements set forth in the Development Code.

Applicant: M Hinson Date: 6/29/2023
55A1B923E6644C3...

FOR OFFICE USE ONLY	Received By:	Date:
----------------------------	---------------------	--------------

LOUDLOW FARMS ANNEXATION AND REZONE MAP

LOCATED IN THE SOUTHEAST QUARTER OF SECTION 22, TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH P.M.,
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

DESCRIPTION OF REZONING AREA PUD TO SUBURBAN RESIDENTIAL:

A parcel of land being a part of the Southeast Quarter of Section 22, Township 4 North, Range 69 West of the 6th P.M., Town of Berthoud, County of Larimer, State of Colorado, being more particularly described as follows:

Considering the South line of the Southeast Quarter of said Section 22, as bearing South 89°06'41" West, with the South Quarter corner of Section 22 being monumented by a 3 1/4" aluminum cap and the Southeast corner of Section 22 being monumented by a 2 1/2" aluminum cap stamped LS 12374, and with all bearings contained herein relative thereto:

COMMENCING at the South Quarter corner of said Section 22, thence along the South line of the Southeast Quarter of Section 22, North 89°06'41" East, a distance of 223.67 feet to a point on the Easterly right-of-way line U.S. Highway 287, said point being the **POINT OF BEGINNING**;
THENCE North 07°21'53" West, a distance of 25.76 feet to the Southwest corner of Lot 9, Ludlow Farms - Conveyance Plat, recorded at Reception No. 2011008205, Larimer County Clerk and Recorder;
THENCE along the Southerly line of Lot 9 the following seven (7) courses and distances:
South 88°00'48" East, a distance of 107.18 feet;
THENCE North 89°17'36" East, a distance of 232.13 feet;
THENCE North 89°35'38" East, a distance of 219.93 feet;
THENCE North 89°49'13" East, a distance of 204.24 feet;
THENCE South 89°36'42" East, a distance of 152.83 feet;
THENCE North 88°06'10" East, a distance of 188.67 feet;
THENCE South 00°08'00" West, a distance of 15.02 feet to said South line of the Southeast Quarter of Section 22;
THENCE departing said South line of Lot 9, along the South line of the Southeast Quarter of said Section 22, South 89°06'41" West a distance of 1101.58 feet to the **POINT OF BEGINNING**.

The above-described parcel of land contains 19,011 square feet or 0.436 acres, more or less (±), and may be subject to easements and rights-of-way now on record or existing.

OWNER: Jean E. Cowles, an individual

BY: _____
Gregory T. Ludlow, under rights of power
of attorney

STATE OF COLORADO)
)SS
COUNTY OF LARIMER)

The foregoing instrument was acknowledged before me this ____ day of _____, 2023, by

_____ as _____ of .

Witness my hand and official seal

My commission expires: _____

Notary Public

OWNER: S. Reid Ludlow, an individual

BY: _____
Gregory T. Ludlow, under rights of power
of attorney

STATE OF COLORADO)
)SS
COUNTY OF LARIMER)

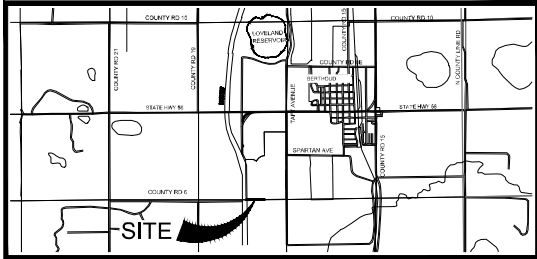
The foregoing instrument was acknowledged before me this ____ day of _____, 2023, by

_____ as _____ of .

Witness my hand and official seal

My commission expires: _____

Notary Public



VICINITY MAP
1" = 2000'

OWNER: Smilin' II, LLC, a Colorado limited liability company

BY: _____
Gregory T. Ludlow, its managing member

STATE OF COLORADO)
)SS
COUNTY OF LARIMER)

The foregoing instrument was acknowledged before me this ____ day of _____, 2023, by

_____ as _____ of .

Witness my hand and official seal

My commission expires: _____

Notary Public

NOTES:

- 1) First National Title Insurance Company, Commitment No. 830003001-SE, dated 08/30/2022 at 8:00 a.m. was used in the preparation of this document.
- 2) The Basis of Bearings is the South line of the Southeast Quarter of said Section 22, as bearing South 89°06'41" West, with the South Quarter corner of Section 22 being monumented by a 3 1/4" aluminum cap and the Southeast corner of Section 22 being monumented by a 2 1/2" aluminum cap stamped LS 12374.
- 3) Northern Engineering relied upon the plat of Ludlow Farms Conveyance Plat recorded at Reception Number 20110018205 Larimer County Clerk and Recorder.
- 4) This is not a statutory boundary survey, lines ran or shown have not been evaluated for title rights either written or unwritten.
- 5) This map is not a land survey plat or improvement survey plat, and it is not to be relied upon for the establishment of fence, building, or other future improvement lines.
- 6) Adjacent property owner information per the Larimer County Land information Locator.
- 7) Zoning information per the Official Zoning map, Town of Berthoud, dated October, 2021 and the Larimer County Zoning Districts Map, dated April 2021.

APPROVAL CERTIFICATES:

This is to certify that the annexation and rezone of the above described property was approved by Ordinance No. _____ of the Town of Berthoud, passed and adopted on the ____ day of _____, 2023, and that the Mayor of the Town of Berthoud as authorized by said ordinance on behalf of the Town of Berthoud hereby for all acknowledges and adopts the said annexation upon which the certificate is endorsed for all purposes indicated hereon.

Approved by the Board of Trustees of the Town of Berthoud, Colorado this ____ day of _____, 2023.

Mayor

The foregoing map is approved for filing and accepted by the Town of Berthoud, Colorado this ____ day of _____, 2023.

ATTEST: _____
Town Clerk

APPROVAL CERTIFICATES:

Approved by the Planning Commission of the Town of Berthoud, Colorado this ____ day of _____, 2023.

Chairman

The foregoing map is approved for filing and accepted by the Town of Berthoud, Colorado this ____ day of _____, 2023.

ATTEST: _____
Planning Technician

LARIMER COUNTY CLERK & RECORDER CERTIFICATE:

This Annexation and Rezoning Map was accepted for filing in the Office of the Larimer County Clerk & Recorder on this ____ day of

_____, 2023, at _____ M. in Book _____, Page _____, Reception No.

By: _____
Larimer County Clerk and Recorder

SURVEYOR'S STATEMENT

I, Robert C. Tessely, a Colorado Registered Professional Land Surveyor, do hereby state that this map of land proposed to be annexed and rezoned is the Town of Berthoud, County of Larimer, State of Colorado was prepared under my direct supervision from existing documents of record and that the same is true and correct to the best of my knowledge, information and belief.

For and on behalf of Northern Engineering Services, Inc.
Robert C. Tessely
Colorado Registered Professional Land Surveyor No. 38470

NOTICE:
According to Colorado law you must commence any legal action based on the provisions of this certificate within ten years after the date of the certificate shown hereon. In no event may any action based on any defect in this survey be commenced more than ten years after the date of the certificate shown hereon.

SECTION: 22
TOWNSHIP: 4 N
RANGE: 69 W of the 6th PM

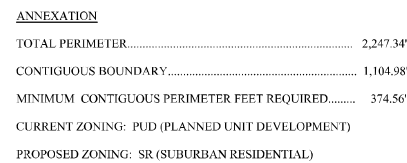
NORTHERN ENGINEERING
SURVEY | MUNICIPAL | LAND DEVELOPMENT
NORTHWEST CORNER OF SECTION 22, TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH P.M., TOWN OF BERTHOUD, COLORADO

PROJECT: 1859-001
CLIENT: LUDLOW FARMS LLC
DRAWN BY: L. Smith
DATE: 06/07/23
SCALE: As shown
REVIEWED BY: R. Tessely

LUDLOW FARMS ANNEXATION AND REZONE MAP
TOWN OF BERTHOUD
LARIMER COUNTY, COLORADO

Sheet
1
Of 2 Sheets

LOCATED IN THE SOUTHEAST QUARTER OF SECTION 22, TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH P.M.,
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO



LEGEND

	BOUNDARY LINE
	EXISTING RIGHT-OF-WAY
	LOT LINE
	SECTION LINE
	EASEMENT LINE



FOUND SECTION CORNER
AS DESCRIBED



PRELIMINARY
For and on behalf of Northern Engineering Services, Inc.
Robert C. Tessely
Colorado Registered Professional Land Surveyor No. 38470

NOTICE: According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you discover such defect. In no event may any action based upon any defect in this survey be commenced more than ten years after the date of the certificate shown hereon.

22
TOWNSHIP:
4 N
RANGE:
69 W of the 6th PM

N **NORTHERN**
ENGINEERING
SURVEY | MUNICIPAL | LAND DEVELOPMENT
PROJECTS | SKILLING | QUALITY
STAFFING | NORTHWESTERN

1859-001	06/07/23
CLIENT: LUDLOW FARMS LLC.	SCALE: 1" = 100'
DRAWN BY: L. Smith	REVIEWED BY: R. Tossely

TOWN OF BERTHOUD
LARIMER COUNTY, COLORADO

Sheet
2
Sheets



**Garden
Spot of
Colorado**

807 Mountain Avenue | PO Box 1229 | Berthoud, CO 80513 | O: 970.532.2643 | F: 970.532.0640 | Berthoud.org

REFERRAL AGENCY REVIEW COMMENTS

Community Development Dept.

PLANNING

Tawn Hillenbrand, thillenbrand@berthoud.org

Response received: 7.27.2023

-
1. As noted by Baseline Engineering, please revise the name on the Annexation-Rezone Map to Ludlow Annexation No. 2.

BASELINE ENGINEERING

Luke Seeber, luke.seeber@baselinecorp.com; Noah Nemmers, noah@baselinecorp.com

Response received: 7.17.2023

-
1. Berthoud, Colorado - Code of Ordinances, Chapter 30 - BERTHOUD DEVELOPMENT CODE, SECTION 8 – ANNEXATION, 30-8-103 - Annexation application, A., 6. Requires the applicant to “submit proof of ownership in the form of a current title commitment issued by a title insurance company licensed by the State of Colorado, whose effective date shall be less than 30 days prior to the date of submittal of the annexation petition. Ownership must match the ownership listed in the petition.” NO COMMITMENT WAS PROVIDED WITH THIS SUBMITTAL.
 2. There is already a Ludlow Farms Annexation of record. This will need to be named Ludlow Farms Annexation No. 2. Please update in all applicable locations.
 3. Verify/update the dimension used for the current contiguous boundary. It calculates at 1,120.00 feet. 4. Update the annotation for the point of commencement to the point of beginning. The narrative description reads North 89°06'41" East, 223.67 feet.
 4. The hatching depicting the town boundary should only be shown where it is adjacent to the proposed annexation.

In addition to a comment summary, Baseline also provide redlines on the Annexation-Rezone Map. Please see the attached comment summary and map document.

BERTHOUD FIRE

Joe Jaramillo, jaramillofire@aol.com

Response received: 7.17.2023

No concerns with the request.

LITTLE THOMPSON WATER DISTRICT

Clayton Orback, COrback@ltwd.org

Response received: 7.25.2023

No objection to the proposed annexation. Although not specific to this annexation request, the LTWD did provide the following general statement pertaining to the Ludlow Farms development:

-
1. Please note that on February 22, 2023, LTWD commented on the subject development. As a reminder to the Developer, LTWD will not be serving the subject development. As a result, LTWD's existing 5/8-inch standard residential tap (tap #433) will need to be properly abandoned and relinquished to the District.

Additionally, as part of the relinquishment process, the subject property will need to have LTWD excluded as a taxing authority with the County. The Developer will need to contact the District accordingly.

CDOT

Response received: 7.06.2023

Tim Bilobrand, timothy.bilobran@state.co.us

1. CDOT's official position for annexation and zoning is "no comment". We typically get involved whenever a redevelopment is actually occurring which increases the daily or peak hour traffic counts. For this email though, nothing further from us. Please let me know if you have any questions.

LARIMER COUNTY ENGINEERING DEPT.

Response Received: 7.06.2023

Steven Rothwell, rothwesc@co.larimer.co.us

No comments on the request.

LARIMER COUNTY PLANNING

Response Received: 7.11.2023

Justin Currie, poc@co.larimer.co.us

No comments on the request.

XCEL

Response Received: 7.06.2023

Cory Thelen, Cory.M.Thelen@xcelenergy.com

1. I don't see any issues with this annexation and rezone, Xcel Energy does not have any utilities in that zone.

PLANNING COMMISSION INFORMATION

COMMUNITY DEVELOPMENT DEPARTMENT



Meeting Date:	August 10, 2023
Agenda Title/Subject:	Public Hearing to consider a request for a Final Plat known as Vantage 7th Filing located south of Water Avenue and west of Vantage Parkway
Type of Item:	Public Hearing
Purpose:	Request for approval of a Final Plat for Vantage 7th Filing
Presented by:	Anne Johnson, Community Development Director Tawn Hillenbrand, Senior Planner Will Charles, Planner, Baseline Engineering

ATTACHMENTS:

- Staff Report
- Application materials
- Presentation materials

BACKGROUND:

The 8.31-acre property is zoned R-3 for Multi-Family uses. The location of this 7th Filing is within the Vantage development and more specifically located south of Water Avenue and west of Vantage Parkway. The applicants are proposing 60 attached single-family units.

UPDATE/NEXT STEPS:

Planning Commission heard the Preliminary Plat request on June 8, 2023 followed by the Town Board of Trustees public hearing on July 11, 2023. Planning Commission holds the only public hearing on the Final Plat which is scheduled for August 10, 2023. If approved, any Conditions of Approval will need to be met, a Development Agreement may need to be entered into, and the mapping/plat products will need to be recorded.

FISCAL IMPACT AND FUND SOURCE:

There is no negative impact to the Town in consideration of this request.

COMMUNITY TOUCHSTONES:

Consideration of this request does not negatively impact community touchstones. The property is within an existing development and this 7th Filing in essence is "in-fill" development completing the final stages of the overall Vantage development.

RECOMMENDED ACTION(S):

Staff recommends approval of the request. There are suggested motions included in the Staff Report.



STAFF REPORT: VANTAGE 7TH FILING FINAL PLAT

DATE: August 10, 2023

GENERAL INFORMATION

Applicant:	DR Horton d/b/a Melody Homes Inc.	Size: 8.31 acres
Site Location:	The property is centrally located within the Vantage subdivision, south of Water Avenue and west of Vantage Parkway	
Applicant's Request:	The Applicant is requesting a preliminary plat for the creation of 60 residential lots intended for single family attached (duplexes) residential. This would create 60 units total.	
Current Zoning:	R3 – Multi-Family	

ZONING DISTRICT INFORMATION

	<u>R3</u>
Max Density	20 per acre
Min. Lot Area	1,400 sq.ft.
Min. Lot Width	16'
Front Setback	10' with rear loaded garages
Side Setback	5' side
Rear Setback	5' with rear loaded garages.
Building Height:	40'

SURROUNDING ZONING, LAND USE AND REQUIRED BUFFERS

	<u>Adjacent Zoning</u>	<u>Adjacent Land Uses</u>	<u>Setbacks for Adjacent Zoning/ Buffer required if rezoned</u>
North	R1	Single-Family / Future Club House	N/A
South	R1	Single-Family	N/A
East	R1	Single-Family	N/A
West	R1	Single-Family	N/A

Proposal

The applicant proposes to subdivide the existing parcel into 60 lots and 6 tracts.

Background

This property is part of the overall Vantage development. In February of 2022 the Vantage development received neighborhood master plan approval for the remaining infill portions of the neighborhood totaling approximately 34.9 acres. Additionally, a preliminary plat was approved at the Board of Trustees July 11, 2023 meeting. The final plat is consistent with the preliminary plat and what was proposed during the neighborhood master plan phase.

Final Plat Review Criteria

In addition to all provisions of this Code, the Town shall use the following criteria to evaluate the applicant's request:

30-6-108(C) Review Criteria	Finding	Rationale
1. The Final Plat is in substantial conformance with the approved Preliminary Plat. For the purposes of this Code, "Substantial conformance." Includes design adjustments made to meet any conditions of preliminary plat approval, and is determined as follows: a. Does not change any land use of the proposed plat. b. Does not change the number of lots or residential density by more than 5%. c. Does not contain changes which would render the final plat in nonconformance with requirements of this Code. d. Does not contain significant changes in street alignment and/or access points, or other public elements such as drainage improvements, utility lines or facilities. e. Does not change any measurable standard (other than above) by more than 15 percent.	Yes	The final plat is identical to what was proposed during the preliminary plat phase.
1. The development complies with this Code, the Comprehensive Plan and the PORT Plan.	Yes	The land use mix is consistent with the current R-3 zone district. The future land use map lists this area as parks, recreation, and trails. The discrepancy between these two visions was discussed during the preliminary phase. At the time it was determined that the future land use map designation was likely done in error, and the alley loaded products was an adequate blend of the two visions for the area. Additionally, the western border of this project area has a neighborhood trail connection that connects to the front yard open spaces of the homes.

2. All applicable technical standards including the provision of water in sufficient amount and quality have been met.	Yes	Plans were reviewed by Town Staff as well as outside referral agencies. The applicant has provided adequate plans for utilities and transportation systems.
--	-----	---

PUBLIC NOTICE AND COMMENT

Notice of the Planning Commission Public Hearing has been mailed to property owners within 500 feet of the subject property on August 2, 2023, a legal ad published on August 3, 2023, and the property was posted as required by the Development Code by August 3, 2023. In addition, the application was sent out to all property owners within 500 feet when the project was originally submitted, with an invitation to comment on the request within three weeks of receipt. No responses were received.

FINDINGS AND RECOMMENDATIONS

- **Staff recommends Planning Commission make a motion to recommend approval of the Final Plat.**

ATTACHMENTS

1. Application form
2. Approved Neighborhood Master Plan
3. Approved Preliminary Plat
4. Proposed Final Plat including landscape and utility plans
5. Presentation from Staff



DEVELOPMENT REVIEW APPLICATION

All required information must be provided before submittal will be accepted. Use appropriate submittal checklist to determine application requirements. Complete both sides of application form.

Project Name: Vantage 7th Filing		
Brief description of project: Preliminary plat for Tract A		
Legal Description of Property (lots, blocks, tracts, subdivision name, or metes & bounds): See attached.		
APPLICATION TYPE (Check as appropriate):		
☐ Annexation	☒ Preliminary Subdivision Plat	☐ Final Site Plan
☐ Rezoning	☐ Final Subdivision Plat	☐ PUD Amendment
☐ Concept Plan	☐ Plat Amendment	☐ PUD Preliminary Development Plan
☐ Minor Subdivision	☐ Oil and Gas	☐ PUD Final Development Plan
☐ Special Use Review	☐ ROW Vacation	☐ Other: Neighborhood Master Plan
Pre-application Date (if applicable): 8.26.21		
APPLICANT		
Company Name: DR Horton d/b/a Melody Homes Inc.		
Contact Person: Ron Mullenbach E-mail: ramullenbach@drhorton.com Phone: 303.488.0061	Address: 9555 S. Kingston Street City: Englewood State: CO Zip: 80112	
OWNER (If different than applicant)		
Company Name: ALC V-Berthoud, LLC		
Contact Person: Bill Zech E-mail: william.r.zech@gmail.com Phone:	Address: 8678 Carey Court City: Stockton State: CA Zip: 95212	
CONSULTANT (Engineer, Surveyor, or Planner)		
Company Name: TB Group		
Contact Person: Kristin Turner E-mail: kristin@tbgroup.us Phone: 970.532.5891	Address: 444 Mountain Ave City: Berthoud State: CO Zip: 80513	

LAND USE INFORMATION		
Existing Use: Agriculture		
Proposed Use: Residential		
Existing Zoning: R3		
Proposed Zoning: (if applicable): N/A		
Number of acres: 8.31 AC		
Adjacent zoning / land use:		
East Side: R1		North Side: R1
West Side: R1		South Side: R1
UTILITY SERVICE INFORMATION		
Water: Town of Berthoud	Sewer: Town of Berthoud	Other:
PROJECT INFORMATION		
Number of proposed units: 60 Number of phases: 1 Number of Units per phase: 60 Number of lots proposed: 60 Lot size minimum: Lot size maximum: Lot size average: 50x98 Gross density (units/acre): 7.2du/ac Net density (units/acre): 8.4 du/ac Area and percent open space: 3.27 AC/39% OS	Non-Residential Building Area (Sq. Ft.) Proposed: N/A Non-Residential construction Floor Area Ratio Proposed: N/A Total Number of Parking Spaces: NA <u>Acreage of Site:</u> a. Gross: 8.31 b. Right-of-Way: 1.23 c. Net (a-b) 7.08	
Type of Housing Proposed (please check):		
☐ Future Single Family ☒ Duplex ☐ Multi-family (# of units:)		☐ Townhouse ☐ Condominium

DESIGNATION OF REPRESENTATIVE:

The undersigned owner(s) and lienholder(s) agree that _____, represents the undersigned in all matters pertaining to this project, including subsequent modification to the application.

Signed by: Bill Bach Date: 8/23/2022
 Owner: 2A8AE47E8E9B443...
 Lienholder: _____ Date: _____

ACKNOWLEDGMENTS:

I, THE APPLICANT or designated representative of the applicant, hereby acknowledge that the information on this application is accurate and complete as per the attached checklist(s) and specification of the Town of Berthoud Development Code.

Applicant or representative: Ron Mullenbach
7AD492032D8A43A...

FOR OFFICE USE ONLY	Received By:	Date:
----------------------------	---------------------	--------------

LARIMER COUNTY

CR 10E

TRACT N
R3 ZONING

TRACT P
R3 ZONING

DETENTION

VANTAGE 2ND FILING
NOT A PART
R1 ZONING

VANTAGE 4TH FILING
NOT A PART
R1 ZONING

LARIMER COUNTY

BERTHOUD PARKWAY

FUTURE BERTHOUD PARK

TRACT O
R1 ZONING

TRACT A
R3 ZONING

DETENTION

VANTAGE 1ST FILING
NOT A PART
R2 ZONING

WESTHAVEN
NOT A PART
R1 ZONING

EXISTING ZONING: R1

LOVELAND RESERVOIR

VANTAGE 1ST FILING
NOT A PART
R2 ZONING

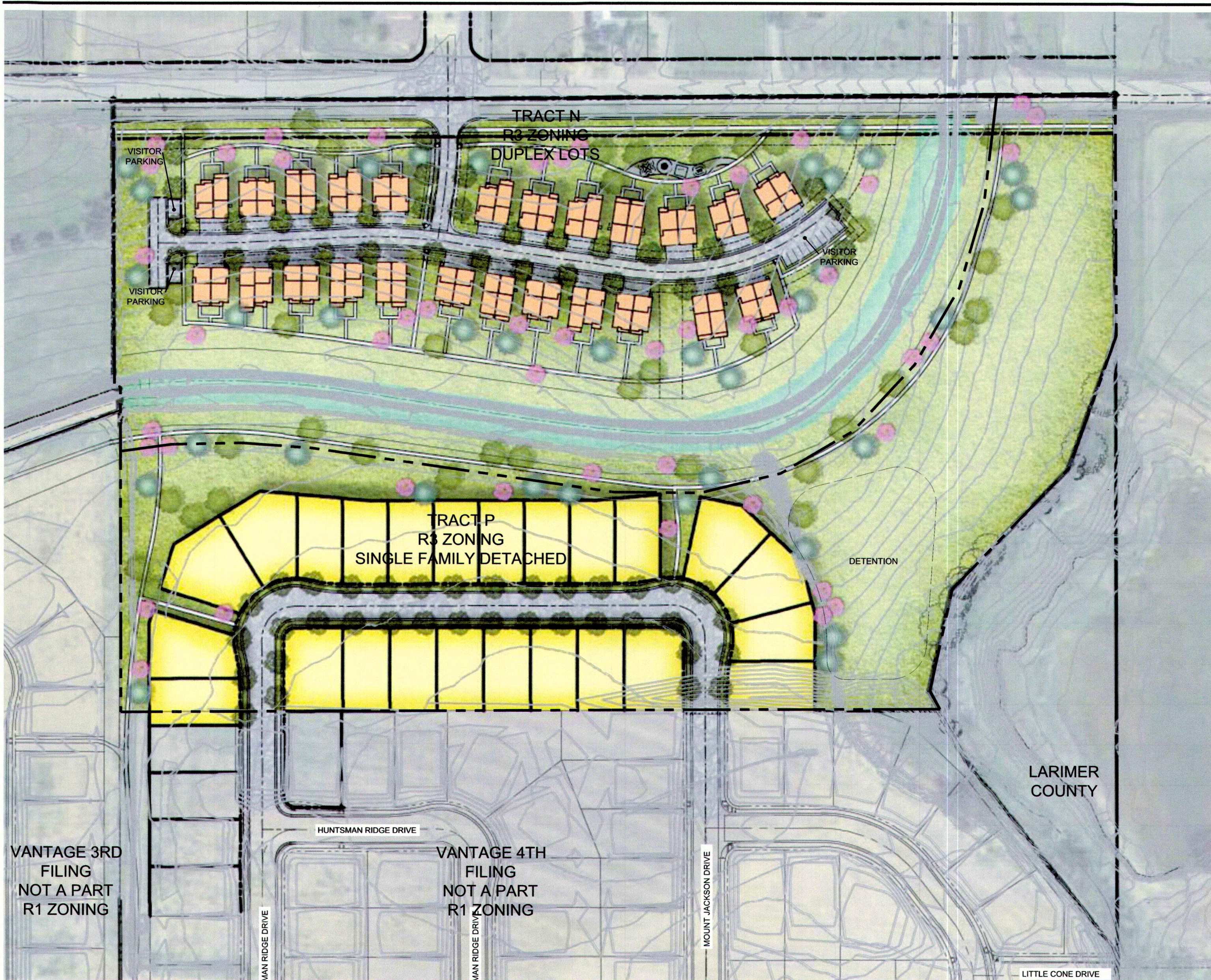
WESTHAVEN
NOT A PART
R1 ZONING

VANTAGE 3RD FILING
NOT A PART
R1 ZONING

BUNYAN AVENUE

FUTURE BERTHOUD PARK

EXISTING ZONING: R1



PARCELS OF LAND BEING A PART OF VANTAGE SUBDIVISION
SECOND FILING, VANTAGE SUBDIVISION THIRD FILING AND
VANTAGE SUBDIVISION FOURTH FILING SITUATE WITHIN THE
SECTION ELEVEN (11) AND SECTION FOURTEEN (14),
TOWNSHIP FOUR NORTH (T.4N.), RANGE SIXTY-NINE WEST
(R.69W.) OF THE SIXTH PRINCIPAL MERIDIAN (6TH P.M.), TOWN
OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

TOTAL ACREAGE =	~34.9 ACRES
ROW ACREAGE =	~ 1.17 ACRES
DRIVE AND PARKING ACREAGE =	~1.93 ACRES

R1 ACREAGE	~5.11 ACRES
R1 PROPOSED DENSITY	N/A
R3 ACREAGE =	~29.8 ACRES
R3 PROPOSED DENSITY	4.3 DU/AC

OVERALL OPEN SPACE ACREAGE = ~23.0 ACRES
% OF SITE AS OPEN SPACE = 66.0%

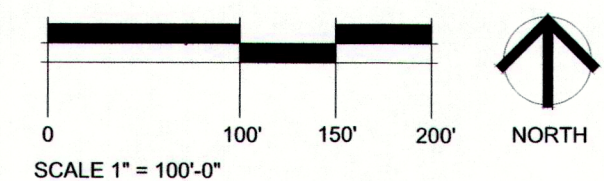
1. THIS CALCULATION INCLUDES TRACTS A, O, N AND P.
2. OPEN SPACE CALCULATIONS IN THE R3 TRACTS MAY ADJUST SLIGHTLY, AT THE TIME OF PLAT, ONCE FINAL LOT LINES ARE DEFINED.

REFER TO COMMUNITY POOL & PARK EXHIBIT
FOR PARK REQUIREMENTS.

SINGLE FAMILY (60' X 110').....24 LOTS

DUPLEX LOTS.....(53 BUILDINGS) 106 LOTS

PROJECT TOTAL.....130 LOTS



SUBDIVISION IDENTITY ELEMENTS POINTS
REQUIRED: 6

THE SUBDIVISION IDENTITY ELEMENTS TO BE PROVIDED WILL BE DETERMINED AT THE TIME OF PLAT. A MINIMUM OF 6 ELEMENT POINTS WILL BE PROVIDED. THE FOLLOWING IS A LIST OF ELEMENTS THAT IS BEING EVALUATED FOR THIS SITE, BUT IS SUBJECT TO CHANGE, SO LONG AS THE REQUIRED ELEMENT POINTS ARE ACHIEVED AT THE TIME OF PLAT:

1. POCKET PARK	1
2. PLAYGROUND	1
3. POOL	2
4. COMMUNITY BUILDING	2
5. ALLEY LOADED STREETS	2
6. POLLINATOR GARDEN	1
TOTAL :	9

SHEET 1 - NEIGHBORHOOD MASTER PLAN & ENLARGEMENT
SHEET 2 - NEIGHBORHOOD MASTER PLAN & ENLARGEMENT
SHEET 3 - COMMUNITY POOL & PARK EXHIBIT
SHEET 4 - CONCEPTUAL UTILITIES

REVISIONS	DATE
REVISIONS	12.8.21

OCTOBER 8, 2021

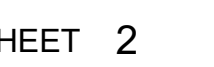
SHEET TITLE

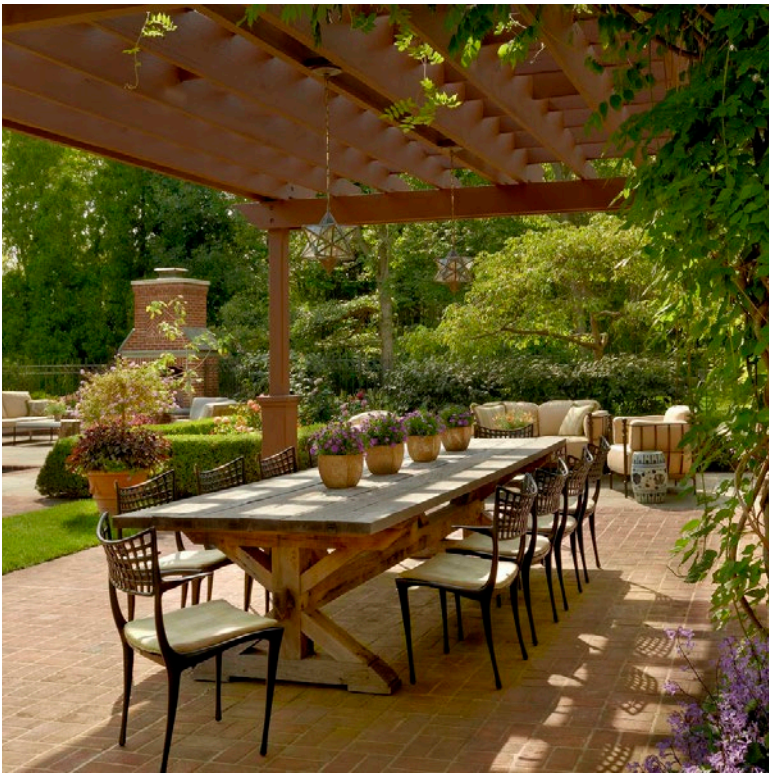
SHEET INFORMATION

SHEET 1

This aerial map illustrates the Vantage development in Larimer County, Colorado. The map is divided into several sections by Larimer County and Berthoud Parkway. Key features include:

- VANTAGE 1ST FILING**: NOT A PART R2 ZONING
- VANTAGE 2ND FILING**: NOT A PART R1 ZONING
- VANTAGE 3RD FILING**: NOT A PART R1 ZONING
- VANTAGE 4TH FILING**: NOT A PART R1 ZONING
- TRACT A**: R3 ZONING
- TRACT O**: R1 ZONING
- TRACT N**: R3 ZONING
- TRACT P**: R3 ZONING
- EXISTING ZONING: R1**
- EXISTING ZONING: R3**
- BUNYAN AVENUE**
- CR 10E**
- FUTURE BERTHOUD PARK**
- LOVELAND RESERVOIR**

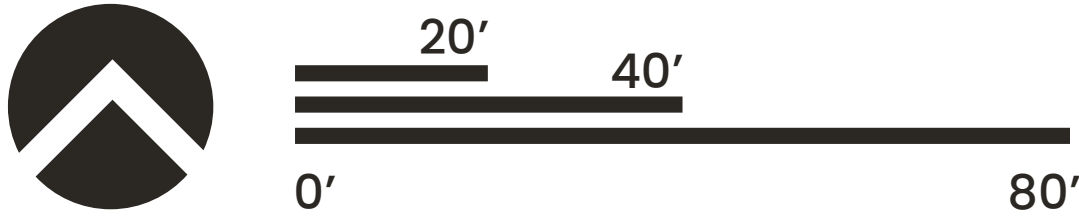


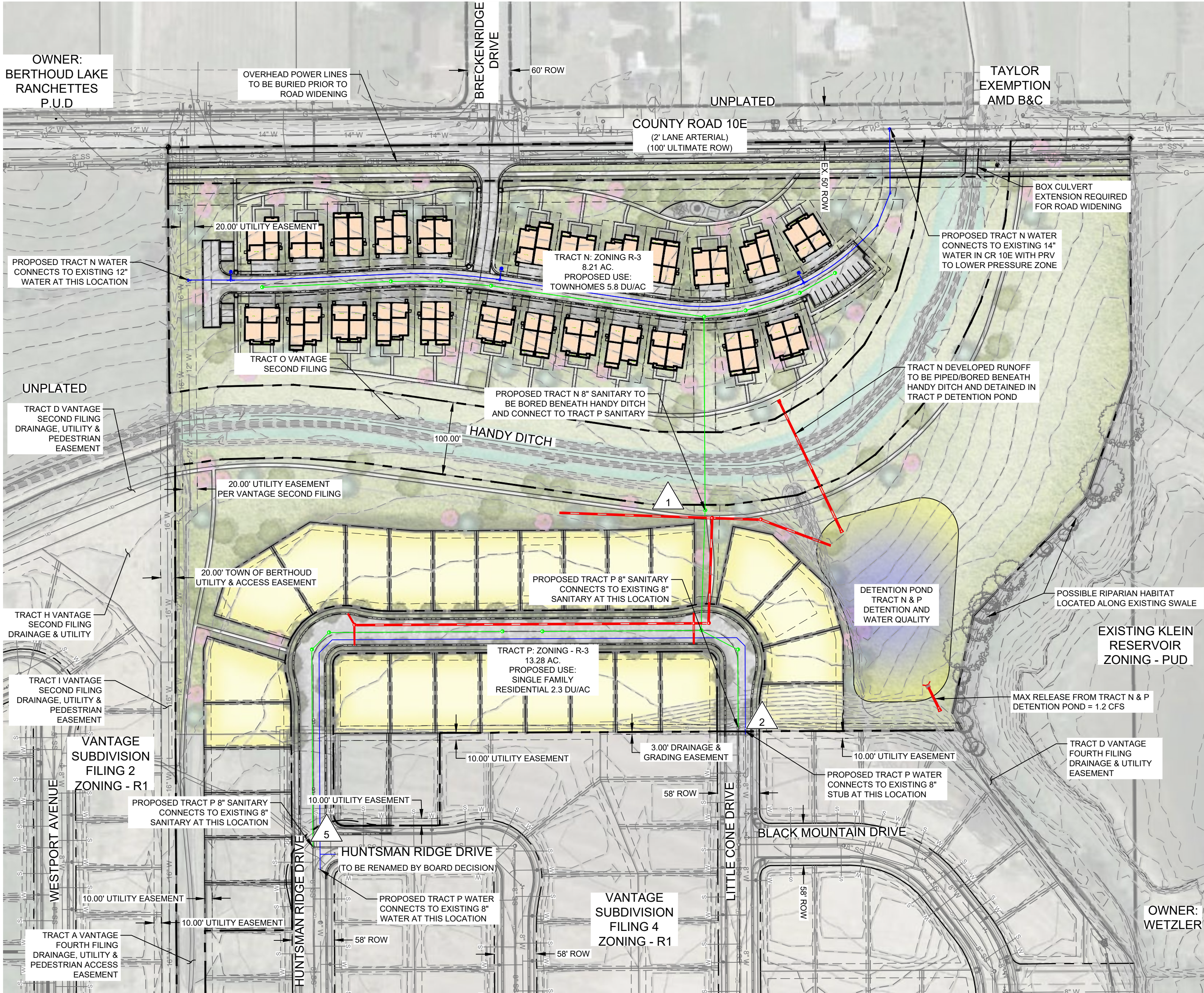
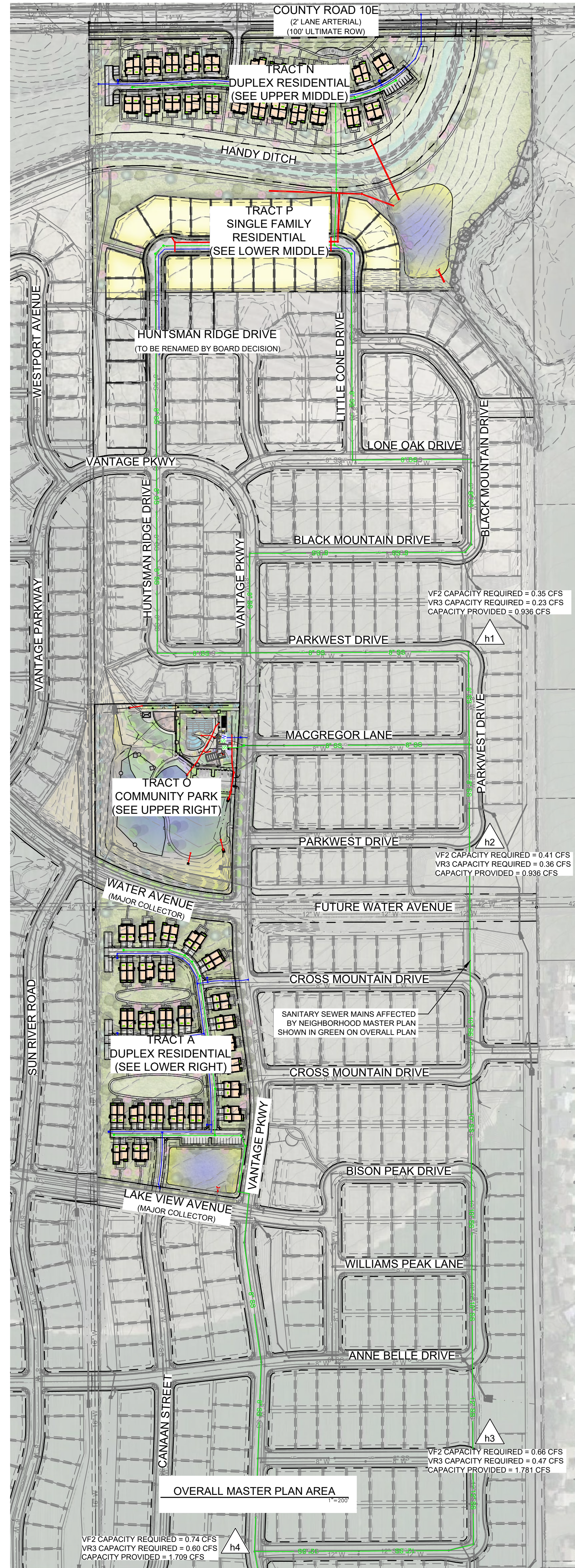


Vantage 5 acre Park - Required Site & Amenity Elements			
		Required	Provided
Parking Calculation			
	Pool & Pool Deck = 6,964 s.f. (6964 / 3) * 1000	21 spaces	21 Off-street 2 Van ADA 40 Street Parking
Neighborhood Park Development Required Elements			
LIST A - REQUIRED COMPONENTS		PROVIDED	
	Electricity		Provided
	Irrigation		Provided
	Security Lighting		Mix of Architectural, Bollard, and Pedestal Lighting
	Trash Receptacles (min. 2 per acre)		5.11 Acres = 11 Trash Receptacles
	Water Services		Provided
	Bike Racks		2 Bike Racks
	Landscaping		Provided
LIST B - (3) PRE-SELECTED COMPONENTS		PROVIDED	
#3	15,000 sf turf min. play area		42,098 SF
#4	10,000 sf min. natural area		63,396 SF
#5	Loop walk (min. 2000 lf)		2,144 LF
LIST D - (2) SPECIALTY COMPONENTS		PROVIDED	
#1	Commercial Grade Playground		Provided
#2	Outdoor Pool		Provided
#9*	Community Building		Provided
LIST E - (3) COMFORT & CONVENIENCE FEATURES		PROVIDED	
#1*	BBQ Grills (min. one per every 2 tables)		(2) Picnic Tables / (2) BBQ grills
#2*	Benches (min. 1 per half acre)		5.11 Acres = 11 Benches
#5	Restrooms with plumbing (Counts as 3)		Provided
#6*	Shade Structure for Components from List D		(1) for Playground (1) for Pool Area
Outdoor Showers			
	(1) Outdoor Shower Required/Provided		

1. Parking Requirement: 3 spaces per 1,000 s.f. of Pool & Pool Deck (@5' min) Area
2. (*) Extra Components, above required # of elements

Open Space / Detention Calculations			
Total Site Acreage	5.11	AC	100%
Open Space	0.96	AC	18.8%
Detention	2.48	AC	48.5%
Total Open Space Provided	3.44	AC	67.3%
Total Open Space Required	0.51	AC	10.0%
Open Space / Parks / Detention Summary			
Park Space Provided	0.41	AC	8.0%
Open Space Provided	0.96	AC	18.8%
Detention Provided	2.48	AC	48.5%
Total	3.85	AC	75.3%
Open Space Elements			
2 Elements Required			
2+ Elements Provided			
Usable Detention Area (2.48 acres)			
Dog Park, Landscape areas, Benches, Permanent Irrigation, Open Lawn, Shade Shelters			





		SANITARY SEWER PROJECTED FLOW DETERMINATION															
Design Point Location	Design Point	Residential									Infiltration		Sewer Design				
		Zoning or Land Use	Area (acres)	Equivalent Dwelling Units	Capita Per Unit ¹	Per Capita Flow Rate (GPD)	Equivalent Population	Average Flow (cfs)	Peak Flow Factor ¹	Peak Flow (cfs)	Flow Factor (GPD) ²	Infiltration (cfs)	Total Peak Sewage Flow (cfs)	Pipe Size (in)	Pipe Slope (#/100 ft)	Required Capacity (cfs)	Capacity Provided (cfs)
Tract N	1	R3	8.2	48	2.66	95	128	0.02	3.00	0.06	500	0.002	0.06	8	0.5	0.068	0.854
Tract P East	2	R3	7.4	12	2.66	95	32	0.00	3.00	0.01	500	0.000	0.07	8	0.5	0.085	0.854
Tract O*	3	R1	5.1	N/A	N/A	N/A	N/A	0.02	3.00	0.07	500	0.003	0.07	8	0.5	0.086	0.854
Tract A	4	R3	7.3	58	2.66	95	154	0.02	3.00	0.07	500	0.002	0.07	8	0.5	0.082	0.854
Tract P West	5	R3	5.9	18	2.66	95	48	0.01	3.00	0.02	500	0.001	0.02	8	0.5	0.025	0.854

¹Clubhouse & pool usage 1 gpm/1000 sq ft
Clubhouse & pool area 22,100 sq ft.
Max. pool drain rate 12.00 gpm

²Assumptions based on Berthoud County Road 17 Sanitary Sewer Sizing and Planning Memorandum by JVA, February 27, 2015

³Assumptions based on City and County of Denver Department of Public Works, Infiltration/Inflow = 500 Gallons per Net Acre per Day

⁴Historic design points shown on the Overall Master Plan Area, VF2 = Vantage Subdivision 2nd Filing Utility Capacity Report, VR3 = Vantage R3 capacities have been recalculated with projected flows for Neighborhood Master Plan Areas.

Description/ Land Use	Acres	Estimated Number of Water Taps Needed	Equivalent Dwelling Units	WATER IMPACTS Assumptions:										Calculations:					
				Assumed Demand ¹ (gal./day/person)	Assumed F.A.R.	Total Area, asf	People per Unit ²	Average Day ³		Max Day ³		Max Hour ³		Average Day		Max Day		Max Hour	
								Residential (gpm/cap)	Non-Residential (gpm/cap)	Residential (gpm/cap)	Non-Residential (gpm/cap)	Residential (gpm/cap)	Non-Residential (gpm/cap)	Residential (gpm)	Non-Residential (gpm)	Residential (gpm)	Non-Residential (gpm)	Residential (gpm/cap)	Non-Residential (gpm/cap)
Tract N Duplex Residential	8.2	48	48	145	N/A	N/A	2.66	0.10	N/A	0.28	N/A	0.45	N/A	13	N/A	36	N/A	57	N/A
Tract P Single Family Residential	13.3	30	12	145	N/A	N/A	2.66	0.10	N/A	0.28	N/A	0.45	N/A	3	N/A	9	N/A	14	N/A
Tract O Community Park ¹	5.1	1	N/A	N/A	N/A	22	N/A	0.10	0.14	N/A	N/A	N/A	1.00	N/A	3	N/A	N/A	N/A	40
Tract A Duplex Residential	8.3	58	18	145	N/A	N/A	2.66	0.10	N/A	0.28	N/A	0.45	N/A	5	N/A	13	N/A	22	N/A
Irrigated Open Space ²	7.9		N/A	N/A	N/A	345	N/A	N/A	0.50	N/A	N/A	N/A	0.50	N/A	173	N/A	N/A	N/A	173
TOTAL = SUB-TOTAL	34.9													21	176	58	0	93	213
															197		58		306

¹Pool Fill Demand

²Irrigation Demand within Tracts N, P & A

³Assumptions based on Denver Water Standards, asf = 1,000 square feet

18 GPM

24 GPM/ACRE for Turf Areas

16 GPM/ACRE for Trees and Shrubs

¹Pool Fill Demand 18 GPM

²Irrigation Demand within Tracts N, P & A 24 GPM/ACRE for Turf Areas
16 GPM/ACRE for Trees and Shrubs

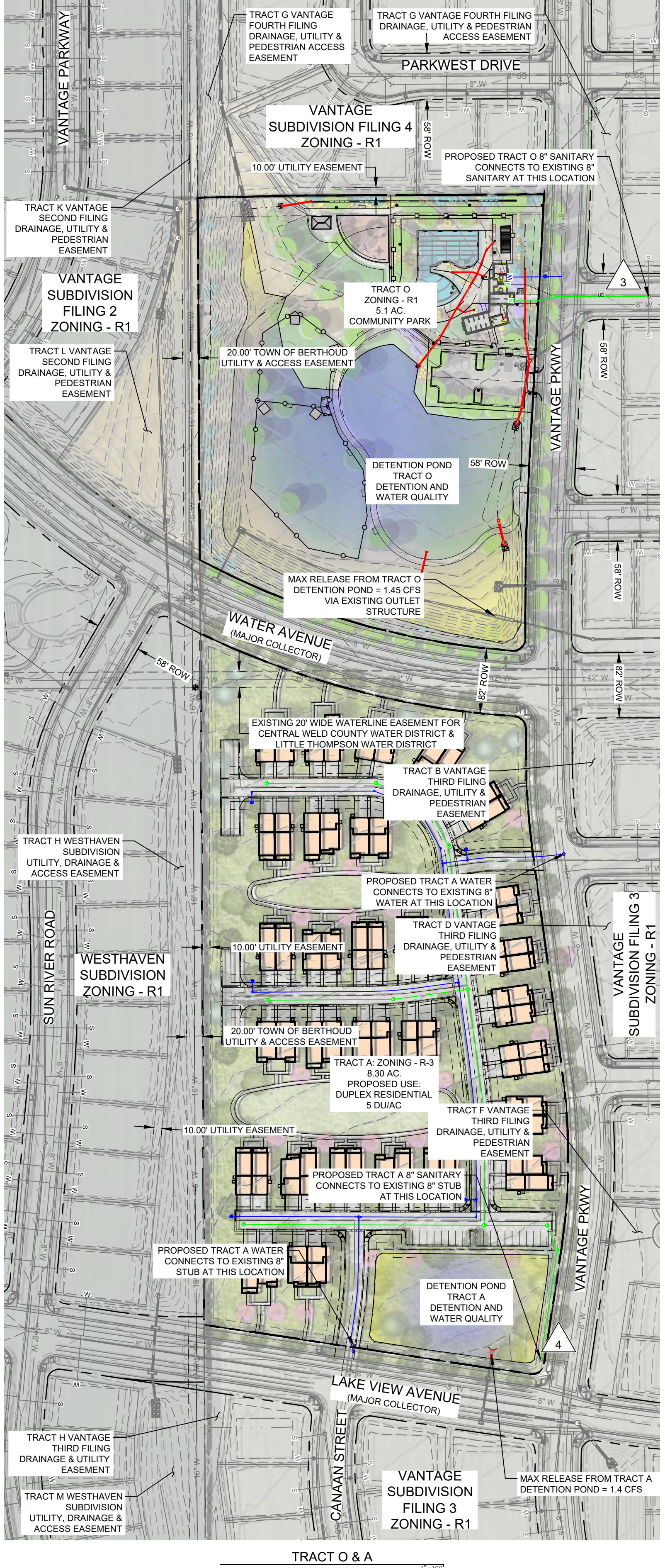
³Assumptions based on Denver Water Standards, asf = 1,000 square feet

Allowable release rates for detention ponds is per "Final Drainage Report for Vantage Subdivision, 2nd Filing" by Northern Engineering dated December 6, 2018

DECEMBER 7, 2021

NE NORTHERN ENGINEERING

P:\167-023\DWG\EXHIBITS\NEIGHBORHOOD MASTER PLAN\VANTAGE R3 - NEIGHBORHOOD MASTER PLAN.DWG



VANTAGE R3 BERTHOUD, CO NEIGHBORHOOD MASTER PLAN SHEET 4 - CONCEPTUAL UTILITIES

PRELIMINARY PLAT OF
VANTAGE SUBDIVISION SEVENTH FILING

A REPLAT OF TRACT A, VANTAGE SUBDIVISION THIRD FILING, LOCATED IN THE SOUTHWEST QUARTER OF SECTION 11, AND THE NORTHWEST QUARTER OF SECTION 14,
TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH P.M., TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

LEGAL DESCRIPTION AND DEDICATION:

KNOW ALL MEN BY THESE PRESENTS: That the undersigned, being the owners of VANTAGE SUBDIVISION SEVENTH FILING, located in the Southwest Quarter of Section 11 and the Northwest Quarter of Section 14, Township 4 North, Range 69 West of the 6th Principal Meridian, Town of Berthoud, County of Larimer, State of Colorado, more particularly described as follows:

Tract A, Vantage Subdivision Third Filing

The above described tracts contain 361,773 square feet or 8.305 acres more or less.

Have laid out, platted, and subdivided the above described land, under the name and style of VANTAGE SUBDIVISION SEVENTH FILING, and by these presents do dedicate to the Town of Berthoud in fee simple the street and public "rights-of-way" as shown on the plats, and grant to the Town of Berthoud such easements and rights-of-way, and all right, title and interest in real property to the above described lands, including all surface interests and all minerals within or underlying said lands, as are created hereby and depicted or, by note, referenced hereon, along with the right to install, maintain, replace and operate mains, transmission lines, service lines, and appurtenances, either directly or through the various public utilities, as may be necessary to provide such utility, cable television, water, electric, natural gas and sanitary services within this subdivision or property contiguous thereto, through, over, under, and across streets, utility and other easements, and other public places shown on the plat.

OWNER: ALC V-BERTHOUD, LLC
a Colorado limited liability company,

BY: Access Land Colorado, LLC, a Colorado
limited liability company, Manager

BY: _____
William R. Zech, General Manager

STATE OF COLORADO)
)SS
COUNTY OF LARIMER)

The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by
William R. Zech as General Manager of Access Land Colorado, LLC, a Colorado limited liability company.

Witness my hand and official seal

My commission expires: _____

Notary Public

LIENHOLDER: Great Western Bank

BY: _____

STATE OF COLORADO)
)SS
COUNTY OF LARIMER)

The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by
_____ as _____ of Great Western Bank.

Witness my hand and official seal

My commission expires: _____

Notary Public

RIGHT TO FARM STATEMENT

The Town of Berthoud has adopted a "Right to Farm" policy. All new and existing residents are expected to read and understand the policy. For a copy of the policy, please contact the Town of Berthoud.

SITE SPECIFIC DEVELOPMENT PLAN:

This plan constitutes a site specific development plan as defined in Article 68 of Title 24, C.R.S., as amended, and Chapter 30 of the Berthoud Development Code available at the Berthoud Town Hall, 807 Mountain Ave., Berthoud, Colorado 80513.

APPROVAL CERTIFICATES:

Approved by the Planning Commission of the Town of Berthoud, Colorado this _____ day of _____, 20____.

Chairman

Approved by the Town of Berthoud, Colorado this _____ day of _____, 20____.

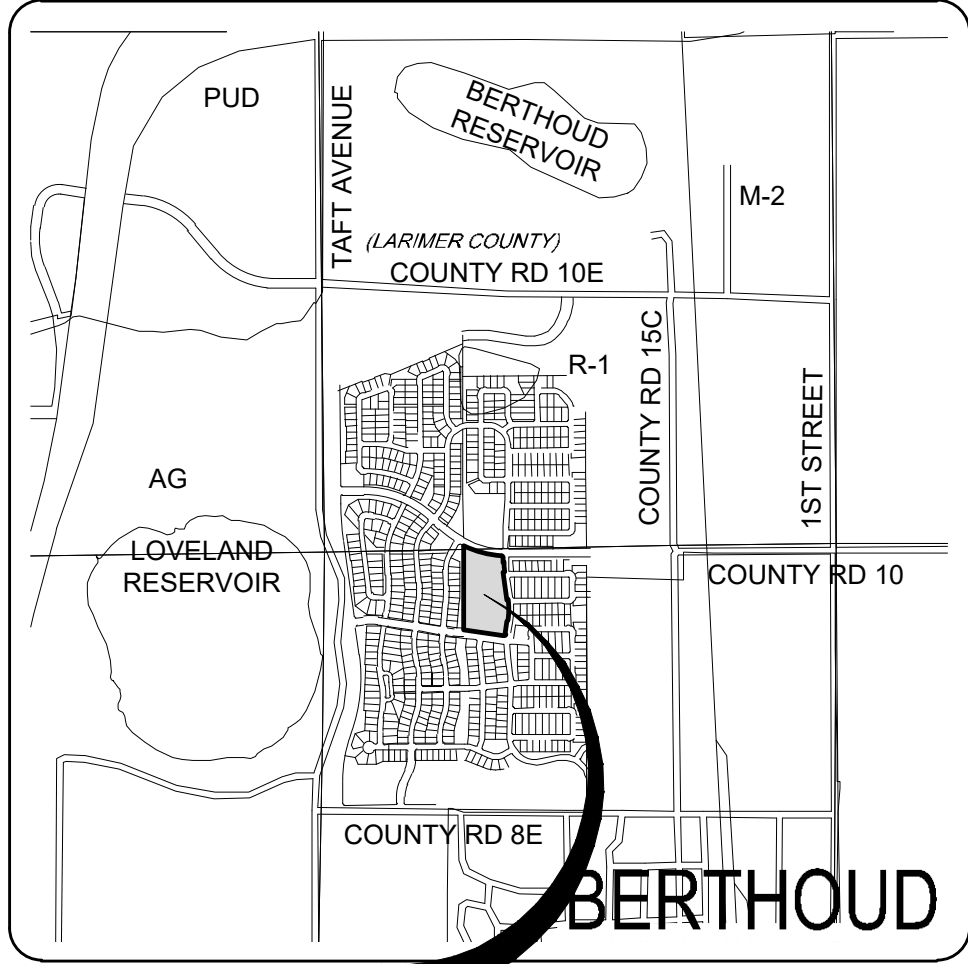
Mayor

The foregoing plat is approved for filing and accepted by the Town of Berthoud, Colorado this _____ day of _____, 20____.

ATTEST: _____
Town Clerk

NOTES:

- The Basis of Bearings is the South line of the Southwest Quarter of Section 11, Township 4 North, Range 69 West of the 6th P.M. as bearing North 89° 41' 08" East, with the West 7th corner of Section 11&14 being a 3 1/4" aluminum cap on #6 rebar, stamped LS 32825 and the South Quarter corner of Section 11 being a 2 1/2" aluminum cap, stamped LS 23500.
- All information regarding easements, right-of-way or title of record, Northern Engineering relied upon Commitment Order No. F25192180-2, dated April 24, 2023, prepared by Land Title Guarantee Company.
- The lineal unit of measurement for this plat is U. S. Survey Feet.
- All previous lot lines, rights-of-way and easements as shown and dedicated on Tract A, Vantage Subdivision Third Filing recorded at Reception Number 20190024429 at the Larimer County Clerk and Recorder which are located within the boundary lines of this plat are hereby vacated upon recordation of this plat and dedicated as shown hereon.
- The word "certify" or "certification" as shown and used hereon is an expression of professional opinion regarding the facts of the survey, and does not constitute a warranty or guaranty, expressed or implied.
- Any easements created by separate document and shown hereon are for reference purposes only. Refer to recorded document for specific location and terms.
- A copy of the title commitment and the documents contained therein were provided to the owner and client for their use and review. It is the surveyor's understanding that said owner and client have reviewed said documents and understand their impact, if any, on the subject property.
- Northern Engineering or the Professional Land Surveyor listed hereon, does not have the expertise to address mineral rights, and recommends the owner retain an expert to address these matters. Northern Engineering or the Professional Land Surveyor listed heron assumes no responsibility for the mineral rights upon the subject property.
- Not all documents listed in title commitment are plottable or definable. Owner, Client and others should refer to the title commitment and those documents listed therein for a true understanding of all rights of way, easements, encumbrances, interests and title of record concerning the subject property.
- Subject property is zoned R3.



DEVELOPER/CLIENT

William Zech
ALC V-Berthoud, LLC
8678 Carey Court
Stockton, CA 95212
(209) 405-1259

SITE ENGINEER

Stephanie Thomas, PE
Northern Engineering Services, Inc.
301 N. Howes Street, Suite 100
Fort Collins, CO 80521
(970) 568-5412

PLANNER/
LANDSCAPE ARCHITECT

Kristen Turner
TB Group
444 Mountain Avenue
Berthoud, Colorado 80513
(970) 532-5891

SITE SURVEYOR

Northern Engineering Services, Inc.
Bob Tessely, PLS
301 North Howes Street, Suite 100
Fort Collins, Colorado 80521
(970) 221-4158

SURVEYOR'S STATEMENT

I, Robert C. Tessely, a Registered Professional Land Surveyor in the State of Colorado, do hereby certify that the survey of VANTAGE SUBDIVISION SEVENTH FILING was made under my supervision and the accompanying plat accurately and properly shows said subdivision and is in compliance with the Subdivision Regulations of the Town of Berthoud.

For and on behalf of Northern Engineering Services, Inc.
Robert C. Tessely
Colorado Registered Professional Land Surveyor No. 38470

NOTICE:
According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you discover such defect. In no event may any action based upon any defect in this survey be commenced more than ten years after the date of the certificate shown hereon.

SECTION:
11 & 14
TOWNSHIP:
4N
RANGE:
69 W of the 6th PM

NORTHERN
ENGINEERING
SURVEY | MUNICIPAL | LAND DEVELOPMENT
FORT COLLINS | GREELEY 970.221.4158
NORTHERNENGINEERING.COM

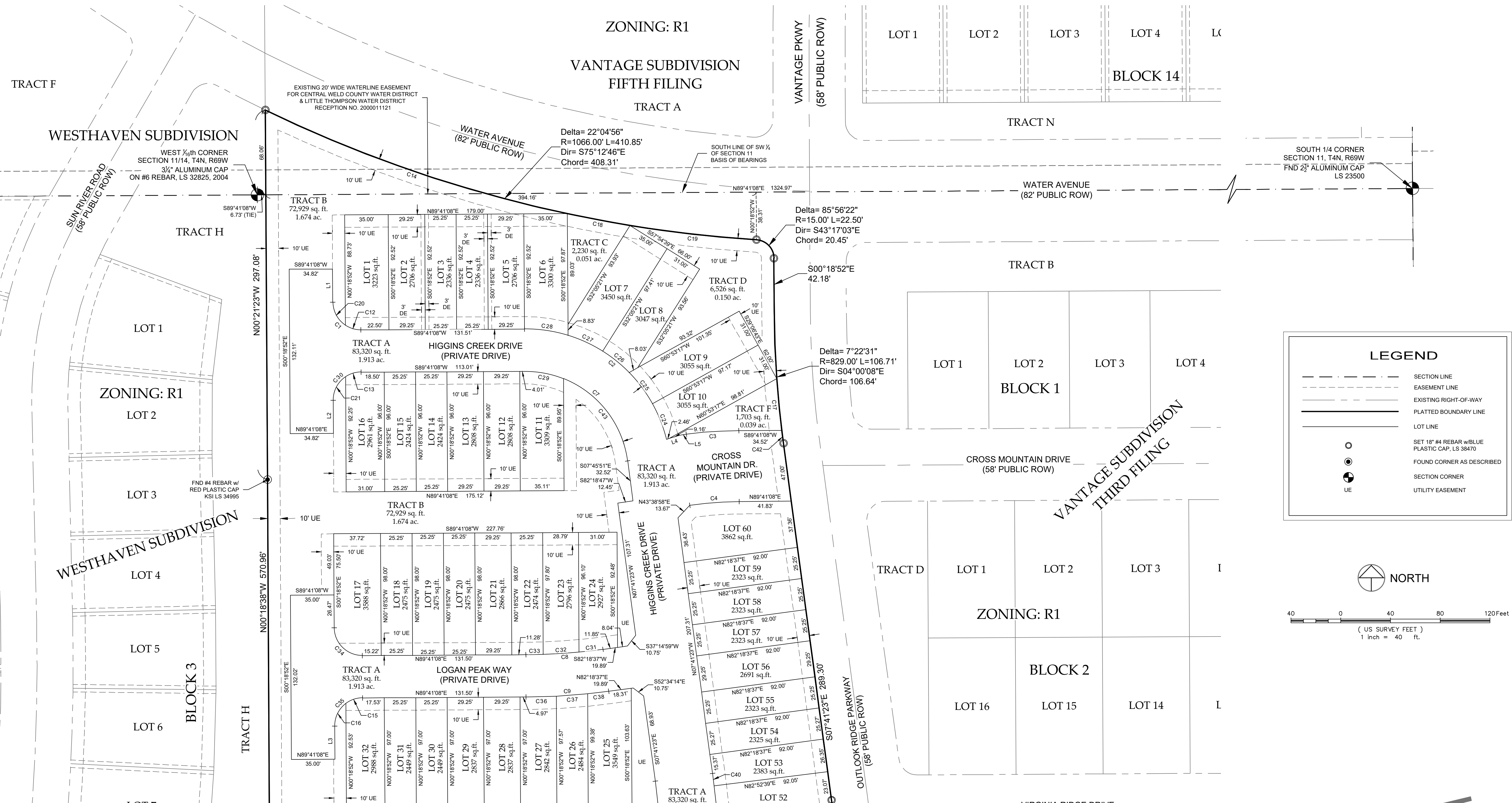
DATE:
4/26/23
SCALE:
As shown
REVIEWED BY:
B. Tessely
PROJECT:
167-025
CLIENT:
DR HORTON
DRAWN BY:
L. Smith

PRELIMINARY PLAT OF
VANTAGE SUBDIVISION SEVENTH FILING
TOWN OF BERTHOUD
STATE OF COLORADO

Sheet
1
Of 3 Sheets

PRELIMINARY PLAT OF
VANTAGE SUBDIVISION SEVENTH FILING

A REPLAT OF TRACT A, VANTAGE SUBDIVISION THIRD FILING, LOCATED IN THE SOUTHWEST QUARTER OF SECTION 11, AND THE NORTHWEST QUARTER OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH P.M., TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO



LAND USE TABLE						
PARCEL	DESCRIPTION/LAND USE	AREA	PERCENT	ENCUMBRANCES	INTENDED OWNERSHIP & MAINTAINANCE BY	
TRACT A	ACCESS, DRIVE ACCESS & UTILITIES	83,320 S.F.	1.91 AC.	23.03%	Utility, Drainage & Access Easement	HOA
TRACT B	OPEN SPACE	72,929 S.F.	1.67 AC.	20.16%	Access & Drainage Easement	Metro District
TRACT C	OPEN SPACE	2,230 S.F.	0.05 AC.	0.62%	Utility Easement	Metro District
TRACT D	OPEN SPACE	6,526 S.F.	0.15 AC.	1.80%	Utility Easement	Metro District
TRACT E	OPEN SPACE	30,350 S.F.	0.70 AC.	8.39%	Drainage Easement	Metro District
TRACT F	OPEN SPACE	1,703 S.F.	0.04 AC.	0.47%	Utility Easement	Metro District
LOTS (60)	PRIVATE RESIDENCE	164,715 S.F.	3.78 AC.	45.53%	Residential	Property Owner
TOTAL		361,773 S.F.	8.31 AC.	100.00%		

DRAFT
4-26-23
PRELIMINARY - NOT FOR CONSTRUCTION,
RECORDING PURPOSES OR IMPLEMENTATION

PRELIMINARY
For and on behalf of Northern Engineering Services, Inc.
Robert C. Tessel
Colorado Registered Professional Land Surveyor No. 38470

NOTICE:
According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you discover such defect. In no event may any action based upon any defect in this survey be commenced more than ten years after the date of the certificate shown herein.

SECTION:
11 & 14
TOWNSHIP:
4N
RANGE:
69 W of the 6th PM

NORTHERN ENGINEERING
SURVEY | MUNICIPAL | LAND DEVELOPMENT
FORT COLLINS | GREELEY 970.221.4158 NORTHERNENGINEERING.COM

DATE:
4/26/23
PROJECT:
167-025
CLIENT:
DR HORTON
DRAWN BY:
L. Smith
REVIEWED BY:
B. Tessel

PRELIMINARY PLAT OF
VANTAGE SUBDIVISION SEVENTH FILING
TOWN OF BERTHOUD
STATE OF COLORADO

Sheet
2
Of 3 Sheets

PRELIMINARY PLAT OF
VANTAGE SUBDIVISION SEVENTH FILING

A REPLAT OF TRACT A, VANTAGE SUBDIVISION THIRD FILING, LOCATED IN THE SOUTHWEST QUARTER OF SECTION 11, AND THE NORTHWEST QUARTER OF SECTION 14,
TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH P.M., TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

SEE SHEET 2

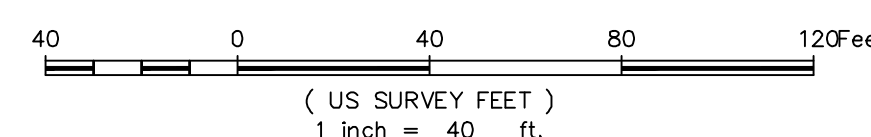


LINE TABLE		
LINE	LENGTH	BEARING
L1	26.62'	N00° 18' 52"W
L2	26.50'	S00° 18' 52"E
L3	26.55'	S00° 18' 52"E
L4	11.62'	S72° 38' 35"W
L5	4.98'	S82° 18' 37"W

CURVE TABLE					
CURVE	DELTA	RADIUS	LENGTH	BEARING	CHORD
C1	56°13'07"	22.51	22.09	N26°26'41"W	21.21
C2	76°21'03"	116.88	155.75	N52°09'31"W	144.08
C3	7°22'31"	336.50	42.29	S85°59'52"W	42.26
C4	8°25'42"	271.50	39.91	N08°31'22"E	39.90
C5	7°53'37"	1017.00	140.14	N03°34'45"W	140.00
C6	8°56'20"	534.14	83.33	N04°06'50"E	83.25
C7	82°37'29"	83.00	119.69	N00°00'08"W	109.55
C8	7°22'31"	483.00	62.12	N85°59'52"E	62.13
C9	7°22'31"	517.00	66.55	N85°59'52"E	66.50
C10	7°53'37"	970.58	133.72	N03°44'35"E	133.61
C11	8°24'22"	471.50	69.18	N04°24'25"E	69.11
C12	33°44'21"	22.51	13.25	N73°25'05"W	13.06
C13	33°51'53"	22.40	13.24	N73°00'09"E	13.67
C14	13°49'48"	1066.00	257.31	S71°05'11"E	256.69
C15	36°46'00"	22.50	14.44	N71°18'08"E	17.36
C16	53°14'00"	22.50	19.90	N26°18'06"E	22.50
C17	2°53'04"	829.00	41.73	S05°31'27"E	41.73
C18	2°45'21"	1066.00	51.27	S29°22'46"E	51.26
C19	5°29'48"	1066.00	102.26	S83°30'20"E	102.22
C20	56°13'07"	22.51	22.09	S28°26'41"E	21.21
C21	56°08'07"	22.40	21.95	S28°00'09"W	54.71
C22	15°07'32"	116.88	30.86	N21°32'46"W	58.26
C25	15°22'45"	116.88	31.37	N36°47'54"W	58.98
C26	13°25'23"	116.88	27.38	N51°11'58"W	27.32
C27	15°00'26"	116.88	30.61	N65°54'25"E	30.53
C28	17°24'57"	116.88	35.53	N61°37'34"W	35.39
C29	22°00'31"	83.00	31.88	S79°18'36"E	31.69
C30	56°08'07"	22.40	21.95	N28°00'09"E	54.71
C31	2°17'48"	483.00	19.36	S83°27'31"W	63.05
C32	3°25'19"	483.00	28.85	S86°19'04"W	49.31
C33	1°39'25"	483.00	13.97	S88°51'26"W	24.39
C34	89°58'59"	22.50	35.34	N45°18'52"W	31.82
C35	90°00'00"	22.50	35.34	N44°41'08"E	31.82
C36	2°41'31"	517.00	24.29	N88°20'32"E	24.29
C37	2°48'21"	517.00	25.32	N85°59'52"E	25.31
C38	1°52'40"	517.00	18.94	N83°14'57"E	16.94
C39	1°38'10"	1017.00	29.04	N06°18'16"W	29.04
C40	0°34'02"	1017.00	10.07	N07°24'22"W	10.07
C41	4°51'45"	771.00	65.43	S06°10'44"W	65.41
C42	0°43'24"	829.00	10.47	S07°19'41"E	10.47
C43	60°36'58"	83.00	87.81	S37°59'52"E	83.77
C44	1°25'21"	1017.00	25.25	N03°21'17"W	74.41
C45	1°25'19"	1017.00	25.24	N04°46'31"W	25.24
C46	2°17'45"	771.00	30.89	S02°35'59"W	30.89
C47	2°21'01"	771.00	31.63	S00°16'36"W	31.62
C48	2°03'15"	771.00	27.64	S01°55'32"E	75.26
C49	2°02'56"	771.00	27.58	S03°58'37"E	75.23
C50	2°02'52"	771.00	27.56	S06°01'32"E	75.26
C51	0°38'25"	771.00	8.62	S07°22'11"E	8.62
C52	1°25'12"	1017.00	25.20	N00°30'20"W	25.20
C53	1°25'33"	1017.00	25.31	N01°56'45"W	74.42

LEGEND

- SECTION LINE
- EASEMENT LINE
- EXISTING RIGHT-OF-WAY
- PLATTED BOUNDARY LINE
- LOT LINE
- SET 18" #4 REBAR w/LUE
PLASTIC CAP, LS 38470
- FOUND CORNER AS DESCRIBED
- SECTION CORNER
- UTILITY EASEMENT



DRAFT
4-26-23
PRELIMINARY - NOT FOR CONSTRUCTION,
RECORDING PURPOSES OR IMPLEMENTATION

PRELIMINARY

PRELIMINARY

For and on behalf of Northern Engineering Services, Inc.
Robert C. Tessely
Colorado Registered Professional Land Surveyor No. 38470

According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you discover such defect. In no event may any action based upon any defect in this survey be commenced more than ten years after the date of the certificate shown hereon.

TOWNSHIP:
4N

RANGE:
69 W of

NE | **NORTHERN
ENGINEERING**
SURVEY | MUNICIPAL | LAND DEVELOPMENT
FORT COLLINS | GREELEY 970.221.4158
NORTHERNENGINEERING.COM

CLIENT: DR HORTON	SCALE: 1"=40'	REVIEWED BY: B. Tessely
DRAWN BY: L. Smith		

VANTAGE SUBDIVISION SEVENTH FILING
TOWN OF BERTHOUD
STATE OF COLORADO

meet

Of 3 Sheets

FINAL PLAT OF
VANTAGE SUBDIVISION SEVENTH FILING

A REPLAT OF TRACT A, VANTAGE SUBDIVISION THIRD FILING, LOCATED IN THE SOUTHWEST QUARTER OF SECTION 11, AND THE NORTHWEST QUARTER OF SECTION 14,
TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH P.M., TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

LEGAL DESCRIPTION AND DEDICATION:

KNOW ALL MEN BY THESE PRESENTS: That the undersigned, being the owners of VANTAGE SUBDIVISION SEVENTH FILING, located in the Southwest Quarter of Section 11 and the Northwest Quarter of Section 14, Township 4 North, Range 69 West of the 6th Principal Meridian, Town of Berthoud, County of Larimer, State of Colorado, more particularly described as follows:

Tract A, Vantage Subdivision Third Filing

The above described tracts contain 361,773 square feet or 8.305 acres more or less.

Have laid out, platted, and subdivided the above described land, under the name and style of VANTAGE SUBDIVISION SEVENTH FILING, and by these presents do dedicate to the Town of Berthoud in fee simple the street and public "rights-of-way" as shown on the plats, and grant to the Town of Berthoud such easements and rights-of-way, and all right, title and interest in real property to the above described lands, including all surface interests and all minerals within or underlying said lands, as are created hereby and depicted or, by note, referenced hereon, along with the right to install, maintain, replace and operate mains, transmission lines, service lines, and appurtenances, either directly or through the various public utilities, as may be necessary to provide such utility, cable television, water, electric, natural gas and sanitary services within this subdivision or property contiguous thereto, through, over, under, and across streets, utility and other easements, and other public places shown on the plat.

OWNER: ALC V-BERTHOUD, LLC
a Colorado limited liability company,

BY: Access Land Colorado, LLC, a Colorado
limited liability company, Manager

BY: _____
William R. Zech, General Manager

STATE OF COLORADO)
)SS
COUNTY OF LARIMER)

The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by
William R. Zech as General Manager of Access Land Colorado, LLC, a Colorado limited liability company.

Witness my hand and official seal

My commission expires: _____

Notary Public

LIENHOLDER'S DEDICATION:

The undersigned mortgagee, for good and valuable consideration does by these presents, hereby subordinate all of its rights to such fee simple dedications and grants of easements to the Town of Berthoud as are depicted and referenced hereon and to the terms and conditions of the development agreement and this final plat and agrees that the development agreement and this final plat shall constitute a first and prior lien upon Vantage Farm Seventh Filing to the same extent as though it were actually executed and recorded prior to said lien or deed of trust.

LIENHOLDER: Great Western Bank

BY: _____

STATE OF COLORADO)
)SS
COUNTY OF LARIMER)

The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by

_____ as _____ of Great Western Bank.

Witness my hand and official seal

My commission expires: _____

Notary Public

RIGHT TO FARM STATEMENT

The Town of Berthoud has adopted a "Right to Farm" policy. All new and existing residents are expected to read and understand the policy. For a copy of the policy, please contact the Town of Berthoud.

SITE SPECIFIC DEVELOPMENT PLAN:

This plan constitutes a site specific development plan as defined in Article 68 of Title 24, C.R.S., as amended, and Chapter 30 of the Berthoud Development Code available at the Berthoud Town Hall, 807 Mountain Ave., Berthoud, Colorado 80513.

APPROVAL CERTIFICATES:

Approved by the Planning Commission of the Town of Berthoud, Colorado this _____ day of _____, 20____.

Chairman

Approved by the Town of Berthoud, Colorado this _____ day of _____, 20____.

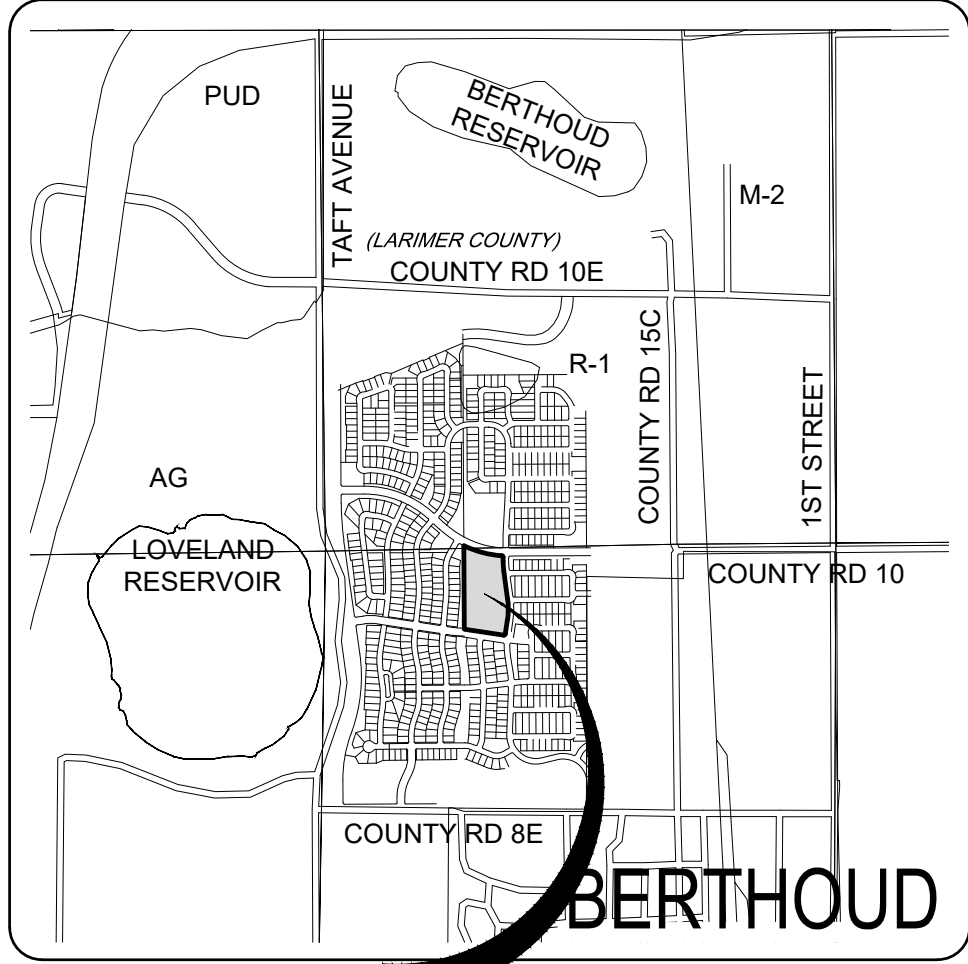
Mayor

The foregoing plat is approved for filing and accepted by the Town of Berthoud, Colorado this _____ day of _____, 20____.

ATTEST: _____
Town Clerk

NOTES:

- 1) The Basis of Bearings is the South line of the Southwest Quarter of Section 11, Township 4 North, Range 69 West of the 6th P.M. as bearing North 89° 41' 08" East, with the West Sixteenth corner of Section 11&14 being a 3 1/4" aluminum cap on #6 rebar, stamped LS 32825 and the South Quarter corner of Section 11 being a 2 1/2" aluminum cap, stamped LS 23500.
- 2) All information regarding easements, right-of-way or title of record, Northern Engineering relied upon Commitment Order No. F25192180-3, dated July 5, 2023, prepared by Land Title Guarantee Company.
- 3) The lineal unit of measurement for this plat is U. S. Survey Feet.
- 4) All previous lot lines, rights-of-way and easements (except easements previously dedicated by separate document) as shown and dedicated on Tract A, Vantage Subdivision Third Filing recorded at Reception Number 20190024429 at the Larimer County Clerk and Recorder which are located within the boundary lines of this plat are hereby vacated upon recordation of this plat and dedicated as shown hereon.
- 5) The word "certify" or "certification" as shown and used hereon is an expression of professional opinion regarding the facts of the survey, and does not constitute a warranty or guaranty, expressed or implied.
- 6) Any easements created by separate document and shown hereon are for reference purposes only. Refer to recorded document for specific location and terms.
- 7) A copy of the title commitment and the documents contained therein were provided to the owner and client for their use and review. It is the surveyor's understanding that said owner and client have reviewed said documents and understand their impact, if any, on the subject property.
- 8) Northern Engineering or the Professional Land Surveyor listed hereon, does not have the expertise to address mineral rights, and recommends the owner retain an expert to address these matters. Northern Engineering or the Professional Land Surveyor listed heron assumes no responsibility for the mineral rights upon the subject property.
- 9) Not all documents listed in title commitment are plottable or definable. Owner, Client and others should refer to the title commitment and those documents listed therein for a true understanding of all rights of way, easements, encumbrances, interests and title of record concerning the subject property.
- 10) Subject property is zoned R3.
- 11) Per CRS 38-51-105 (3)(a), (3)(b), (4)(b), (4)(c), & 5, the Developer/Owner of the subdivision plat has the requirement of providing monumentation of the interior corners created by this platting procedure within one year of the effective date of a sales contract. The Surveyor of record of said subdivision plat has only the required responsibility of providing for the on the ground monumentation of the external boundary of the subdivision plat.



DEVELOPER/CLIENT

William Zech
ALC V-Berthoud, LLC
8678 Carey Court
Stockton, CA 95212
(209) 405-1259

SITE ENGINEER

Stephanie Thomas, PE
Northern Engineering Services, Inc.
301 N. Howes Street, Suite 100
Fort Collins, CO 80521
(970) 568-5412

PLANNER/
LANDSCAPE ARCHITECT

Kristen Turner
TB Group
444 Mountain Avenue
Berthoud, Colorado 80513
(970) 532-5891

SITE SURVEYOR

Northern Engineering Services, Inc.
Bob Tessely, PLS
301 North Howes Street, Suite 100
Fort Collins, Colorado 80521
(970) 221-4158

SURVEYOR'S STATEMENT

I, Robert C. Tessely, a Registered Professional Land Surveyor in the State of Colorado, do hereby certify that the survey of VANTAGE SUBDIVISION SEVENTH FILING was made under my supervision and the accompanying plat accurately and properly shows said subdivision and is in compliance with the Subdivision Regulations of the Town of Berthoud.

For and on behalf of Northern Engineering Services, Inc.
Robert C. Tessely
Colorado Registered Professional Land Surveyor No. 38470

NOTICE:
According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you discover such defect. In no event may any action based upon any defect in this survey be commenced more than ten years after the date of the certificate shown herein.

SECTION:
11 & 14
TOWNSHIP:
4N
RANGE:
69 W of the 6th PM

NORTHERN
ENGINEERING
SURVEY | MUNICIPAL | LAND DEVELOPMENT
FORT COLLINS | GREELEY 970.221.4158
NORTHERNENGINEERING.COM

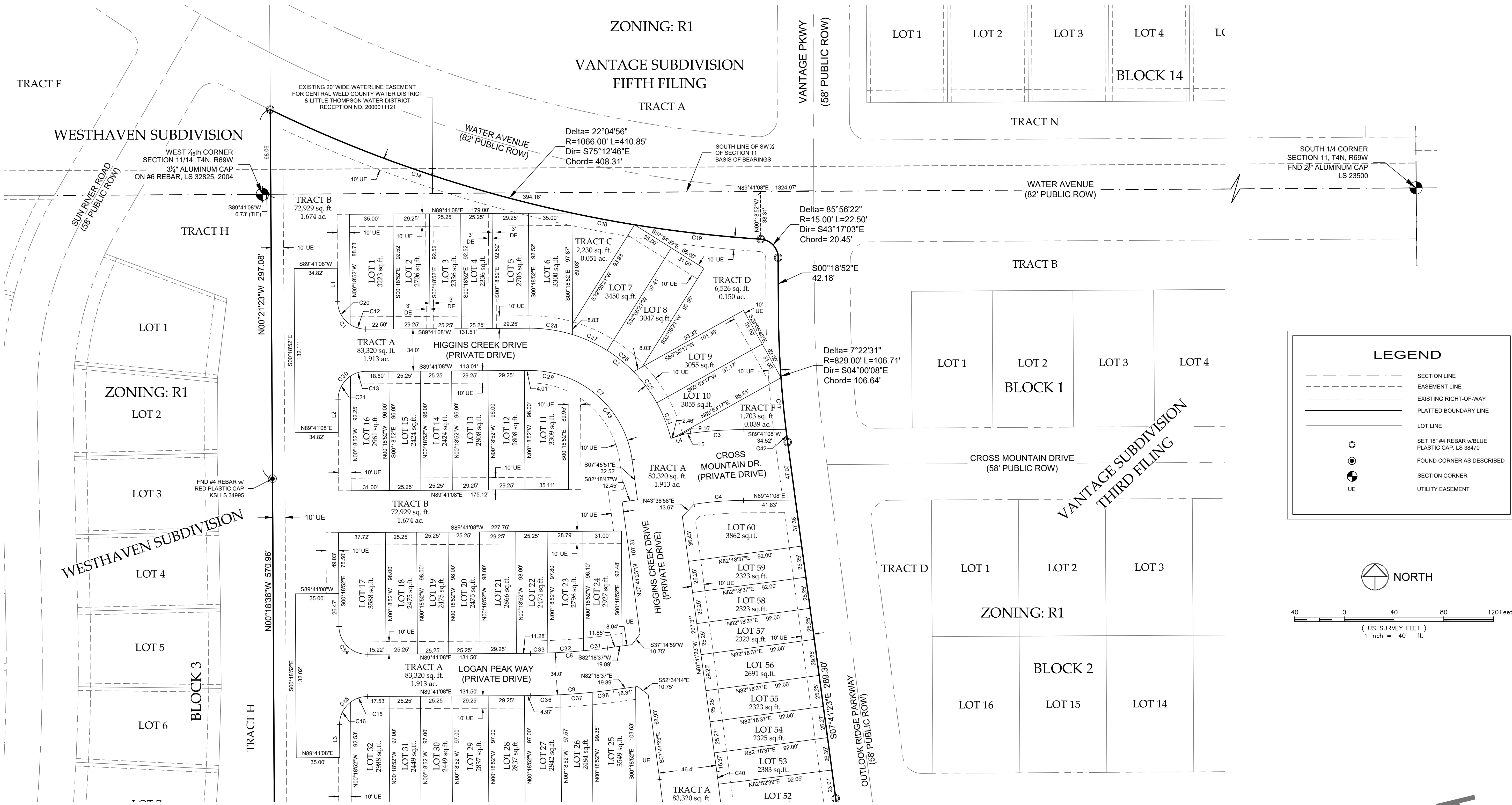
DATE:
7/14/23
SCALE:
As shown
REVIEWED BY:
B. Tessely
PROJECT:
167-025
CLIENT:
DR HORTON
DRAWN BY:
L. Smith

FINAL PLAT OF
VANTAGE SUBDIVISION SEVENTH FILING
TOWN OF BERTHOUD
STATE OF COLORADO

Sheet
1
Of 3 Sheets

FINAL PLAT OF
VANTAGE SUBDIVISION SEVENTH FILING

A REPLAT OF TRACT A, VANTAGE SUBDIVISION THIRD FILING, LOCATED IN THE SOUTHWEST QUARTER OF SECTION 11, AND THE NORTHWEST QUARTER OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH P.M., TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO



LEGEND

- SECTION LINE
- EASEMENT LINE
- EXISTING RIGHT-OF-WAY
- PLATTED BOUNDARY LINE
- LOT LINE
- SET 18" #4 REBAR w/BLUE PLASTIC CAP, LS 38470
- FOUND CORNER AS DESCRIBED
- SECTION CORNER
- UTILITY EASEMENT

North Arrow

Scale
40 0 40 80 120 Feet
(U.S. SURVEY FEET)
1 inch = 40 ft.

LAND USE TABLE						
PARCEL	DESCRIPTION/LAND USE	AREA	PERCENT	ENCUMBRANCES	INTENDED OWNERSHIP & MAINTAINANCE BY	
TRACT A	ACCESS, DRIVE ACCESS & UTILITIES	83,320 S.F.	1.91 AC.	23.03%	Utility, Drainage & Access Easement	HOA
TRACT B	OPEN SPACE	72,929 S.F.	1.67 AC.	20.16%	Access & Drainage Easement	Metro District
TRACT C	OPEN SPACE	2,230 S.F.	0.05 AC.	0.62%	Utility Easement	Metro District
TRACT D	OPEN SPACE	6,526 S.F.	0.15 AC.	1.80%	Utility Easement	Metro District
TRACT E	OPEN SPACE	3,350 S.F.	0.07 AC.	8.39%	Drainage Easement	Metro District
TRACT F	OPEN SPACE	1,703 S.F.	0.04 AC.	0.47%	Utility Easement	Metro District
LOTS (60)	PRIVATE RESIDENCE	164,715 S.F.	3.78 AC.	45.53%	Residential	Property Owner
TOTAL		361,773 S.F.	8.31 AC.	100.00%		

DRAFT
7-14-23
PRELIMINARY - NOT FOR CONSTRUCTION,
RECORDING PURPOSES OR IMPLEMENTATION

PRELIMINARY
For and on behalf of Northern Engineering Services, Inc.
Robert C. Tessel
Colorado Registered Professional Land Surveyor No. 38470

NOTICE:
According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you discover such defect. In no event may any action based upon any defect in this survey be commenced more than ten years after the date of the certificate shown herein.

SECTION:
11 & 14

TOWNSHIP:
4N

RANGE:
69 W of the 6th PM

NORTHERN ENGINEERING

SURVEY | MUNICIPAL | LAND DEVELOPMENT

FORT COLLINS | GREELEY 970.221.4188 NORTHERNENGINEERING.COM

DATE:
7/14/23

SCALE:
1"=40'

REVIEWED BY:
B. Tessel

PROJECT:
167-025

CLIENT:
DR. HORTON

DRAWN BY:
L. Smith

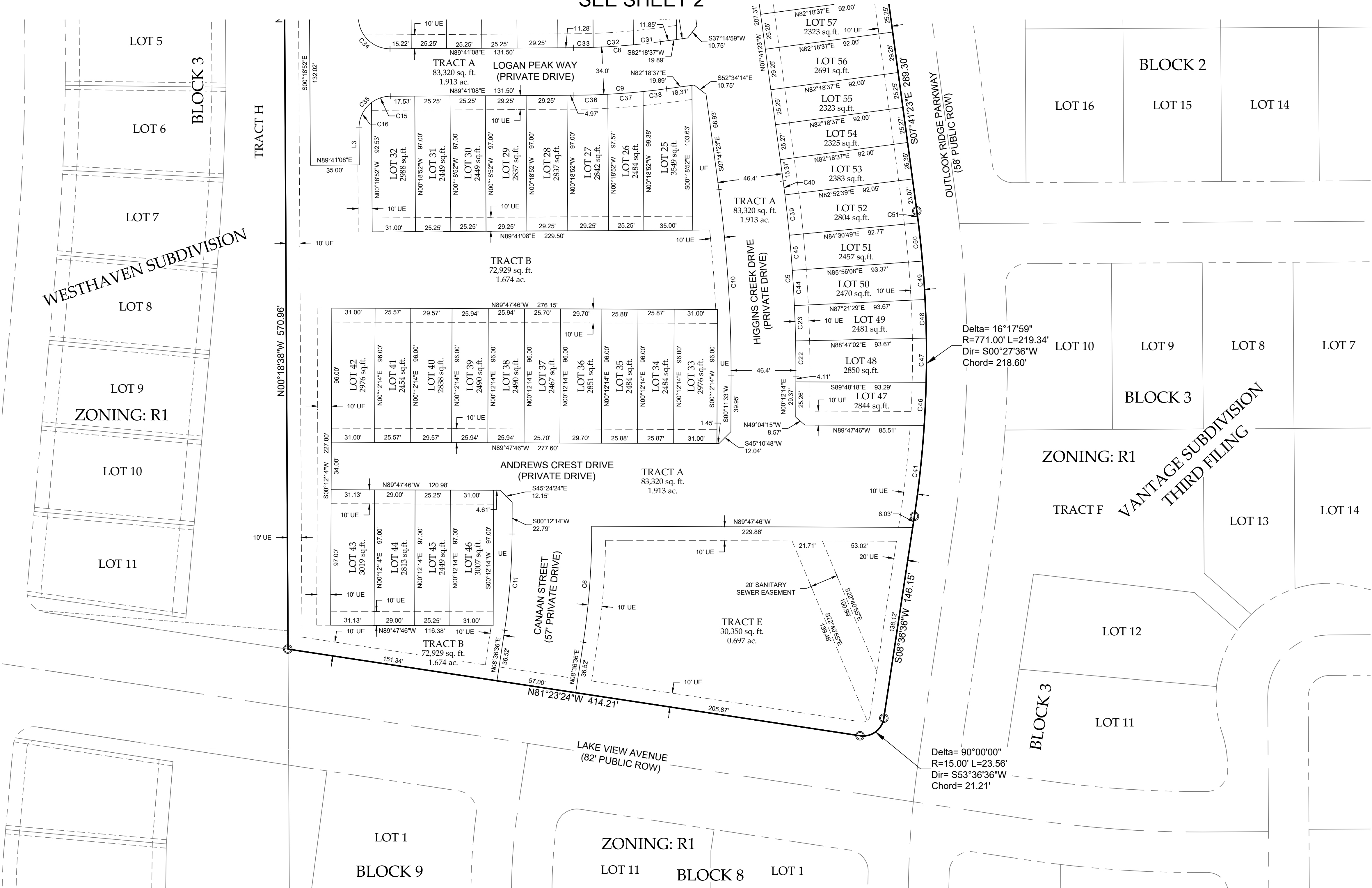
FINAL PLAT OF
VANTAGE SUBDIVISION SEVENTH FILING
TOWN OF BERTHOUD
STATE OF COLORADO

Sheet
2
Of 3 Sheets

FINAL PLAT OF
VANTAGE SUBDIVISION SEVENTH FILING

A REPLAT OF TRACT A, VANTAGE SUBDIVISION THIRD FILING, LOCATED IN THE SOUTHWEST QUARTER OF SECTION 11, AND THE NORTHWEST QUARTER OF SECTION 14,
TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH P.M., TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

SEE SHEET 2



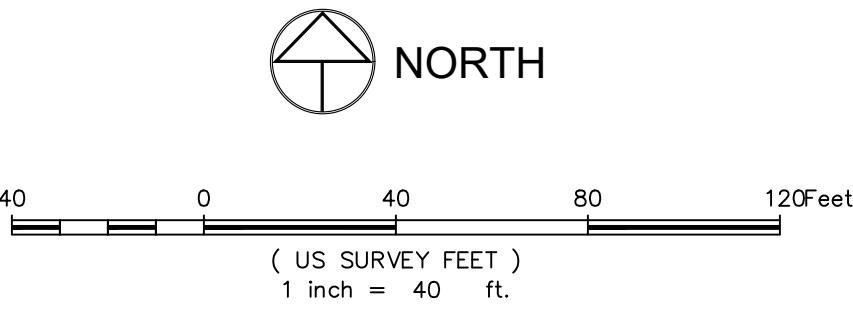
LINE TABLE		
LINE	LENGTH	BEARING
L1	26.62'	N00°18'52"W
L2	26.50'	S00°18'52"E
L3	26.55'	S00°18'52"E
L4	11.62'	S72°38'35"W
L5	4.98'	S82°18'37"W

CURVE TABLE				
CURVE	DELTA	RADIUS	LENGTH	BEARING
C1	56°13'07"	22.51'	22.09'	N28°26'41"W
C2	76°21'03"	116.88'	155.75'	N52°09'31"W
C3	7°22'31"	328.50'	42.29'	S85°59'52"W
C4	8°25'42"	271.50'	39.94'	N85°31'22"E
C5	7°53'37"	1017.00'	140.11'	N03°44'35"W
C6	8°56'20"	534.14'	83.33'	N04°06'50"E
C7	82°37'29"	83.00'	119.69'	N49°00'08"W
C8	7°22'31"	483.00'	62.17'	N85°59'52"E
C9	7°22'31"	517.00'	66.55'	N85°59'52"E
C10	7°53'37"	970.58'	133.72'	S03°44'35"E
C11	8°24'22"	471.50'	69.18'	N04°24'25"E
C12	33°44'21"	22.51'	13.25'	N73°25'25"W
C13	33°51'53"	22.40'	13.24'	N73°00'09"E
C14	13°49'48"	1066.00'	257.31'	S71°05'11"E
C15	36°46'00"	22.50'	14.44'	N71°18'08"E
C16	53°14'00"	22.50'	20.90'	N26°18'08"E
C17	2°53'04"	829.00'	41.73'	S05°31'27"E
C18	2°45'21"	1066.00'	51.27'	S79°22'46"E
C19	5°29'48"	1066.00'	102.26'	S83°30'20"E
C20	56°13'07"	22.51'	22.09'	S28°26'41"E
C21	56°08'07"	22.40'	21.95'	S28°00'09"W
C22	1°25'12"	1017.00'	25.20'	N00°30'22"W
C23	1°25'33"	1017.00'	25.31'	N01°55'45"W
C24	15°07'32"	116.88'	30.86'	N21°32'46"W
C25	15°22'45"	116.88'	31.37'	N36°47'54"W
C26	13°25'23"	116.88'	27.38'	N51°11'58"W
C27	15°00'26"	116.88'	30.61'	N65°24'52"W
C28	17°24'57"	116.88'	35.53'	N81°37'34"W
C29	22°00'31"	83.00'	31.88'	S79°18'36"E
C30	56°08'07"	22.40'	21.95'	N28°00'09"E
C31	2°17'48"	483.00'	19.36'	S83°27'31"W
C32	3°25'19"	483.00'	28.85'	S86°19'04"W
C33	1°39'25"	483.00'	13.97'	S88°51'26"W
C34	89°58'59"	22.50'	35.34'	N45°18'52"W
C35	90°00'00"	22.50'	35.34'	N44°41'08"E
C36	2°41'31"	517.00'	24.29'	N88°20'23"E
C37	2°48'21"	517.00'	25.32'	N85°35'27"E
C38	1°52'40"	517.00'	16.94'	N83°14'57"E
C39	1°38'10"	1017.00'	29.04'	N06°18'16"W
C40	0°34'02"	1017.00'	10.07'	N07°24'22"W
C41	4°51'45"	771.00'	65.43'	S06°10'44"W
C42	0°43'24"	829.00'	10.47'	S07°19'41"E
C43	60°38'58"	83.00'	87.81'	S37°59'52"E
C44	1°25'21"	1017.00'	25.25'	N03°21'11"W
C45	1°25'19"	1017.00'	25.24'	N04°46'31"W
C46	2°17'45"	771.00'	30.89'	S02°35'59"W
C47	2°21'01"	771.00'	31.63'	S00°16'36"W
C48	2°03'15"	771.00'	27.64'	S01°55'32"E
C49	2°02'56"	771.00'	27.57'	S03°58'37"E
C50	2°02'52"	771.00'	27.56'	S06°01'32"E
C51	0°38'25"	771.00'	8.62'	S07°22'11"E

LEGEND

--- SECTION LINE
--- EASEMENT LINE
--- EXISTING RIGHT-OF-WAY
--- PLATTED BOUNDARY LINE
--- LOT LINE

○ SET 18" #4 REBAR w/BUE PLASTIC CAP, L.S. 38470
● FOUND CORNER AS DESCRIBED
⊕ SECTION CORNER
UE UTILITY EASEMENT



DRAFT
7-14-23
PRELIMINARY - NOT FOR CONSTRUCTION,
RECORDING PURPOSES OR IMPLEMENTATION

PRELIMINARY
For and on behalf of Northern Engineering Services, Inc.
Robert C. Tessel
Colorado Registered Professional Land Surveyor No. 38470

NOTICE:
According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you discover such defect. In no event may any action based upon any defect in this survey be commenced more than ten years after the date of the certificate shown herein.

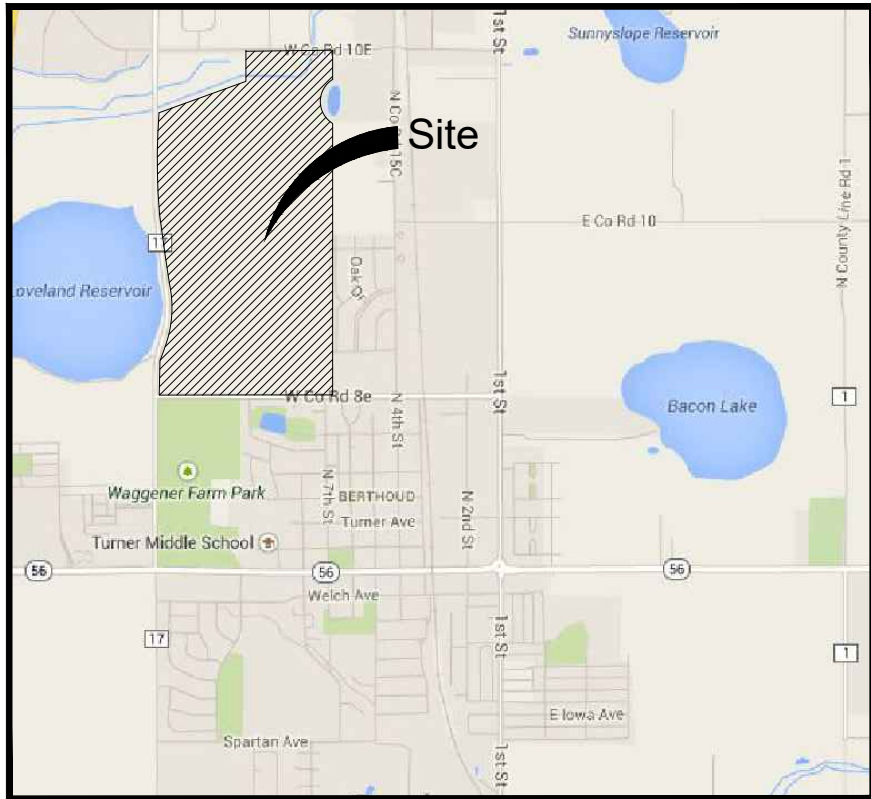
SECTION:
11 & 14
TOWNSHIP:
4N
RANGE:
69 W of the 6th PM

NORTHERN
ENGINEERING
SURVEY | MUNICIPAL | LAND DEVELOPMENT
FORT COLLINS | GREELEY 970.221.4188 NORTHERNENGINEERING.COM

DATE:
7/14/23
SCALE:
1"=40'
PROJECT:
167-025
CLIENT:
DR HORTON
DRAWN BY:
L. Smith
REVIEWED BY:
B. Tessel

FINAL PLAT OF
VANTAGE SUBDIVISION SEVENTH FILING
TOWN OF BERTHOUD
STATE OF COLORADO

Vicinity Map:



General Notes:

1. ALL SIGNS SHALL BE REQUIRED TO APPLY FOR SIGN PERMIT.
2. PROPOSED GRADES SHALL MATCH OR IMPROVE EXISTING GRADES TO PROVIDE POSITIVE DRAINAGE AWAY FROM BUILDING WHILE PROVIDING A SMOOTH TRANSITION BETWEEN ALL ADJACENT UNDISTURBED GRADES AND PROPOSED GRADES.
3. JOB SITE TO BE KEPT CLEAN AT ALL TIMES AND CONSTRUCTION AREAS ARE TO BE MAINTAINED FOR SAFETY.
4. ALL SOILS DISTURBED ADJACENT TO WORK AREA, INCLUDING AREAS OUTSIDE OF CONSTRUCTION LIMITS, DUE TO NEW CONSTRUCTION ARE TO BE REGRADED AND SURFACE CONDITIONS REPAIRED EQUIVALENT TO THAT CONDITION PRIOR TO START OF WORK PER THE NATIVE SEED MIX NOTES THIS SHEET.
5. PROTECT EXISTING SURFACES AND SOILS, BOTH INSIDE AND OUTSIDE OF CONSTRUCTION LIMITS, DURING CONSTRUCTION. IF GRADES, CONCRETE OR ASPHALT ARE DAMAGED DUE TO CONSTRUCTION OPERATIONS OR WEATHER THE CONTRACTOR IS RESPONSIBLE FOR REPAIR TO THAT EQUIVALENT TO EXISTING CONDITIONS AT NO EXPENSE TO THE OWNER / TOWN.
6. CONTRACTOR IS RESPONSIBLE FOR SETUP OF BARRICADES, WARNING SIGNAGE, OR OTHER PROTECTIVE DEVICES IF ANY EXCAVATIONS ARE LEFT EXPOSED AFTER ON-SITE WORK HOURS.
7. THE CONTRACTOR SHALL NOT PURPOSEFULLY PROCEED WITH ANY CONSTRUCTION PER PLANS PROVIDED WHEN OBSTRUCTIONS AND/OR GRADE DIFFERENCES EXIST THAT WERE NOT CONSIDERED OR CHANGED AFTER PLANS WERE SUBMITTED. CONTRACTOR SHALL NOTIFY OWNER OR OWNER'S REPRESENTATIVE IF SITUATION ARISES AND REVISIONS ARE NECESSARY. OWNER WILL COORDINATE ANY REQUIRED REVISIONS WITH TOWN.
8. THE CONTRACTOR SHALL PREVENT SEDIMENT, DEBRIS AND OTHER POLLUTANTS FROM ENTERING ANY STORM WATER SEWER SYSTEM OR, ADJACENT WATER WAYS, ETC., DURING THE DEMOLITION OR CONSTRUCTION OPERATIONS THAT ARE PART OF THIS PROJECT. THE CONTRACTOR SHALL BE HELD RESPONSIBLE AND EXPENSE FOR THE CORRECTION OF ANY ADVERSE IMPACTS TO THE STORM WATER SEWER SYSTEM OR, ADJACENT WATER WAYS, WETLANDS ETC., RESULTING FROM THE WORK DONE AS PART OF THIS PROJECT/CONTRACT.
9. THE CONTRACTOR SHALL BE RESPONSIBLE PRIOR TO BIDDING AND CONSTRUCTION, OF BECOMING AWARE OF ALL EXISTING AND PROPOSED UTILITIES, PIPES, STRUCTURES, ETC. CALL UNCC THREE DAYS BEFORE SCHEDULED WORK AT 811 OR 1-800-922-1987.

Landscape Notes

1. LANDSCAPE AREAS SHALL BE MAINTAINED, INCLUDING MOWING, WATERING AND FERTILIZING BY CONTRACTOR, UP TO FINAL ACCEPTANCE. AT SUCH TIME OWNER WILL BE RESPONSIBLE FOR ALL MAINTENANCE. LANDSCAPE AND IRRIGATION WILL BE WARRANTED FOR ONE (1) FULL YEAR AFTER FINAL ACCEPTANCE. ALL NATIVE GRASS AREAS MAY NOT EXCEED 8" IN HEIGHT.
2. ANY DISCREPANCIES WITH THE DRAWINGS AND SITE CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE OWNERS REPRESENTATIVE PRIOR TO PROCEEDING WITH CONSTRUCTION.
3. CONTRACTOR TO VERIFY ALL FIELD CONDITIONS, EASEMENTS, PROPERTY LINES, ETC. PRIOR TO STARTING WORK. SHOULD ANY DISCREPANCIES, OMISSIONS, OR ERRORS OCCUR, NOTIFY THE OWNER'S REPRESENTATIVE IMMEDIATELY.
4. CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UTILITIES 48 HRS. PRIOR TO ANY EXCAVATION OR PLANTING.
5. LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY COORDINATION WITH SUBCONTRACTORS AS REQUIRED TO ACCOMPLISH PLANTING OPERATIONS.
6. STREET AND ORNAMENTAL TREES SHALL BE PLANTED NO CLOSER THAN FORTY (40) FEET AND FIFTEEN (15) FEET RESPECTIVELY FROM STREET LIGHTS. NO TREES SHALL BE PLANTED WITHIN TEN (10) FEET FROM WATER AND SEWER LINES, FOUR (4) FEET FROM GAS, TELEPHONE AND ELECTRIC UTILITIES, FIVE (5) FEET FROM STORM SEWER LINES, AND TEN (10) FEET FROM ANY DRIVEWAY. CONTRACTOR TO NOTIFY OWNER OF ANY CONFLICTS. OWNER TO COORDINATE ANY NECESSARY PLAN REVISIONS.
7. MINIMUM CLEARANCE OF THREE (3) FEET ON EACH SIDE OF FIRE DEPARTMENT CONNECTION (FDC), NO VEGETATION OTHER THAN TURF OR GROUND COVERS PLANTED IN FRONT OF FDC.
8. ANY OBJECT WITHIN THE SIGHT DISTANCE EASEMENT MORE THAN 30 INCHES ABOVE THE FLOWLINE ELEVATION OF THE ADJACENT STREET SHALL CONSTITUTE A SIGHT OBSTRUCTION, AND SHALL BE REMOVED OR LOWERED. SUCH OBJECTS INCLUDE BUT ARE NOT LIMITED TO BERMS, BUILDINGS, PARKED VEHICLES ON PRIVATE PROPERTY, CUT SLOPES, HEDGES, TREES, BUSHES, UTILITY CABINETS, OR TALL CROPS. MAILBOX CLUSTERS MUST BE INSTALLED A MINIMUM OF 2 FEET FROM BACK OF WALK AND NOT CAUSE ANY SIGHT OBSTRUCTION. IN NO CASE SHALL ANY PERMANENT OBJECT ENCR OACH INTO THE LINE-OF-SIGHT OF ANY PART OF THE SIGHT-DISTANCE TRIANGLE. STREET TREES REQUIRED ARE EXCEPTED FROM THIS REQUIREMENT. TREES ARE PERMITTED IF PRUNED UP TO 8 FEET. IN ADDITION TO THE SIGHT DISTANCE TRIANGLE REQUIREMENTS, A CLEAR SPACE ZONE IS REQUIRED WITHIN ALL CURB RETURNS (MEASURED FROM POINT OF CURB TO POINT OF CURB RETURN) WHERE NO TREES, SHRUBS, AESTHETIC STRUCTURES, FEATURES, MONUMENT SIGNS, OR OBJECTS THAT HAVE THE POTENTIAL TO HINDER DRIVER VISIBILITY, AND/OR PEDESTRIAN AND BICYCLE SAFETY, ARE ALLOWED. SEE LARIMER COUNTY URBAN AREA STREET STANDARDS SECTION 7.4.1.C. FOR ADDITIONAL INFORMATION.
9. IF TREES OR SHRUBS ARE LOCATED ON TOP OF FIELD VERIFIED UTILITIES, CONTRACTOR SHALL NOTIFY OWNER BEFORE ANY DIGGING HAS COMMENCED. VERIFY WITH OWNER IF AND WHICH SHRUBS/TREES SHALL BE TAKEN OUT OF PROJECT/CONTRACT.
10. TO THE MAXIMUM EXTENT FEASIBLE, TOPSOIL THAT IS REMOVED DURING CONSTRUCTION ACTIVITY SHALL BE CONSERVED FOR LATER USE ON AREAS REQUIRING REVEGETATION AND LANDSCAPING.
11. EXCAVATED MATERIAL TO BE USED AS FILL WILL HAVE ALL ROCKS, DEBRIS, WASTE MATERIAL, FROZEN MATERIAL, VEGETATION LARGER THAN 3" IN ANY DIMENSION REMOVED BEFORE PLANTING AND COMPACTION OF SOIL.
12. PRIOR TO FINE GRADING, DURA-TURF TALL FESCUE SOD OR DURA-TURF TALL FESCUE SEEDBED AREAS AND PLANTING BEDS, SHALL BE THOROUGHLY LOOSENEED AND TILLED TO A 6" DEPTH. REMOVE ALL UNSUITABLE TOPSOIL, INCLUDING ALL ROCKS LARGER THAN 3 INCHES IN ANY DIRECTION, ALL CONCRETE, TRASH, DEBRIS, WEEDS, ROOTS AND OTHER WASTE MATERIALS. AFTER THAT TIME CLASS I OR II, EXCLUDING MANURE, SHALL THEN BE THOROUGHLY TILLED AND INCORPORATED TO A MINIMUM 6" DEPTH IN THESE AREAS AT THE MINIMUM OF RATE OF 3 CU. YDS. / 1,000 SQ.FT.
13. UNIFORMLY COMPACT AND FINE GRADE THESE SOD / GRASS AREAS AND PLANTING BEDS TO A SMOOTH SURFACE, FREE FROM IRREGULAR SURFACE CHANGES. CUT OUT SOFT SPOTS, FILL IN LOW SPOTS AND TRIM HIGH SPOTS TO COMPLY WITH REQUIRED GRADE TOLERANCES.
14. ONCE COMPACTED AND FINE GRADED ALL ROCKS, DEBRIS, WASTE MATERIAL AND VEGETATION MATERIAL LARGER THAN 1/2" WILL BE RAKED FROM THE SURFACE AND REMOVED FROM SITE.
15. SOD TO BE 100% COLORADO GROWN DURA-TURF TALL FESCUE BLEND SPECIFICALLY GROWN FOR LOW WATER LAWN APPLICATIONS WITH MINIMUM THREE (3) IMPROVED VARIETIES, HAVING A HEALTHY VIGOROUS ROOT SYSTEM. ONCE TURF IS LAID IT SHALL BE PROPERLY ROLLED, COMPACTED AND PUSHED TOGETHER TO ELIMINATE ANY GAPS BETWEEN ROLL EDGES. APPLY FERTILIZER IN THESE AREAS PER SOD FARMS RECOMMENDATIONS.
16. ALL PLANT MATERIALS ARE SIZED AND OUTLINED IN PLANT LIST. ALL PLANTS TO BE PLANTED IN AMENDED SOIL AND STAKED AS SHOWN IN DETAILS. ALL PLANT MATERIAL SHALL MEET OR EXCEED THE CODE OF STANDARDS CURRENTLY RECOMMENDED BY THE COLORADO NURSERY ACT FOR NUMBER ONE GRADE.
17. IF PLANTS ARE IN NEED OF REPLACEMENT DUE TO DECLINING HEALTH, DISEASE, OR DEATH, CONTRACTOR MUST NOTIFY OWNER AND THE PLANT MUST BE REPLACED WITH THE ORIGINAL SPECIES UNLESS OWNER RECEIVES APPROVAL FOR REPLACEMENT SPECIES BY TOWN.
18. CHANGES IN PLANT SPECIES OF PLANT LOCATIONS FROM WHAT IS LISTED ON THE LANDSCAPE PLAN WILL REQUIRE THE APPROVAL OF THE TOWN PRIOR TO INSTALLATION OF REPLACEMENT. OVERALL QUANTITY AND QUALITY TO BE CONSISTENT WITH THE APPROVED PLANS. IN THE EVENT OF CONFLICT WITH THE QUANTITIES INCLUDED IN THE PLANT LIST, SPECIES AND QUANTITIES SHALL BE PROVIDED.
19. ALL TREES AND SHRUBS TO BE BALLED AND BURLAPPED, OR CONTAINERIZED.
20. ALL EXISTING TREES TO REMAIN UNLESS OTHERWISE NOTED.
21. ALL PLANT MATERIAL SHALL HAVE ALL WIRE, TWINE, BASKETS, BURLAP, AND ALL OTHER NON-BIODEGRADABLE CONTAINMENT MATERIAL REMOVED FROM THE TRUNK AND/OR ROOT BALL OF THE PLANT, PRIOR TO PLANTING.
22. ALL SHRUB BEDS SHALL HAVE MINIMUM 4" DEPTH SHREDDED CEDAR MULCH - NATURAL COLOR AND/OR WASHED SMOOTH COBBLE. A CONTINUOUS LAYER OF TYRAN LANDSCAPE FABRIC OR APPROVED EQUAL SHALL BE INSTALLED IN ALL COBBLE AREA WITH 6" OVERLAP AT SEAMS WITH 4" STAPLES 4' O.C. IN ALL DIRECTIONS.
23. EDGING BETWEEN GRASS TYPES AND SHRUB BEDS / ROCK COBBLE SHALL BE HEAVY DUTY STEEL EDGER MIN 3/8" x 4" WITH ROUNDED TOP AND PLASTIC CAP AND SHALL BE SET LEVEL WITH THE TOP OF THE ADJACENT SOD. NO EDGING SHALL BE USED BETWEEN CEDAR MULCH AND COBBLE TRANSITIONS.
24. LANDSCAPING WITHIN THE FRONT YARD SETBACK OF RESIDENTIAL PROPERTIES MUST BE INSTALLED WITHIN ONE (1) YEAR OF CERTIFICATION OF OCCUPANCY.
25. MAINTENANCE OF ALL COMMON AREAS AND PUBLIC R.O.W. LANDSCAPING IS THE RESPONSIBILITY OF THE METRO DISTRICT.
26. ALL TURF GRASSES PLANTED IN PUBLIC R.O.W. MUST BE SOD
27. STREET TREES WILL BE PLANTED AT LEAST 5' FROM ANY SERVICE LINE AND DRIVEWAY.
28. TURF (SOD) IS REQUIRED IN ALL TREE LAWNS. THE INSTALLATION RESPONSIBILITY IS THE BUILDER/HOMEOWNER IN FRONT OF INDIVIDUAL LOTS.
29. IN ANY CIRCUMSTANCE WHERE PLANT LIST QUANTITIES OR SPECIES DO NOT MATCH THE PLAN LAYOUT, THE LANDSCAPE INSTALLATION SHALL MATCH THE PLAN LAYOUT.
30. WEED CONTROL SHALL BE A CONTINUAL RESPONSIBILITY OF THE OWNER DURING ALL PHASES OF LAND CLEARING AND CONSTRUCTION, AND OPERATION. EVERY EFFORT SHALL BE MADE TO PREVENT THE SPREAD OF NOXIOUS WEEDS.
31. APPROVAL OF SEEDED TURF AREAS SHALL BE BASED UPON THE SEED PRODUCERS GUARANTEED SEEDING GERMINATION RATE FOR A ONE SQUARE FOOT AREA. IF GUARANTEED GERMINATION RATE IS NOT ACHIEVED, THE CONTRACTOR SHALL OVERSEED UNTIL THE GERMINATION RATE IS ACHIEVED. REVEGETATION SHALL HAVE AT LEAST 3 NATIVE GRASS SEEDLINGS/SQUARE FOOT AND NO BARE AREAS EXCEEDING ONE SQUARE METER AFTER THE SECOND GROWING SEASON. FOR DRILL SEEDED AREAS, PLANTING ROWS SHALL BE NOTICEABLE BY THE END OF THE FIRST FULL GROWING SEASON. IF A PARTIAL OR TOTAL SEEDING FAILURE IS APPARENT AFTER THE SECOND GROWING SEASON, POORLY VEGETATED AREAS SHALL BE RESEEDED IN THE SAME MANNER DESCRIBED ABOVE. APPROPRIATE SITE PREPARATION PRACTICES SHALL BE USED TO CREATE A SUITABLE SEEDBED FOR PLANTING, BUT ANY ESTABLISHED NATIVE VEGETATION SHALL BE UNDISTURBED TO THE EXTENT POSSIBLE. AREAS THAT ERODE BEFORE GERMINATION AND ESTABLISHMENT CAN OCCUR SHALL BE REPAIRED AND IMMEDIATELY RESEEDED DURING THE SAME SEASON.

Irrigation Notes

1. ENTIRE IRRIGATION SYSTEM AND ASSOCIATED IRRIGATION TAP(S) TO BE SIZED, DESIGNED AND BUILT BY CONTRACTOR. IRRIGATION CONTRACTOR SHALL VERIFY P.S.I. AND GPM AVAILABLE. SYSTEM SHALL BE DESIGNED TO MEET THE AVAILABLE P.S.I. AND GPM. IF NECESSARY CONTACT THE WATER DISTRICT PRIOR TO BEGINNING DESIGN TO OBTAIN AVAILABLE PRESSURES.
2. ALL INDICATED TURF GRASS AREAS ARE TO BE IRRIGATED BY A PERMANENT UNDERGROUND AUTOMATIC IRRIGATION SYSTEM. TURF AREAS LESS THAN 25 FEET IN WIDTH ARE TO BE IRRIGATED WITH POP-UP SPRAY HEADS AND AREAS GREATER THAN 25 FEET SHALL USE A ROTOR POP-UP SPRAY SYSTEM.
3. ALL TREES, SHRUBS AND PERENNIALS OUTSIDE OF IRRIGATED TURF GRASS AREAS, ARE TO BE IRRIGATED WITH A PERMANENT DRIP IRRIGATION SYSTEM.
4. IRRIGATION SYSTEM WITH SMART CONTROLLER, RAIN SENSOR AND NECESSARY SLEEVING WILL BE DESIGNED AND BUILT BY CONTRACTOR AND ADJUSTED TO A LOW WATER REQUIREMENT, BASED ON THE NEEDS OF SELECTED PLANT MATERIAL.
5. QUICK COUPLERS SHALL BE PROVIDED AT EACH POINT OF CONNECTION AND AT REGULAR SPACING ALONG THE IRRIGATION MAINLINE. SPACING OF QUICK COUPLERS SHALL NOT EXCEED 200 FEET. LOCATE QUICK COUPLING VALVE AT A POINT OF EASY ACCESS.
6. FINAL LOCATION OF IRRIGATION HEADS MUST BE APPROVED BY OWNER'S REPRESENTATIVE PRIOR TO PLANTING. HEAD LOCATION SHALL BE COORDINATED IN THE FIELD WITH EXISTING SITE CONDITIONS AND PLANT MATERIAL.
7. ALL IRRIGATION TRENCHES SHALL BE PROPERLY WATERED AND COMPACTED TO AVOID FUTURE SETTLING. ANY SETTLING DURING WARRANTY PERIOD WILL BE REPAIRED BY THE CONTRACTOR AT NO COST TO THE OWNER.
8. COORDINATE ALL IRRIGATION WORK WITH EXISTING UTILITIES AND RESPECTIVE TRADES.
9. ALL IRRIGATION SLEEVING SHALL BE PROVIDED AND INSTALLED BY GENERAL CONTRACTOR. IRRIGATION CONTRACTOR SHALL COORDINATE SLEEVING LOCATIONS WITH GENERAL CONTRACTOR. ALL IRRIGATION SLEEVING TO BE STAKED IN THE FIELD OR LOCATED ON DIMENSIONED "AS-BUILT" DRAWING BY THE GENERAL CONTRACTOR TO ALLOW FUTURE USE AND LOCATION.

Native Grass Seed Mix

1. SEED SHALL BE AS MANUFACTURED BY ARKANSAS VALLEY SEED SOLUTIONS, 4625 COLORADO BOULEVARD, DENVER, CO 80216, (877) 957-3337 OR APPROVED EQUAL.
 2. SEED SHALL BE A MIXTURE THAT MATCHES THE FOLLOWING:

IRRIGATED FOOTHILLS MIX		
COMMON NAME	%	LBS.P.L.S./ACRE
ANNUAL RYEGRASS	20%	
SLENDER WHEATGRASS	15%	
CRESTED WHEATGRASS	12%	
MOUNTAIN BROME	10%	
HARD FESCUE	10%	
CANADA BLUEGRASS	10%	
SIDE-OATS GRAMA	6%	
BIG BLUESTEM	5%	
BLUE GRAMA (COATED)	5%	
SAND DROPSEED	1%	
 3. DRILLED APPLICATION RATE: 25.0 LBS (PLS) PER ACRE (0.57 LBS / 1000 SF)
 4. ADEQUATE TEMPORARY IRRIGATION OR BY WATER TRUCK, OR BY OTHER ACCEPTABLE MEANS, WILL BE PROVIDED BY CONTRACTOR FOR THE WATERING. ESTABLISHMENT AND MAINTENANCE OF THESE SEEDED AREAS, AND THAT NATIVE GRASSES SHALL BE MAINTAINED IN A CONDITION OF ACCEPTABLE HEIGHT. FREE OF WEEDS, TRASH AND DEBRIS, AND SHALL NOT REPRESENT A FIRE HAZARD NOR BECOME A NUISANCE SITE FOR WATER OR WIND EROSION.
 5. FOR ALL NATIVE GRASS MIX AREAS, THE DEVELOPER SHALL BE RESPONSIBLE FOR ESTABLISHMENT OF A COMPLETE, WEED FREE STAND OF GRASS PRIOR TO TURNING OVER MAINTENANCE TO THE BERTHOUD HERITAGE METRO DISTRICT.
- MULCH IN ALL NATIVE SEED AREAS:
3. IMMEDIATELY FOLLOWING THE RAKING OPERATION, ADD STRAW MULCH TO THE SEEDED AREAS.
 4. APPLY STRAW MULCH AT A MINIMUM OF 1.5 TONS PER ACRE OF AIR DRY MATERIAL. SPREAD STRAW MULCH UNIFORMLY OVER THE AREA WITH MECHANICAL MULCH SPREADER / CRIMPER. DO NOT MULCH WHEN WIND VELOCITY EXCEEDS 10 MPH.
 5. WHEREVER THE USE OF CRIMPING EQUIPMENT IS PRACTICAL, PLACE MULCH IN THE MANNER NOTED ABOVE AND ANCHOR IT INTO THE SOIL. USE A DISC SUCH AS A MULCH TILLER, WITH A FLAT SERRATED DISC AT LEAST 1/4 INCH IN THICKNESS, HAVING DULL EDGES, AND SPACE NO MORE THAN 9 INCHES APART, WITH DISCS OF SUFFICIENT DIAMETER TO PREVENT THE FRAME OF THE EQUIPMENT FROM DRAGGING THE MULCH. ANCHOR MULCH A MINIMUM DEPTH OF 2 INCHES AND ACROSS THE SLOPE WHERE PRACTICAL WITH NO MORE THAN TWO PASSES OF THE ANCHORING EQUIPMENT.
 6. IMMEDIATELY UPON COMPLETION OF THE MULCHING AND BINDING OPERATION, THE SEEDED AREAS SHALL BE IRRIGATED, KEEPING THE TOP 2 INCHES OF SOIL EVENLY MOIST UNTIL SEED HAS UNIFORMLY GERMINATED AND GROWN TO A HEIGHT OF 2-INCHES.
 7. WATERING APPLICATION SHALL BE DONE IN A MANNER WHICH WILL PROVIDE UNIFORM COVERAGE BUT WHICH WILL NOT CAUSE EROSION, MOVEMENT, OR DAMAGE TO THE FINISHED SURFACE.

Landscape Sheet Index:

SHEET 1	COVER SHEET AND NOTES
SHEET 2	OVERALL LANDSCAPE PLAN
SHEET 3	LANDSCAPE PLAN
SHEET 4	LANDSCAPE PLAN
SHEET 5	LANDSCAPE PLAN
SHEET 6	HYDROZONE PLAN
SHEET 7	DETAILS

SITE FURNISHING SCHEDULE

DESCRIPTION	MANUFACTURER	MODEL	QUANTITY	COLOR	MOUNT TYPE
TRASH RECEPCTACLE	MyTCoat - OUTDOOR FURNITURE	LTPQL32	2	BLACK	SURFACE
DOG WASTE STATION	DOG WASTE DEPOT	006-B-BLK	3	MATTE BLACK	IN-GROUND
NOTE: ALL SITE FURNISHINGS AS SPECIFIED OR APPROVED EQUAL					

TOWN OF BERTHOUD, COLORADO
FINAL APPROVAL

Town Planner _____ Date _____

SEAL

PROJECT TITLE

VANTAGE

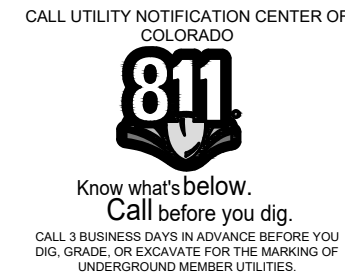
7th Filing
Preliminary Plat

Berthoud, Colorado

PREPARED FOR

D.R. HORTON d/b/a MELODY
HOMES INC.

9555 S. KINGSTON CT
ENGLEWOOD, CO 80112



REVISIONS	DATE
STAFF COMMENTS	02.16.23
STAFF COMMENTS	04.20.23

DATE

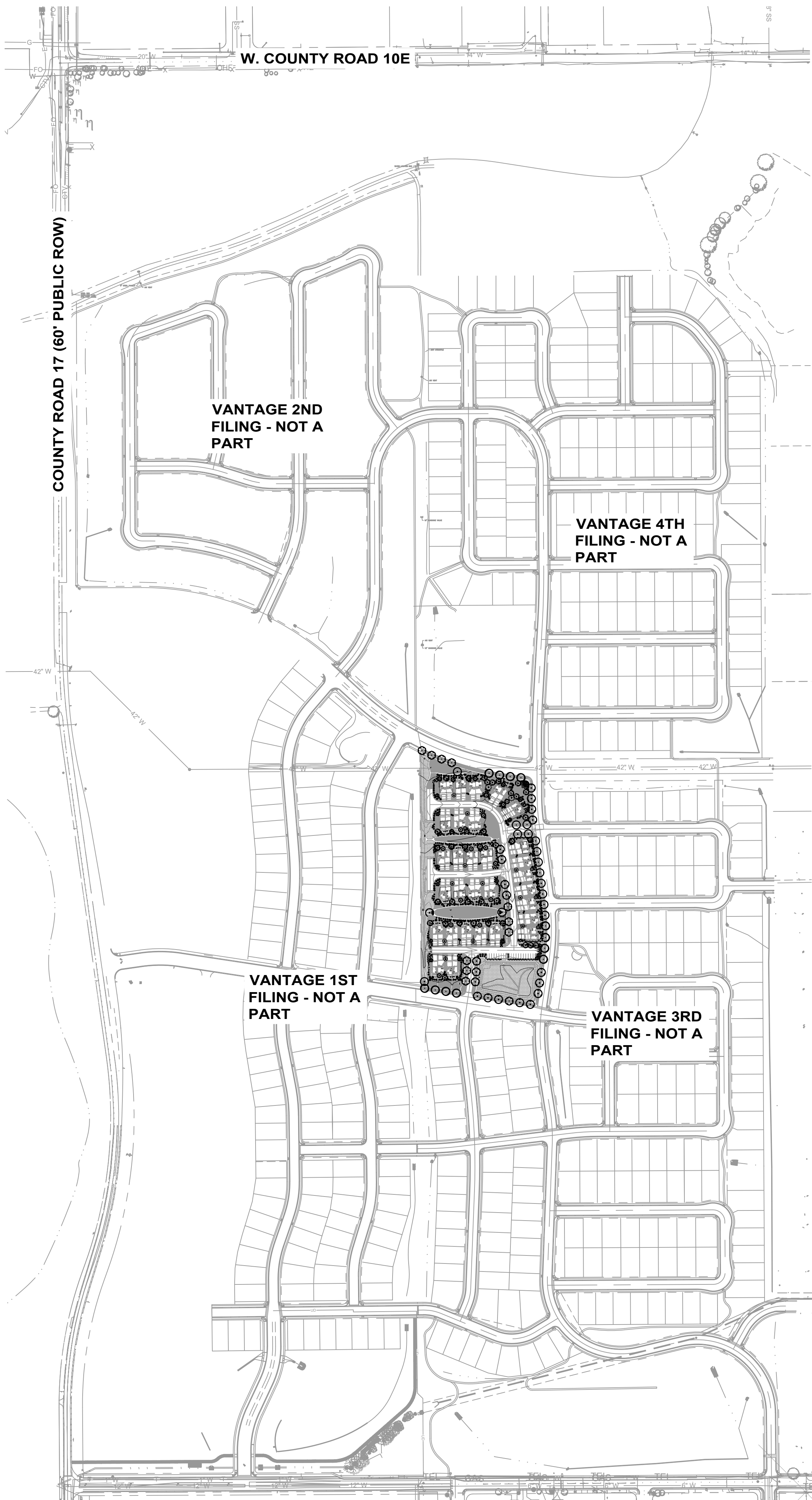
AUGUST 31, 2022

SHEET TITLE

Cover Sheet &
Notes

SHEET INFORMATION

SHEET 1



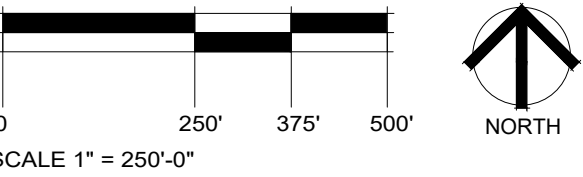
Materials Legend	
SYMBOL	DESCRIPTION
	IRRIGATED TURF DURATURF FESCUE BLEND OR APPROVED EQUAL
	NON-IRRIGATED NATIVE SEED SEE DETAILS FOR SEED MIX
	WOOD MULCH ALL SHRUB BEDS TO RECEIVE A MINIMUM 4" DEPTH SHREDDED CEDAR MULCH
	1.5" WASHED RIVER ROCK COBBLE ALL SHRUB BEDS TO RECEIVE A MINIMUM 2"-3" DEPTH ROCK COBBLE

Plan Legend

- PROPERTY BOUNDARY
- LOT LINE
- EASEMENTS
- LANDSCAPE EDGING
- POTENTIAL FENCE LOCATIONS
(REFERENCE DETAIL A ON SHEET 7)
- LIGHT POLE TYP.

FENCING NOTE:

FENCING WILL BE OPTIONAL AND INSTALLED BY PROPERTY OWNER.
POTENTIAL FENCE LOCATIONS ARE SHOWN FOR REFERENCE ONLY.



Plant List							
DECIDUOUS TREES	QTY	BOTANICAL / COMMON NAME	SIZE	HEIGHT	WIDTH	BIODIVERSITY	REMARKS
	6	Catalpa speciosa Western Catalpa	2.0" cal. BB	50'	40'	4.4%	WELL BRANCHED W/ STRAIGHT TRUNK & CENTRAL LEADER
	12	Celtis occidentalis Western Hackberry	2.0" cal. BB	60'	40'	8.8%	WELL BRANCHED W/ STRAIGHT TRUNK AND CENTRAL LEADER
	11	Gymnocladus dioica 'Espresso' Seedless Kentucky Coffeetree	2.0" cal. BB	60'	40'	8.1%	WELL BRANCHED W/ STRAIGHT TRUNK AND CENTRAL LEADER
	6	Quercus buckleyi Texas Red Oak	2.0" cal. BB	30'	30'	4.4%	WELL BRANCHED W/ STRAIGHT TRUNK AND CENTRAL LEADER
	3	Quercus macrocarpa Bur Oak	2.0" cal. BB	80'	70'	2.2%	WELL BRANCHED W/ STRAIGHT TRUNK AND CENTRAL LEADER
	16	Quercus robur English Oak	2.0" cal. BB	60'	40'	11.8%	WELL BRANCHED W/ STRAIGHT TRUNK & CENTRAL LEADER
	4	Tilia americana 'Redmond' Redmond American Linden	2.0" cal. BB	50'	40'	2.9%	WELL BRANCHED W/ STRAIGHT TRUNK AND CENTRAL LEADER
EVERGREEN TREES	QTY	BOTANICAL / COMMON NAME	SIZE	HEIGHT	WIDTH	BIODIVERSITY	REMARKS
	5	Picea pungens Colorado Spruce	12'-14' B&B	40'	20'	3.7%	FULL SPECIMEN, EVENLY AND WELL BRANCHED
	14	Picea pungens 'Baby Blue Eyes' Baby Blue Eyes Spruce	6' B&B	30'	15'	10.3%	FULL SPECIMEN, EVENLY AND WELL BRANCHED
	6	Pinus leucodermis 'Emerald Arrow' Emerald Arrow Bosnian Pine	6' B&B	25'	12'	4.4%	FULL SPECIMEN, EVENLY AND WELL BRANCHED
	2	Pinus strobiformis Southwestern White Pine	6' B&B	50'	30'	1.5%	FULL SPECIMEN, EVENLY AND WELL BRANCHED
ORNAMENTAL TREES	QTY	BOTANICAL / COMMON NAME	SIZE	HEIGHT	WIDTH	BIODIVERSITY	REMARKS
	16	Acer ginnala 'Flame' Amur Maple	2.0" cal. BB	15'	15'	11.8%	WELL BRANCHED W/ STRAIGHT TRUNK & CENTRAL LEADER
	11	Acer tataricum 'GarAnn' Hot Wings Tatarian Maple	1.5" cal. BB	20'	20'	8%	WELL BRANCHED W/ STRAIGHT TRUNK & CENTRAL LEADER
	10	Pyrus calleryana 'Chanticleer' Chanticleer Pear	1.5" cal. BB	35'	25'	7.4%	WELL BRANCHED W/ STRAIGHT TRUNK & CENTRAL LEADER
	14	Syringa reticulata Japanese Tree Lilac	1.5" cal. BB	25'	20'	10.3%	WELL BRANCHED W/ STRAIGHT TRUNK AND CENTRAL LEADER
DECIDUOUS SHRUBS	QTY	BOTANICAL / COMMON NAME	SIZE	HEIGHT	WIDTH		
	15	Amelanchier alnifolia 'Regent' Regent Serviceberry	10 gal.	8'	8		24" (h) FULL SPECIMEN, EVENLY AND WELL BRANCHED
	11	Amelanchier canadensis Canadian Serviceberry	5 gal.	20'	15'		24" (h) FULL SPECIMEN, EVENLY AND WELL BRANCHED
	63	Arctostaphylos x coloradoensis Panchito Manzanita	1 gal.	15"	3'		12" (h) FULL SPECIMEN, EVENLY AND WELL BRANCHED
	95	Caryopteris x clandonensis 'Blue Mist' Blue Mist Spirea	5 gal.	4'	4'		24" (h) FULL SPECIMEN, EVENLY AND WELL BRANCHED
	102	Rhus aromatica 'Gro-Low' Gro-Low Fragrant Sumac	5 gal.	3'	6'		24" (h) FULL SPECIMEN, EVENLY AND WELL BRANCHED
	98	Rosa x 'Meineble' Red Meidiland® Rose	5 gal.	2'	6'		12" (h) FULL SPECIMEN, EVENLY AND WELL BRANCHED
	14	Syringa vulgaris Common Lilac	5 gal.	15'	10'		24" (h) FULL SPECIMEN, EVENLY AND WELL BRANCHED
EVERGREEN SHRUBS	QTY	BOTANICAL / COMMON NAME	SIZE	HEIGHT	WIDTH		
	64	Arctostaphylos uva-ursi Kinnikinnick	5 gal.	6"	6'		3"(h) FULL SPECIMEN, EVENLY AND WELL BRANCHED
	70	Chamaebatiaria millefolium Fernbush	5 gal.	4'	5'		24" (h) FULL SPECIMEN, EVENLY AND WELL BRANCHED
	35	Picea abies 'Nidiformis' Bird's Nest Norway Spruce	5 gal.	3'	5'		24" (h) FULL SPECIMEN, EVENLY AND WELL BRANCHED
	31	Pinus sylvestris 'Albyn Prostrata' Albyn Prostrata Scotch Pine	5 gal.	2'	8'		12" (h) FULL SPECIMEN, EVENLY AND WELL BRANCHED
GRASSES	QTY	BOTANICAL / COMMON NAME	SIZE	HEIGHT	WIDTH		
	84	Bouteloua gracilis 'Blonde Ambition' Blonde Ambition Blue Grama	1 gal.	2'	2'		WELL ROOTED AND ESTABLISHED
	75	Miscanthus sinensis 'Purpurescens' Flame (Purple Maiden) Grass	1 gal.	4'	3'		WELL ROOTED AND ESTABLISHED
	90	Muhlenbergia reverchonii 'PUND01S' Undaunted® Ruby Muhly	1 gal.	2'	1.5'		WELL ROOTED AND ESTABLISHED
	34	Panicum virgatum 'Heavy Metal' Heavy Metal Switch Grass	1 gal.	4'	1.5'		WELL ROOTED AND ESTABLISHED
	120	Sorghastrum nutans Indian Grass	5 gal.	5'	3'		WELL ROOTED AND ESTABLISHED
PERENNIALS	QTY	BOTANICAL / COMMON NAME	SIZE	HEIGHT	WIDTH		
	36	Oenothera lindheimeri 'Whirling Butterflies' Whirling Butterflies Gaura	5 gal.	2'	3'		WELL ROOTED AND ESTABLISHED
	55	Penstemon pinifolius 'P019S' TM SteppeSuns Sunset Glow Penstemon	1 gal.	18"	18"		WELL ROOTED AND ESTABLISHED
	49	Rudbeckia hirta fulgida Black-eyed Susan	1 gal.	2'	2'		WELL ROOTED AND ESTABLISHED

landscape architecture | planning | illustration

444 Mountain Ave. | TEL: 970.532.5891
Berthoud, CO 80513 | WEB: TBGroup.us

SEAL

PROJECT TITLE

VANTAGE

7th Filing
Preliminary Plat

Berthoud, Colorado

PREPARED FOR

D.R. HORTON d/b/a MELODY HOMES INC.

9555 S. KINGSTON CT
ENGLEWOOD, CO 80112

CALL UTILITY NOTIFICATION CENTER OF COLORADO

Know what's below.
Call before you dig.
CALL 3 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG. GRADE, OR EXCAVATE FOR THE REMOVAL OF UNDERGROUND MEMBER UTILITIES.

REVISIONS	DATE
STAFF COMMENTS	02.16.23
STAFF COMMENTS	04.20.23

DATE

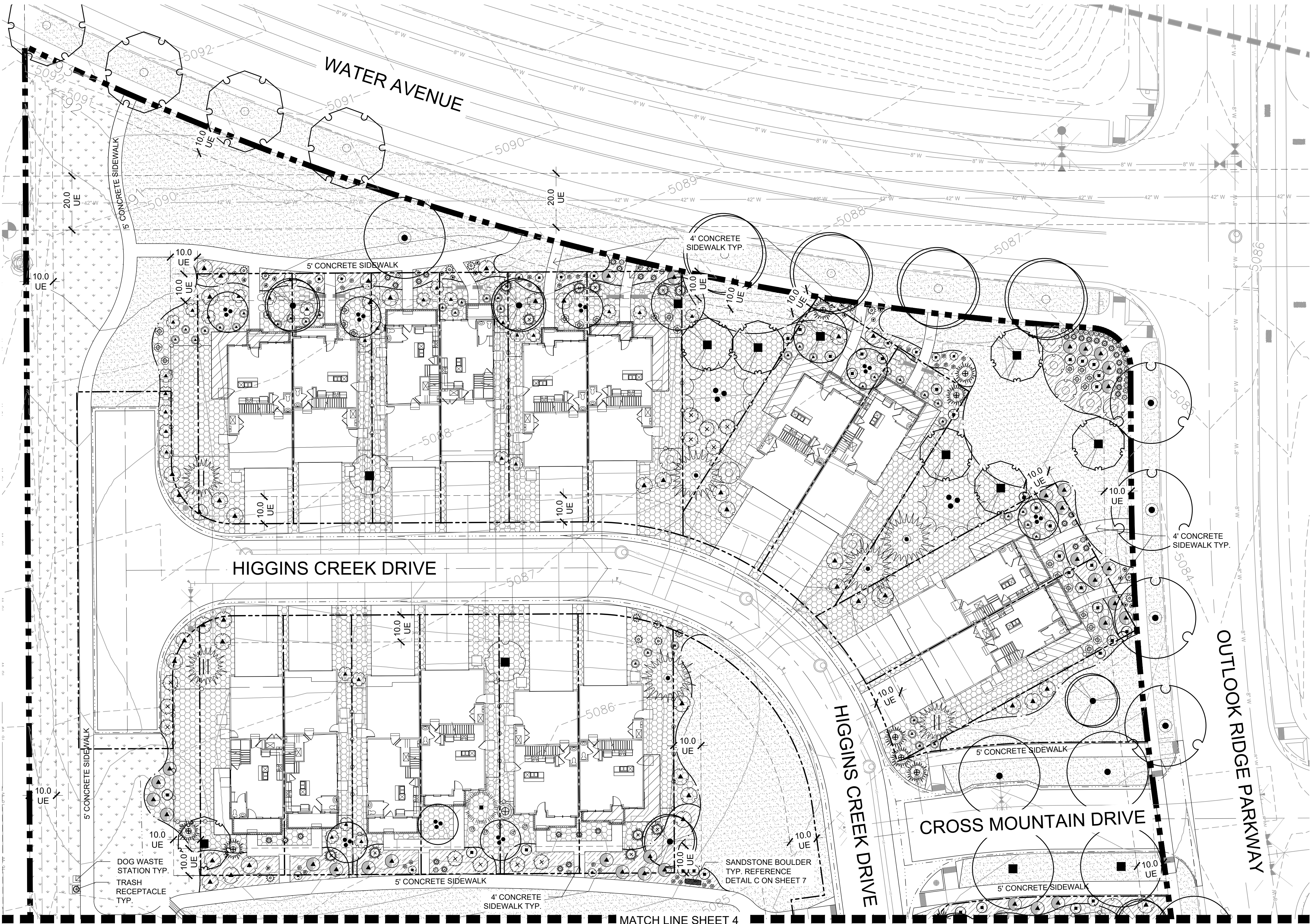
AUGUST 31, 2022

SHEET TITLE

Overall Site & Landscape Plan

SHEET INFORMATION

SHEET **2**



Materials Legend

SYMBOL	DESCRIPTION	QTY
	IRRIGATED TURF DURATUR® FESCUE BLEND OR APPROVED EQUAL	55,343 sf
	NON-IRRIGATED NATIVE SEED SEE DETAILS FOR SEED MIX	52,511 sf
	WOOD MULCH ALL SHRUB BEDS TO RECEIVE A MINIMUM 4" DEPTH SHREDDED CEDAR MULCH	21,810 sf
	1.5" WASHED RIVER ROCK COBBLE ALL SHRUB BEDS TO RECEIVE A MINIMUM 2"-3" DEPTH ROCK COBBLE	64,090 sf

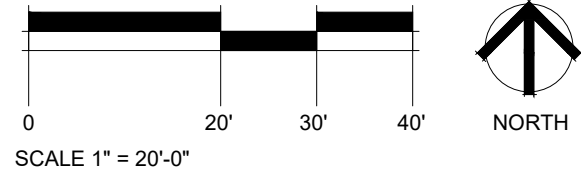
Plan Legend

	PROPERTY BOUNDARY
	LOT LINE
	EASEMENTS
	LANDSCAPE EDGING
	POTENTIAL FENCE LOCATIONS (REFERENCE DETAIL A ON SHEET 7)
	LIGHT POLE TYP.

FENCING NOTE:

FENCING WILL BE OPTIONAL AND INSTALLED BY PROPERTY OWNER.
POTENTIAL FENCE LOCATIONS ARE SHOWN FOR REFERENCE ONLY.

Sheet Key



Plant List

DECIDUOUS TREES	QTY	BOTANICAL / COMMON NAME
	6	Catalpa speciosa Western Catalpa
	12	Celtis occidentalis Western Hackberry
	11	Gymnocladus dioica 'Espresso' Seedless Kentucky Coffeetree
	6	Quercus buckleyi Texas Red Oak
	3	Quercus macrocarpa Bur Oak
	16	Quercus robur English Oak
	4	Tilia americana 'Redmond' Redmond American Linden
EVERGREEN TREES	QTY	BOTANICAL / COMMON NAME
	5	Picea pungens Colorado Spruce
	14	Picea pungens 'Baby Blue Eyes' Baby Blue Eyes Spruce
	6	Pinus leucodermis 'Emerald Arrow' Emerald Arrow Bosnian Pine
	2	Pinus strobiformis Southwestern White Pine
ORNAMENTAL TREES	QTY	BOTANICAL / COMMON NAME
	16	Acer ginnala 'Flame' Amur Maple
	11	Acer tataricum 'GarAnn' Hot Wings Tatarian Maple
	10	Pyrus calleryana 'Chanticleer' Chanticleer Pear
	14	Syringa reticulata Japanese Tree Lilac
DECIDUOUS SHRUBS	QTY	BOTANICAL / COMMON NAME
	15	Amelanchier alnifolia 'Regent' Regent Serviceberry
	11	Amelanchier canadensis Canadian Serviceberry
	63	Arctostaphylos x coloradoensis Panchito Manzanita
	95	Caryopteris x clandonensis 'Blue Mist' Blue Mist Spirea
	102	Rhus aromatica 'Gro-Low' Gro-Low Fragrant Sumac
	98	Rosa x 'Meinlebe' Red Meidiland® Rose
	14	Syringa vulgaris Common Lilac
EVERGREEN SHRUBS	QTY	BOTANICAL / COMMON NAME
	64	Arctostaphylos uva-ursi Kinnikinnick
	70	Chamaebatiaria millefolium Fernbush
	35	Picea abies 'Nidiformis' Bird's Nest Norway Spruce
	31	Pinus sylvestris 'Albyn Prostrata' Albyn Prostrata Scotch Pine
GRASSES	QTY	BOTANICAL / COMMON NAME
	84	Bouteloua gracilis 'Blonde Ambition' Blonde Ambition Blue Grama
	75	Miscanthus sinensis 'Purpurescens' Flame (Purple Maiden) Grass
	90	Muhlenbergia reverchonii 'PUND01S' Undaunted® Ruby Muhly
	34	Panicum virgatum 'Heavy Metal' Heavy Metal Switch Grass
	120	Sorghastrum nutans Indian Grass
PERENNIALS	QTY	BOTANICAL / COMMON NAME
	36	Oenothera lindheimeri 'Whirling Butterflies' Whirling Butterflies Gaura
	55	Penstemon pinifolius 'P019S'™ SteppeSuns Sunset Glow Penstemon
	49	Rudbeckia hirta fulgida Black-eyed Susan

landscape architecture | planning | illustration

444 Mountain Ave. | TEL: 970.532.5891
Berthoud, CO 80513 | WEB: TBGroup.us

SEAL

PROJECT TITLE

VANTAGE

7th Filing

Preliminary Plat

Berthoud, Colorado

PREPARED FOR

D.R. HORTON d/b/a MELODY HOMES INC.

9555 S. KINGSTON CT
ENGLEWOOD, CO 80112

CALL UTILITY NOTIFICATION CENTER OF COLORADO

Know what's below.
Call before you dig.
CALL 3 BUSINESS DAYS IN ADVANCE BEFORE YOU
DIG. GRADE, OR EXCAVATE FOR THE REMOVAL OF
UNDERGROUND MEMBER UTILITIES.

REVISIONS	DATE
STAFF COMMENTS	02.16.23
STAFF COMMENTS	04.20.23

DATE

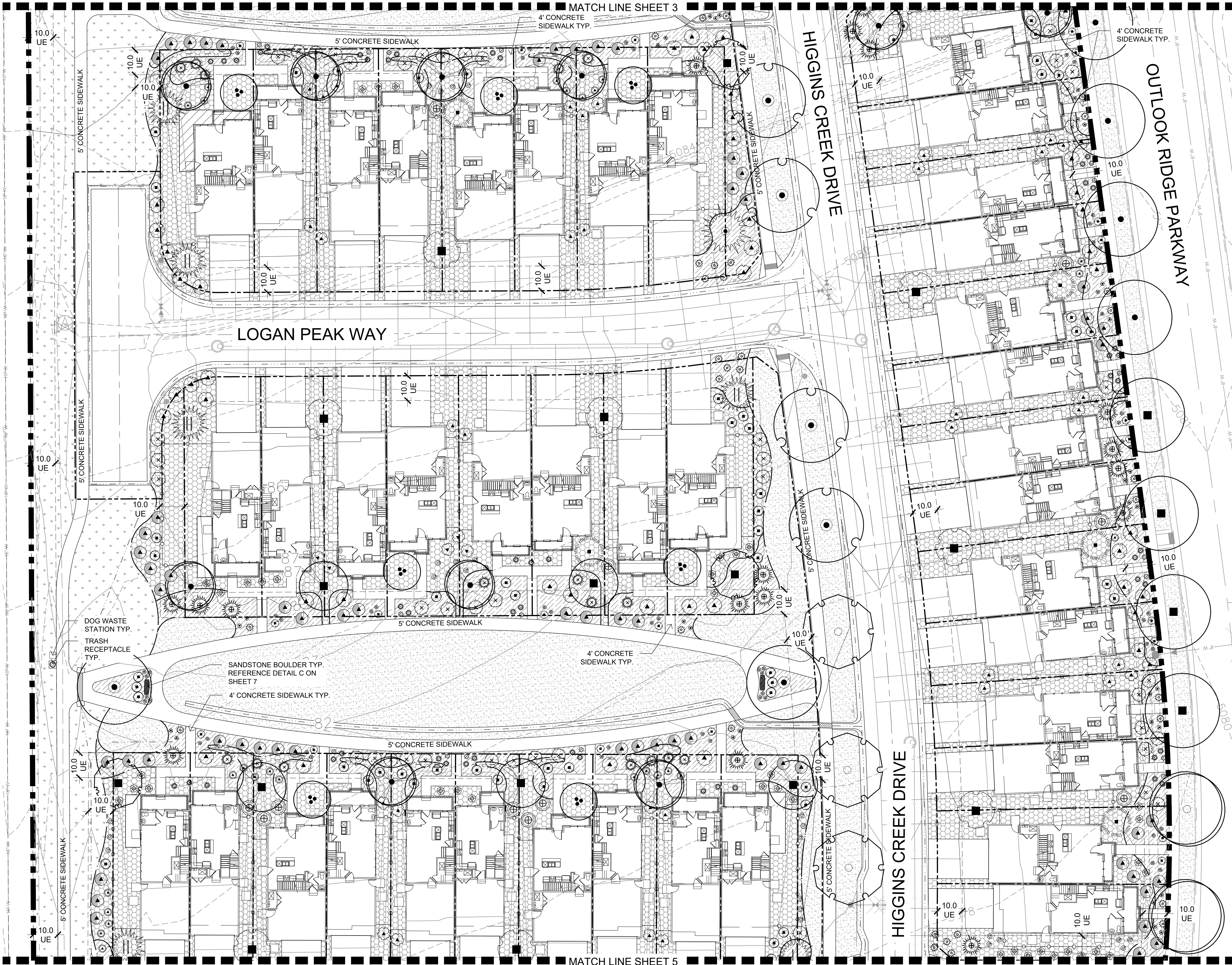
AUGUST 31, 2022

SHEET TITLE

Landscape Plan

SHEET INFORMATION

SHEET 3



Materials Legend

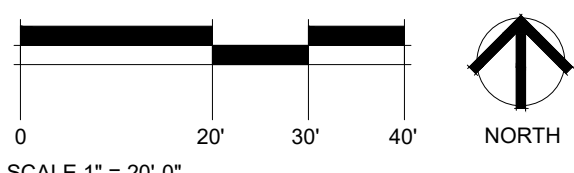
SYMBOL	DESCRIPTION	QTY
	IRRIGATED TURF DURATURF FESCUE BLEND OR APPROVED EQUAL	55,343 sf
	NON-IRRIGATED NATIVE SEED SEE DETAILS FOR SEED MIX	52,511 sf
	WOOD MULCH ALL SHRUB BEDS TO RECEIVE A MINIMUM 4" DEPTH SHREDDED CEDAR MULCH	21,810 sf
	1.5" WASHED RIVER ROCK COBBLE ALL SHRUB BEDS TO RECEIVE A MINIMUM 2"-3" DEPTH ROCK COBBLE	64,090 sf

Plan Legend

	PROPERTY BOUNDARY
	LOT LINE
	EASEMENTS
	LANDSCAPE EDGING
	POTENTIAL FENCE LOCATIONS (REFERENCE DETAIL A ON SHEET 7)
	LIGHT POLE TYP.

FENCING NOTE:
FENCING WILL BE OPTIONAL AND INSTALLED BY
PROPERTY OWNER. POTENTIAL FENCE
LOCATIONS ARE SHOWN FOR REFERENCE ONLY.

Sheet Key



Plant List

DECIDUOUS TREES	QTY	BOTANICAL / COMMON NAME
	6	Catalpa speciosa Western Catalpa
	12	Celtis occidentalis Western Hackberry
	11	Gymnocladus dioica 'Espresso' Seedless Kentucky Coffeetree
	6	Quercus buckleyi Texas Red Oak
	3	Quercus macrocarpa Bur Oak
	16	Quercus robur English Oak
	4	Tilia americana 'Redmond' Redmond American Linden
EVERGREEN TREES	QTY	BOTANICAL / COMMON NAME
	5	Picea pungens Colorado Spruce
	14	Picea pungens 'Baby Blue Eyes' Baby Blue Eyes Spruce
	6	Pinus leucodermis 'Emerald Arrow' Emerald Arrow Bosnian Pine
	2	Pinus strobus Southwestern White Pine
ORNAMENTAL TREES	QTY	BOTANICAL / COMMON NAME
	16	Acer ginnala 'Flame' Amur Maple
	11	Acer tataricum 'GarAnn' Hot Wings Tatarian Maple
	10	Pyrus calleryana 'Chanticleer' Chanticleer Pear
	14	Syringa reticulata Japanese Tree Lilac
DECIDUOUS SHRUBS	QTY	BOTANICAL / COMMON NAME
	15	Amelanchier alnifolia 'Regent' Regent Serviceberry
	11	Amelanchier canadensis Canadian Serviceberry
	63	Arctostaphylos x coloradoensis Panchito Manzanita
	95	Caryopteris x clandonensis 'Blue Mist' Blue Mist Spirea
	102	Rhus aromatica 'Gro-Low' Gro-Low Fragrant Sumac
	98	Rosa x 'Meinle' Red Meidiland® Rose
	14	Syringa vulgaris Common Lilac
EVERGREEN SHRUBS	QTY	BOTANICAL / COMMON NAME
	64	Arctostaphylos uva-ursi Kinnikinnick
	70	Chamaebatiaria millefolium Fernbush
	35	Picea abies 'Nidiformis' Bird's Nest Norway Spruce
	31	Pinus sylvestris 'Albyn Prostrata' Albyn Prostrata Scotch Pine
GRASSES	QTY	BOTANICAL / COMMON NAME
	84	Bouteloua gracilis 'Blonde Ambition' Blonde Ambition Blue Grama
	75	Miscanthus sinensis 'Purpurescens' Flame (Purple Maiden) Grass
	90	Muhlenbergia reverchonii 'PUND01S' Undaunted® Ruby Muhly
	34	Panicum virgatum 'Heavy Metal' Heavy Metal Switch Grass
	120	Sorghastrum nutans Indian Grass
PERENNIALS	QTY	BOTANICAL / COMMON NAME
	36	Oenothera lindheimeri 'Whirling Butterflies' Whirling Butterflies Gaura
	55	Penstemon pinifolius 'P019S' TM SteppeSuns Sunset Glow Penstemon
	49	Rudbeckia hirta fulgida Black-eyed Susan

landscape architecture | planning | illustration

444 Mountain Ave. | TEL: 970.532.5891
Berthoud, CO 80513 | WEB: TBGroup.us

SEAL

PROJECT TITLE
VANTAGE
7th Filing
Preliminary Plat

Berthoud, Colorado

PREPARED FOR
D.R. HORTON d/b/a MELODY HOMES INC.

9555 S. KINGSTON CT
ENGLEWOOD, CO 80112

CALL UTILITY NOTIFICATION CENTER OF COLORADO

Know what's below.
Call before you dig.
CALL 3 BUSINESS DAYS IN ADVANCE BEFORE YOU
DIG. GRADE, OR EXCAVATE FOR THE REMOVAL OF
UNDERGROUND MEMBER UTILITIES.

REVISIONS	DATE
STAFF COMMENTS	02.16.23
STAFF COMMENTS	04.20.23

DATE
AUGUST 31, 2022

SHEET TITLE
Landscape Plan

SHEET INFORMATION
SHEET 4

[illegible]

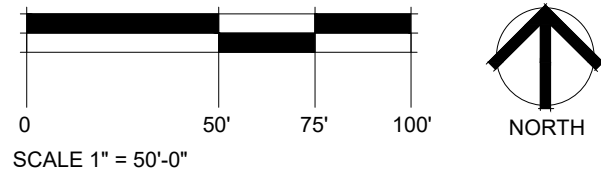


Hydrozone Budget

SF	Acre (AC)	Landscape Type	Water Requirement ft/acre
TOWNHOMES, DUPLEX OR SMALL SFD LOTS			
55,343	1.27	Irrigated Turf	3
55,268	1.27	Shrub Beds	1.33
52,511	1.21	Irrigated Native Foothills Grass Mix Shrubs in	0.8
1,550	0.04	non-irrigated areas	1.33

Hydrozone Legend

SYMBOL	DESCRIPTION	QTY
	IRRIGATED TURF DURATURF FESCUE BLEND	55,343 sf
	SHRUB BEDS	55,268 sf
	IRRIGATED NATIVE SEED MIX	52,511 sf
	AREAS NEEDING NO IRRIGATION	20,034 sf
	SHRUBS IN AREAS NOT NEEDING IRRIGATION	1,550 sf



SEAL

PROJECT TITLE

VANTAGE

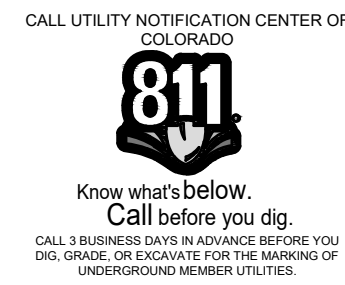
7th Filing
Preliminary Plat

Berthoud, Colorado

PREPARED FOR

D.R. HORTON d/b/a MELODY
HOMES INC.

9555 S. KINGSTON CT
ENGLEWOOD, CO 80112



REVISIONS

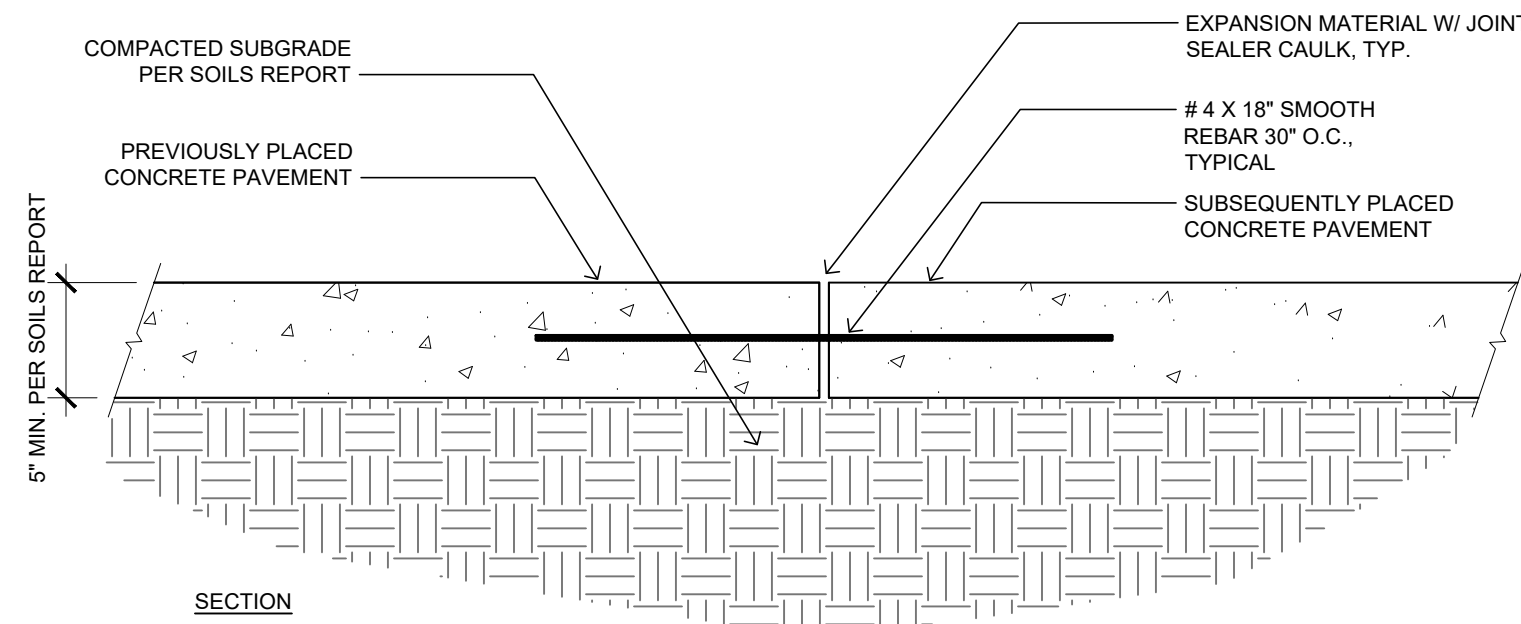
STAFF COMMENTS

STAFF COMMENTS

DATE

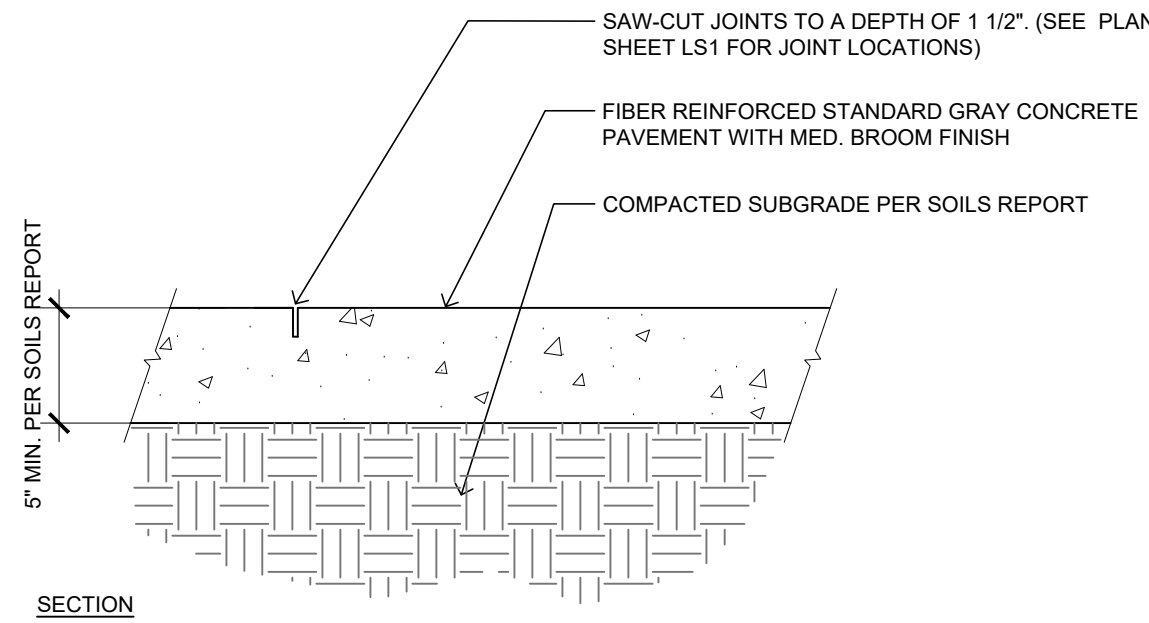
02.16.23

04.20.23



A
7

TYPICAL CONCRETE COLD JOINT



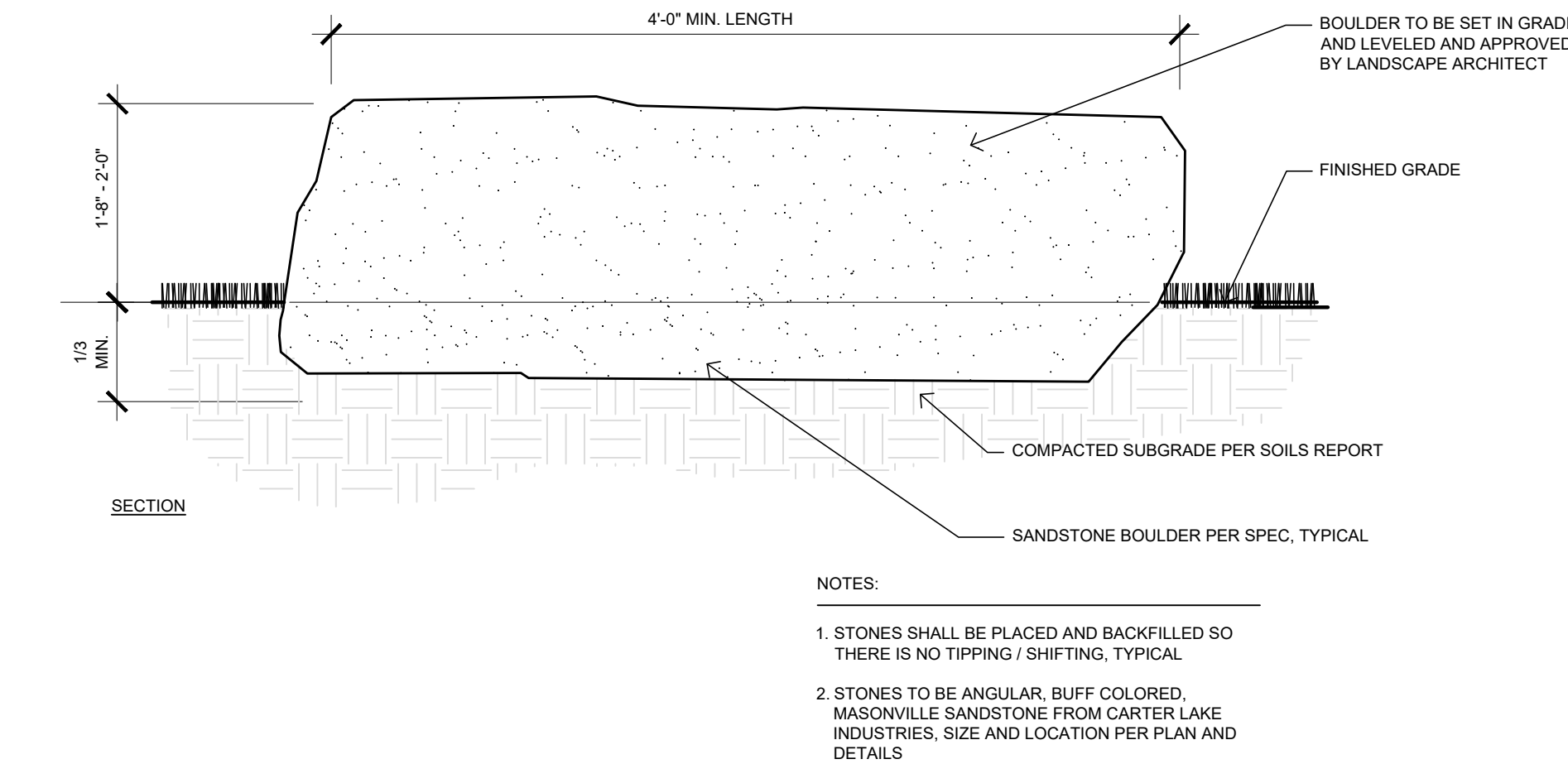
B
7

TYPICAL CONCRETE SAW CUT

- NOTES
1. APPLY MEDIUM BROOM FINISH PERPENDICULAR TO DIRECTION OF WALKS.
 2. PROVIDE 1/4" RADIUS EDGE AT OUTSIDE EDGES
 3. APPLY BROOM FINISH SO THAT NO TROWEL LINES REMAIN AT OUTSIDE EDGES
 4. MATERIAL IS STANDARD GRAY CONCRETE PER SITE PLAN
 5. CONCRETE PAVEMENT SHALL SLOPE TO DRAIN(S) UNLESS OTHERWISE NOTED. PROVIDE 2% CROSS SLOPE IN DIRECTION OF DRAINAGE, UNLESS OTHERWISE NOTED. TYP.

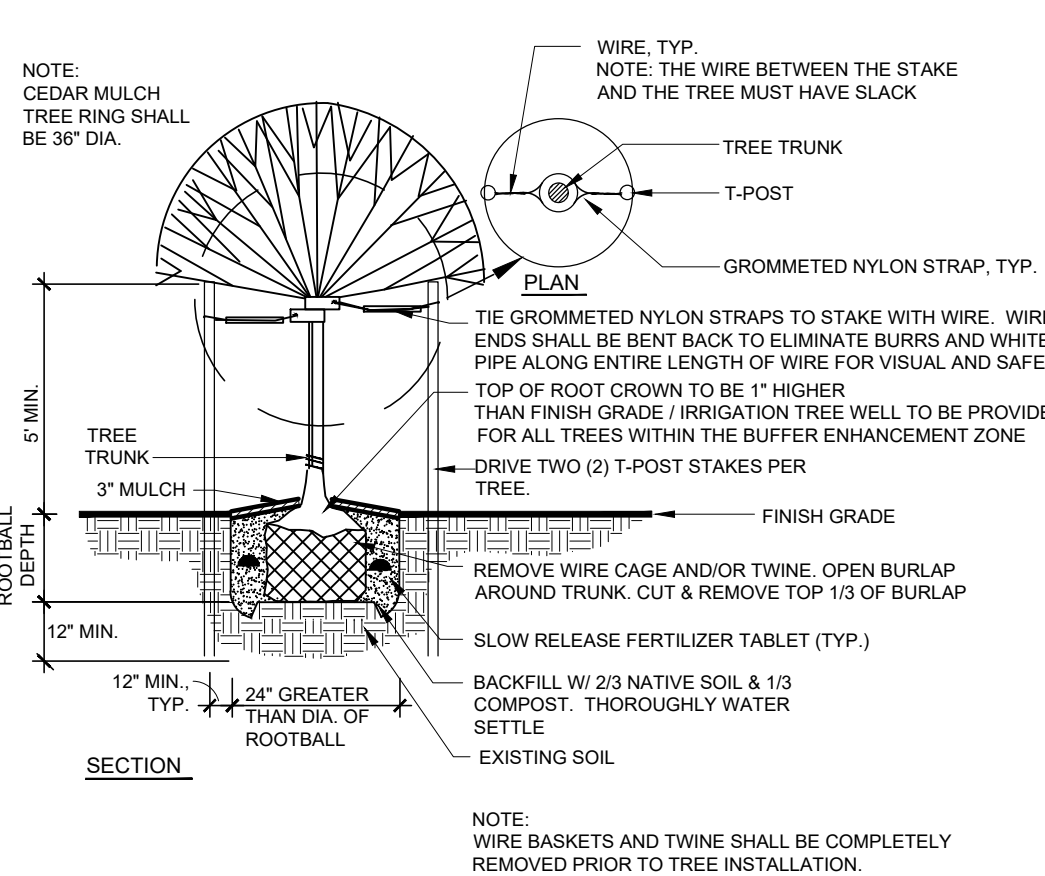
General Concrete Notes:

1. ALL CONCRETE TO BE FORMED-IN-PLACE TO CREATE CONSISTENT SLOPE TOWARDS GENERAL DIRECTION OF EXISTING GRADES, SLOPES AND DRAINAGE PATTERNS / SYSTEMS.
2. CONCRETE TO BE AT A MINIMUM 4500 PSI AT 28 DAYS WITH AIR ENTRAINMENT AT 5% TO 7% (ABSOLUTE 8% MAX) FOR MINIMUM 3/4" AGGREGATE WITH FIBER REINFORCEMENT OF 100 PERCENT VIRGIN HOMOPOLYMER POLYPROPYLENE MULTIFILAMENT FIBERS, CONTAINING NO REPROCESSED OLEFIN MATERIALS, COMPLYING WITH ASTM C 1116 - TYPE III AT 1.5 POUNDS PER CUBIC YARD (0.90 KG/M3) OF CONCRETE.
3. ALL NEW CONCRETE POURS ADJACENT TO EXISTING CONCRETE SHALL BE DOWELED, HAVE EXPANSION MATERIAL AND CAULKED ALONG THESE TRANSITIONS.
4. EXPANSION JOINTS SHALL BE CAULKED AND LOCATED AT ALL NEW POURS OR EVERY 100'.
5. ALL CONCRETE EDGES TO BE TOOLED ROUND UNLESS OTHERWISE NOTED DIFFERENTLY.
6. ALL CONCRETE SUB-GRADES ARE TO BE PROPERLY BACKFILLED AND COMPACTED. EXPOSED SOILS TO BE SCARIFIED TO A MINIMUM DEPTH OF 9 INCHES, ADJUSTED IN MOISTURE CONTENT TO WITHIN -1 TO +3% OF STANDARD PROCTOR OPTIMUM MOISTURE CONTENT AND COMPACTED TO BETWEEN 94 TO 98% OF THE MATERIAL'S STANDARD PROCTOR MAXIMUM DRY DENSITY AS DETERMINED IN ACCORDANCE WITH ASTM SPECIFICATION D698
7. CONTRACTOR TO SURVEY OR VERIFY POSITIVE DRAINAGE OF ALL FORMED IN PLACE CONCRETE PER NOTE 1 ABOVE PRIOR TO POURING OR BACKFILLING.
8. CONTRACTOR TO PROPERLY DISPOSE OF ALL EXCAVATED AND WASTE MATERIALS OFF-SITE PER LOCAL REGULATIONS AND CODES.
9. ALL CONCRETE FLATWORK TO BE MINIMUM 6" THICK W/ MEDIUM BROOM PERPENDICULAR TO GENERAL PEDESTRIAN MOVEMENT.
10. IF NOT SHOWN PROVIDE CONTROL JOINTS IN A GENERAL SQUARE AND EQUAL (MAX. 8' x 8') PATTERN STARTING AT POINTS OF GREATEST PROBABILITY OF CRACKING.
11. CONCRETE TO BE UNDER FULL WARRANTY FOR 2 YEARS.



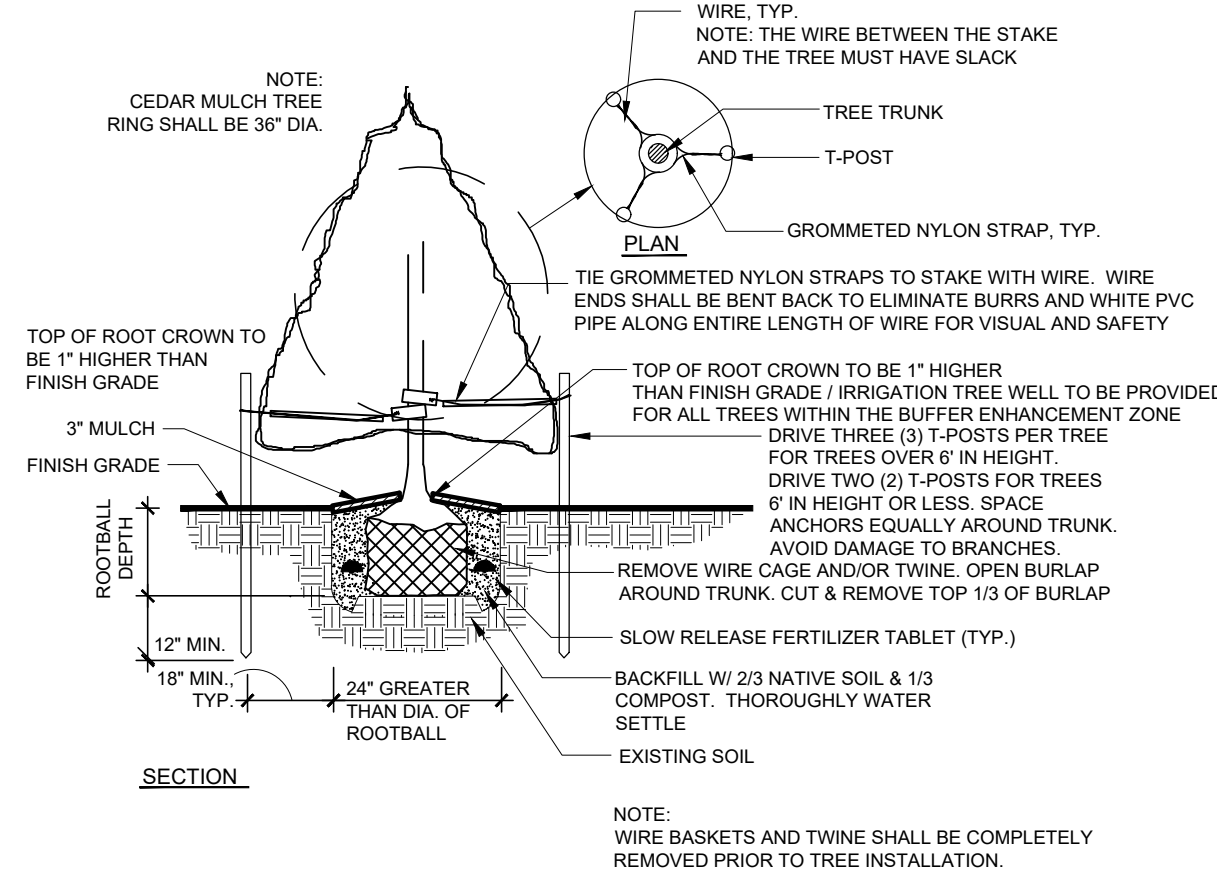
C
7

SANDSTONE BOULDER



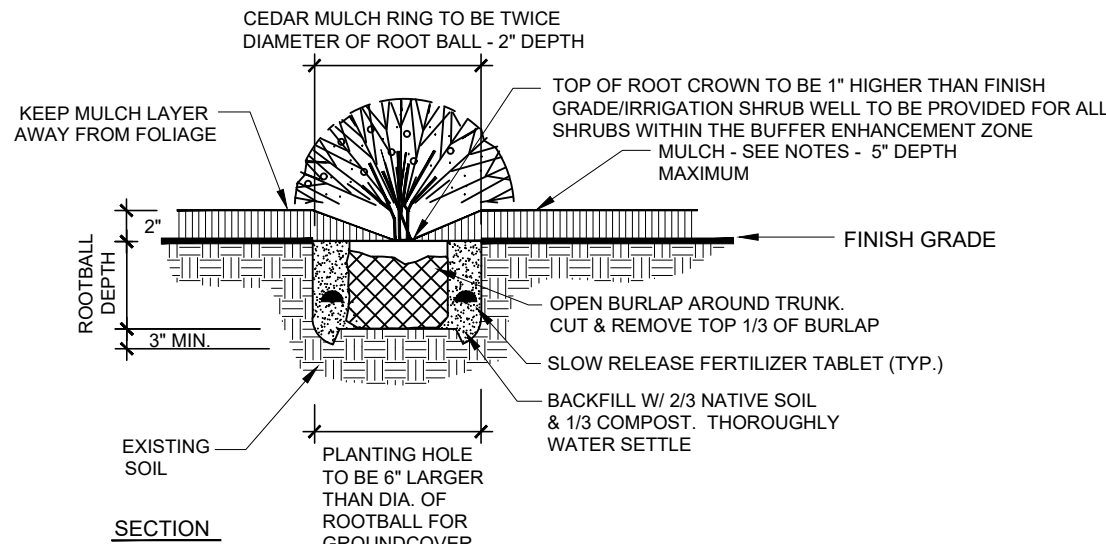
D
7

DECIDUOUS TREE PLANTING DETAIL



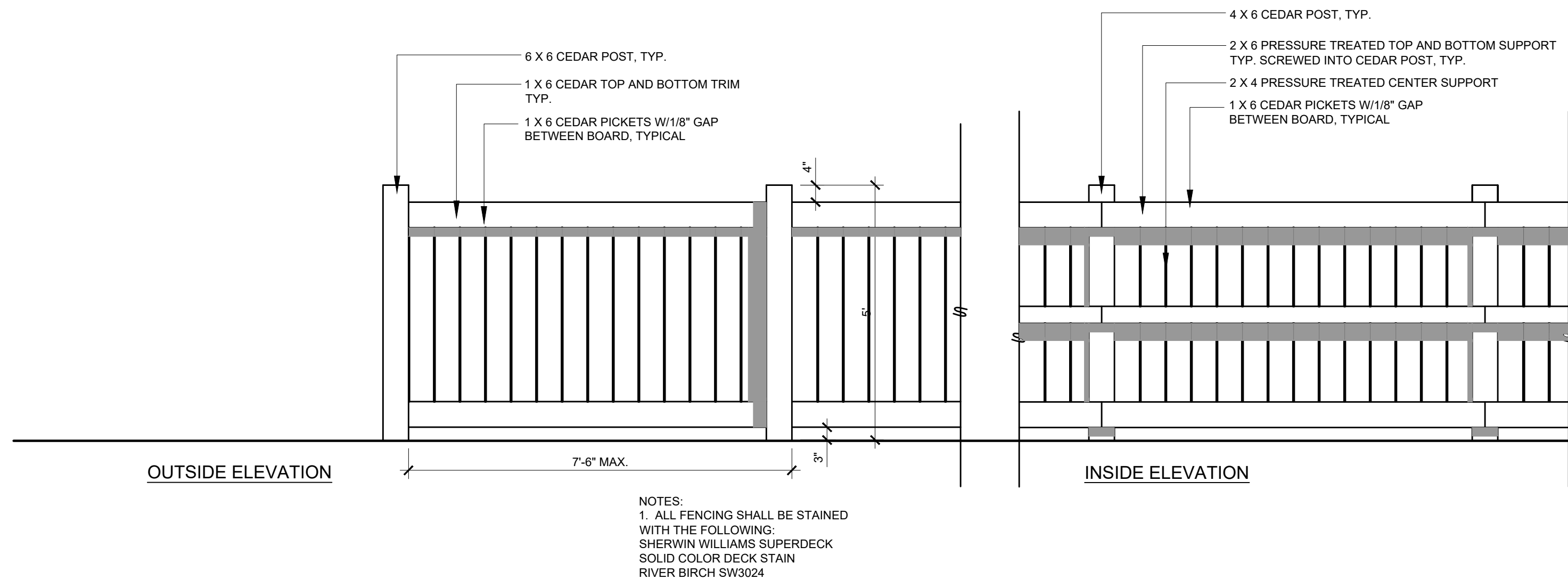
E
7

CONIFEROUS TREE PLANTING DETAIL



F
7

GROUND COVER AND SHRUB PLANTING DETAIL



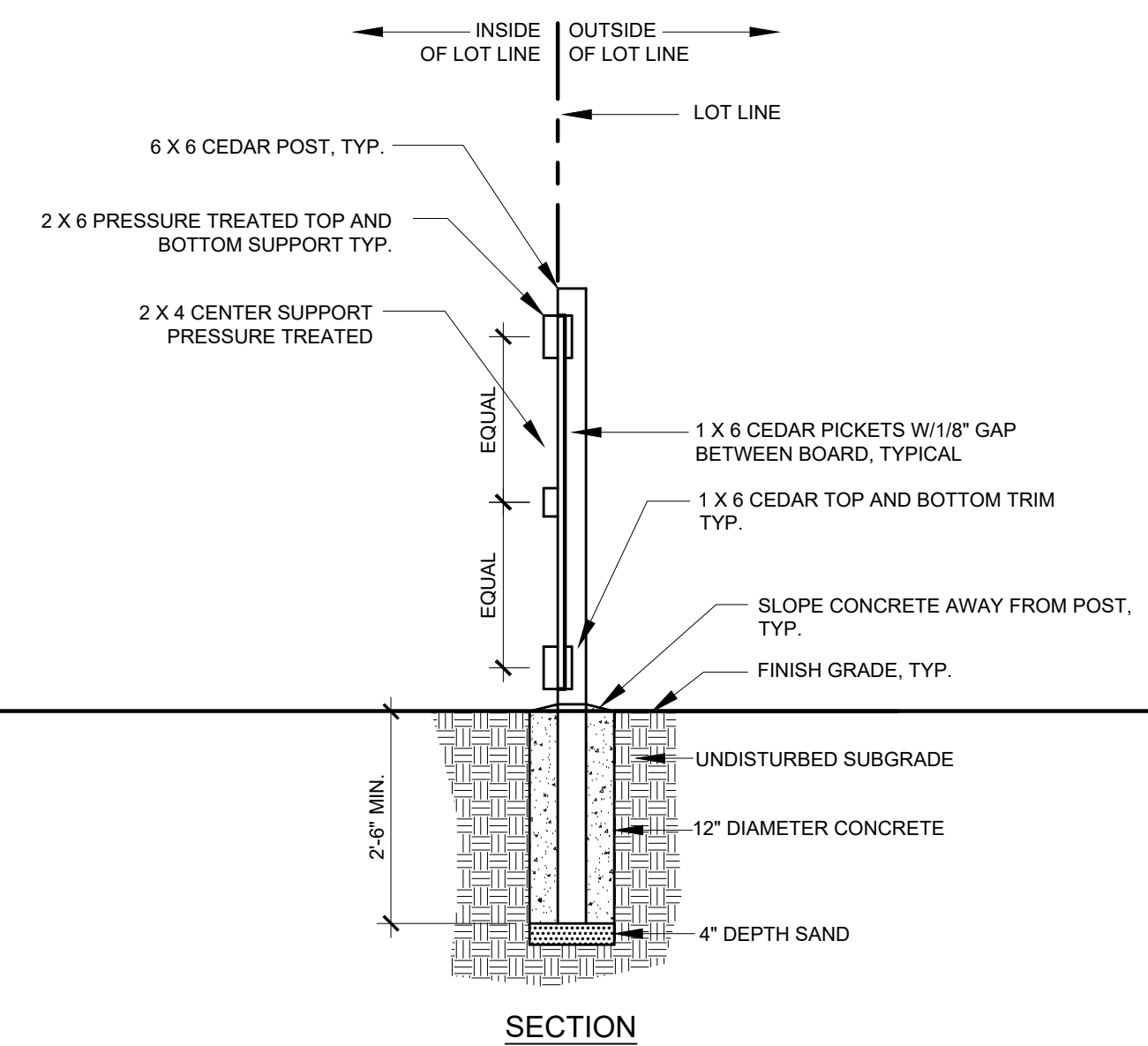
G
7

5' PRIVACY FENCE

SCALE 3/8" = 1'-0"

FENCING NOTE:

FENCING WILL BE OPTIONAL AND INSTALLED BY PROPERTY OWNER. POTENTIAL FENCE LOCATIONS ARE SHOWN FOR REFERENCE ONLY.



SEAL

PROJECT TITLE

VANTAGE

7th Filing
Preliminary Plat

Berthoud, Colorado

PREPARED FOR

D.R. HORTON d/b/a MELODY
HOMES INC.

9555 S. KINGSTON CT
ENGLEWOOD, CO 80112

REVISIONS	DATE
STAFF COMMENTS	02.16.23
STAFF COMMENTS	04.20.23

DATE

AUGUST 31, 2022

SHEET TITLE

Details

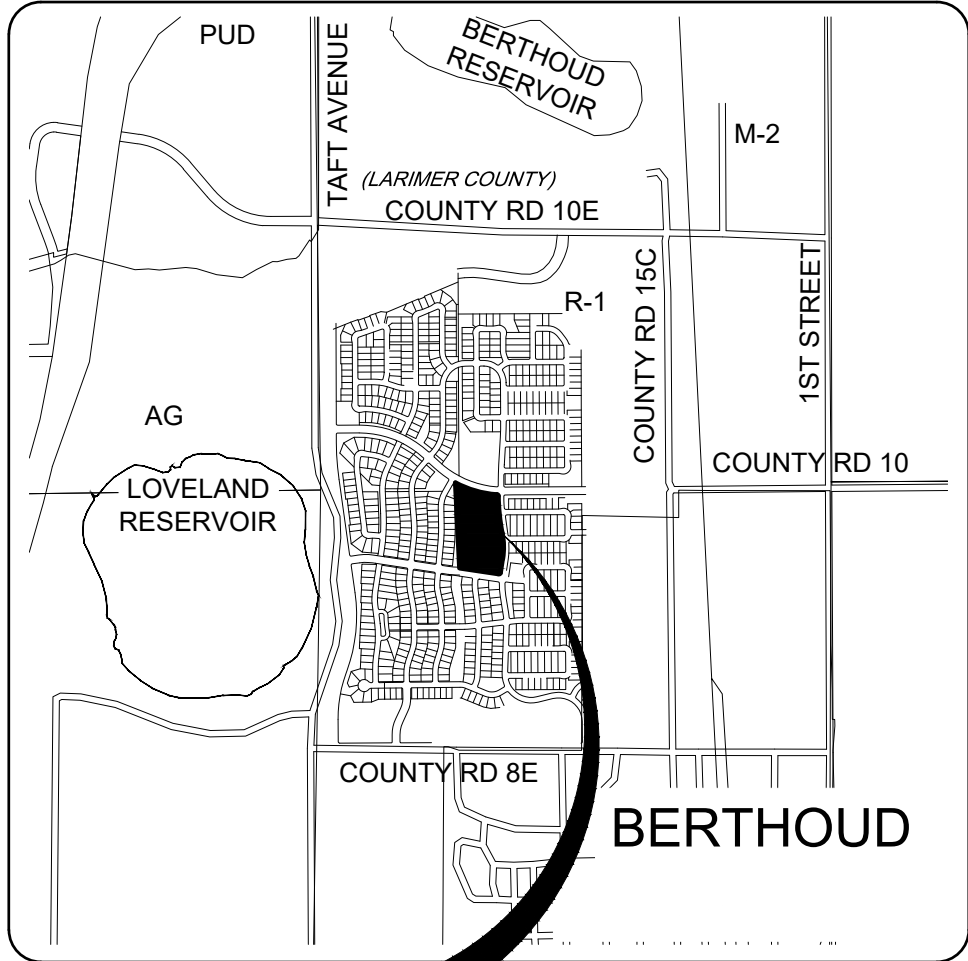
SHEET INFORMATION

SHEET 7

PRELIMINARY UTILITY PLANS FOR
VANTAGE SUBDIVISION 7TH FILING

A REPLAT OF TRACT A, VANTAGE SUBDIVISION THIRD FILING, LOCATED IN THE SOUTHWEST QUARTER OF SECTION 11, AND THE NORTHWEST QUARTER OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH P.M., TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

APRIL 2023

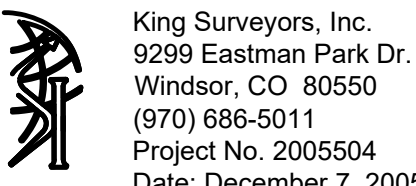


PROJECT BENCHMARKS:

Benchmark #1
NGS designation "K 410", a steel rod, ¼ mile South of junction of hwy 287 and 56, on the West side of hwy 287, 6 feet North of the power pole with North, South, and East running utility lines.
Elevation = 5066.70 (NAVD 88)

Basis of Bearings
West line of the Southwest Quarter of said Section 11, bearing North 00°15'09" West, being a grid bearing of the Colorado State Plane Coordinate System, North Zone, North America Datum 1983/92, a distance of 2649.26 feet.

ORIGINAL FIELD SURVEY BY:



King Surveyors, Inc.
9299 Eastman Park Dr.
Windsor, CO 80550
(970) 686-5011
Project No. 2005504
Date: December 7, 2005

SUPPLEMENTAL FIELD SURVEY BY:



Northern Engineering Services, Inc.
301 N. Howes Street, Suite 100
Fort Collins, CO 80521
(970) 221-4158
Project No. 103-034
Date: September 26, 2013

DISCLAIMER STATEMENT:

These plans have been reviewed by the Town of Berthoud for concept only. The review does not imply responsibility by the reviewing department, the Town of Berthoud Engineer, or the Town of Berthoud for accuracy and correctness of the calculations. Furthermore, the review does not imply that quantities of items on the plans are the final quantities required. The review shall not be construed for any reason as acceptance of financial responsibility by the Town of Berthoud for additional quantities of items shown that may be required during the construction phase.

CERTIFICATION STATEMENT:

I hereby affirm that these final construction plans were prepared under my direct supervision, in accordance with all applicable Town of Berthoud and State of Colorado standards and statutes, respectively, and that I am fully responsible for the accuracy of all design, revisions, and record conditions that I have noted on these plans.

CONTACT INFORMATION

PROJECT TEAM:



NORTHERN
ENGINEERING



TB GROUP
landscape architecture | planning | illustration



NORTHERN
ENGINEERING

DEVELOPER/CLIENT

William Zech
ALC V-Berthoud, LLC
8678 Carey Court
Stockton, CA 95212
(209) 405-1259

SITE ENGINEER

Cody Pape, PE
Northern Engineering Services, Inc.
301 N. Howes Street, Suite 100
Fort Collins, CO 80521
(970) 568-5412

PLANNER/
LANDSCAPE ARCHITECT

Kristin Turner
TB Group
444 Mountain Avenue
Berthoud, Colorado 80513
(970) 532-5891

SITE SURVEYOR

Northern Engineering Services, Inc.
Bob Tessely, PLS
301 North Howes Street, Suite 100
Fort Collins, Colorado 80521
(970) 221-4158

UTILITY CONTACT LIST: *

UTILITY COMPANY	PHONE NUMBER
Comcast Communications	(970) 663-2000
Xcel Energy	800-772-7858
Poudre Valley REA	800-432-1012
Xcel Energy Natural Gas	800-772-7858
Qwest Communications	800-244-1111
Town of Berthoud	(970) 532-2643
Town of Berthoud Electric & Water	(970) 962-3581
Platte River Power Authority	(970) 229-5320
Little Thompson Water District	(970) 532-2096

* This list is provided as a courtesy reference only. Northern Engineering Services assumes no responsibility for the accuracy or completeness of this list. In no way shall this list relinquish the Contractor's responsibility for locating all utilities prior to commencing any construction activity. Please contact the Utility Notification Center of Colorado (UNCC) at 811 for additional information.

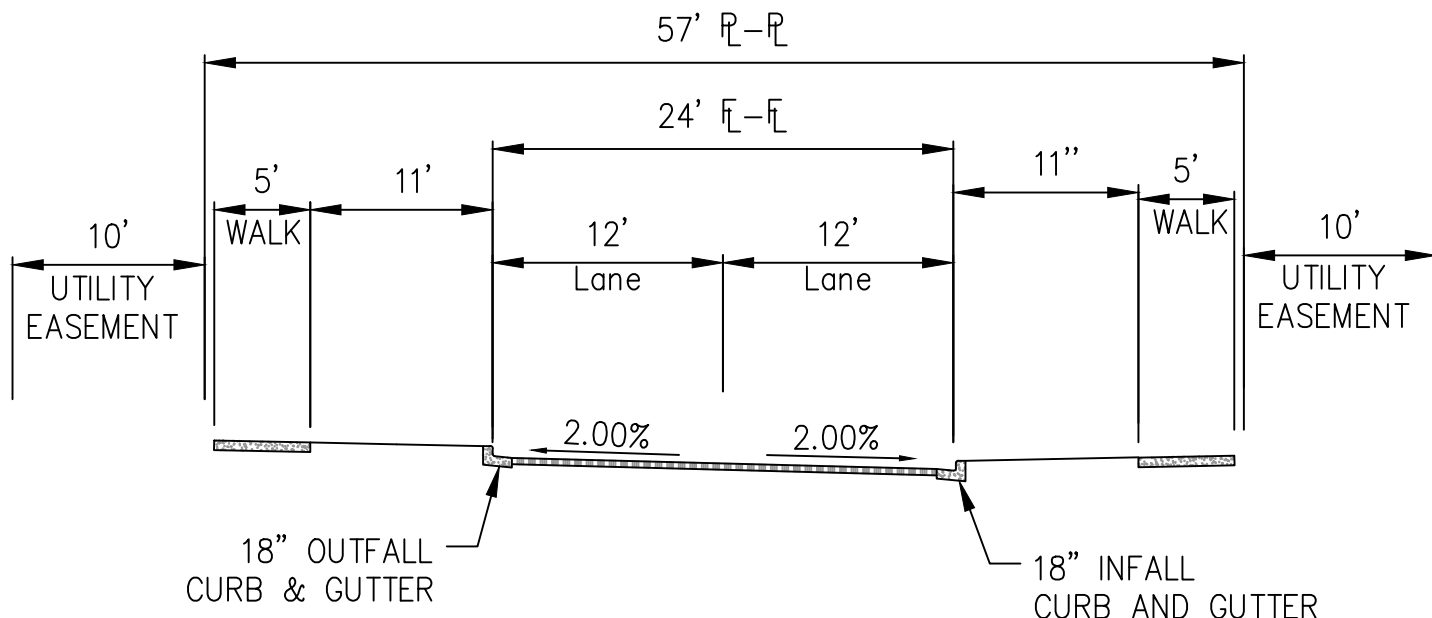
SHEET INDEX

1	COVER SHEET	DETAIL SHEETS
2	GENERAL & CONSTRUCTION NOTES	16-17 SANITARY SEWER DETAILS
3	EXISTING CONDITIONS & DEMOLITION PLAN	18-19 WATER DETAILS
4-5	CIVIL SITE PLAN	20-21 DRAINAGE DETAILS
UTILITY SHEETS		22-23 SITE DETAILS
6	OVERALL UTILITY PLAN	EROSION CONTROL SHEETS
SANITARY SEWER SHEETS		24 EROSION CONTROL PLAN
7	SANITARY A SEWER PLAN & PROFILE	25-26 EROSION CONTROL DETAILS
8	SANITARY A3 & A5 SEWER PLAN & PROFILE	DRAINAGE SHEETS
WATERLINE SHEETS		27 DRAINAGE EXHIBIT
9	WATERLINE 1 PLAN AND PROFILE	
10	WATERLINE 2, 3 & 4 PLAN AND PROFILE	
STORM DRAIN SHEETS		
11	STORM DRAIN PLAN AND PROFILE	
GRADING SHEETS		
12	OVERALL GRADING PLAN	
13-15	GRADING PLAN	

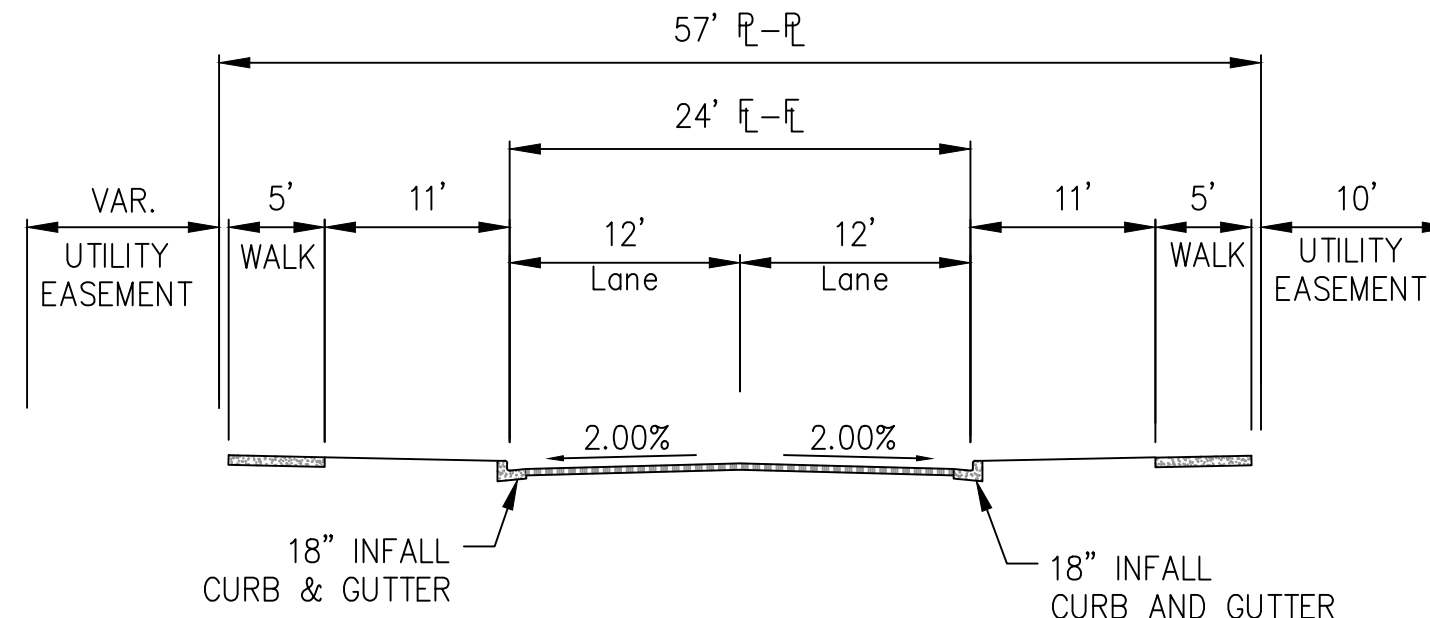
ABBREVIATIONS:

ABC	=	AGGREGATE BASE COURSE
ACP	=	ASBESTOS-CEMENT PIPE
BLDG	=	BUILDING
BP	=	BEGINNING POINT
CL	=	CENTERLINE
CMP	=	CORRUGATED METAL PIPE
C.O.	=	CLEAN OUT
DIP	=	DUCTILE IRON PIPE
DE	=	DRAINAGE EASEMENT
D, U & AE	=	DRAINAGE, UTILITY & ACCESS EASEMENT
D, U & PAE	=	DRAINAGE, UTILITY & PEDESTRIAN ACCESS EASEMENT
D & E	=	DRAINAGE & UTILITY EASEMENT
EAE	=	EMERGENCY ACCESS EASEMENT
EL or ELEV	=	ELEVATION
EOA	=	EDGE OF ASPHALT
EP	=	ENDING POINT
UE	=	UTILITY EASEMENT
FES	=	FLARED END SECTION
FFE	=	FINISHED FLOOR ELEVATION
FL	=	FLOWLINE
FH	=	FIRE HYDRANT
FG	=	FINISHED GRADE
GB	=	GRADE BREAK
GV	=	GATE VALVE
HC	=	HANDICAP
HP	=	HIGH POINT
INV	=	INVERT
LF	=	LINEAR FEET
LP	=	LOW POINT
MAX	=	MAXIMUM
MH or M.H.	=	MANHOLE
MIN	=	MINIMUM
PC	=	POINT OF CURVATURE
PCR	=	POINT OF CURVE RETURN
PERF	=	PERFORATED
PRC	=	POINT OF REVERSE CURVE
PT	=	POINT OF TANGENCY
PVC	=	POLYVINYL CHLORIDE
PVI	=	POINT OF VERTICAL INTERSECTION
PVMT	=	PAVEMENT
RCP	=	REINFORCED CONCRETE PIPE
RD	=	ROOF DRAIN
ROW	=	RIGHT OF WAY
STA	=	STATION
STD	=	STANDARD
SQ FT	=	SQUARE FOOT / FEET
SW	=	STEEL WATERLINE
TB	=	THRUST BLOCK
TBC	=	TOP BACK OF CURB
TYP	=	TYPICAL
UE	=	UTILITY EASEMENT
U & AE	=	UTILITY & ACCESS EASEMENT
WSEL	=	WATER SURFACE ELEVATION

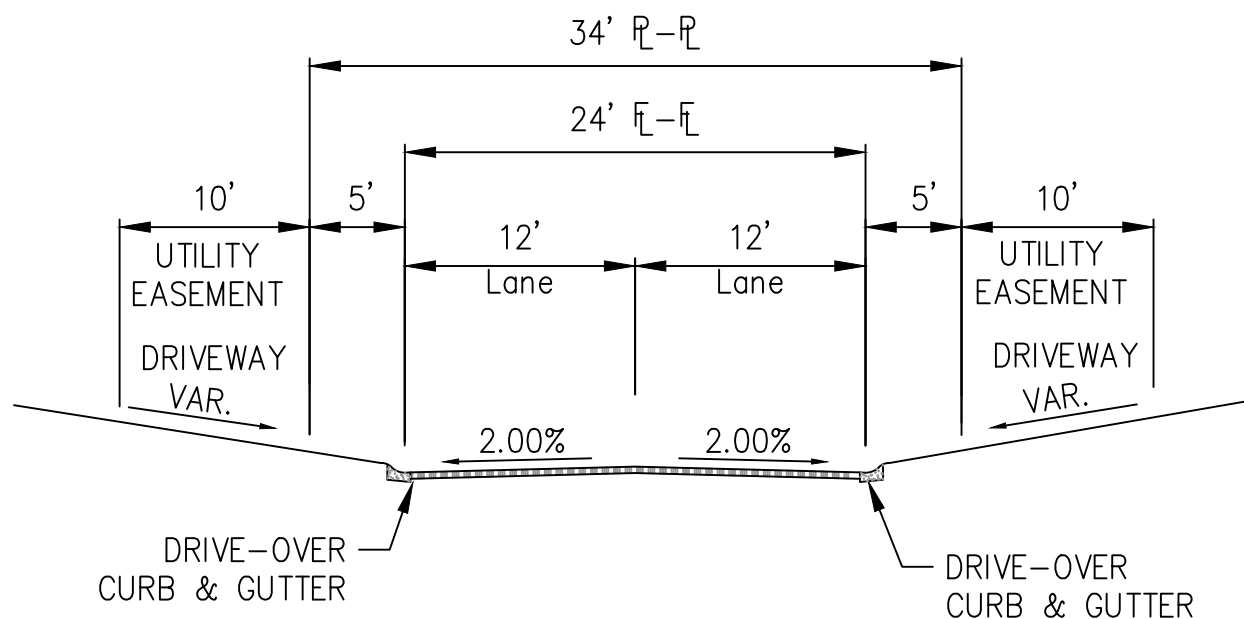
TYPICAL SECTIONS



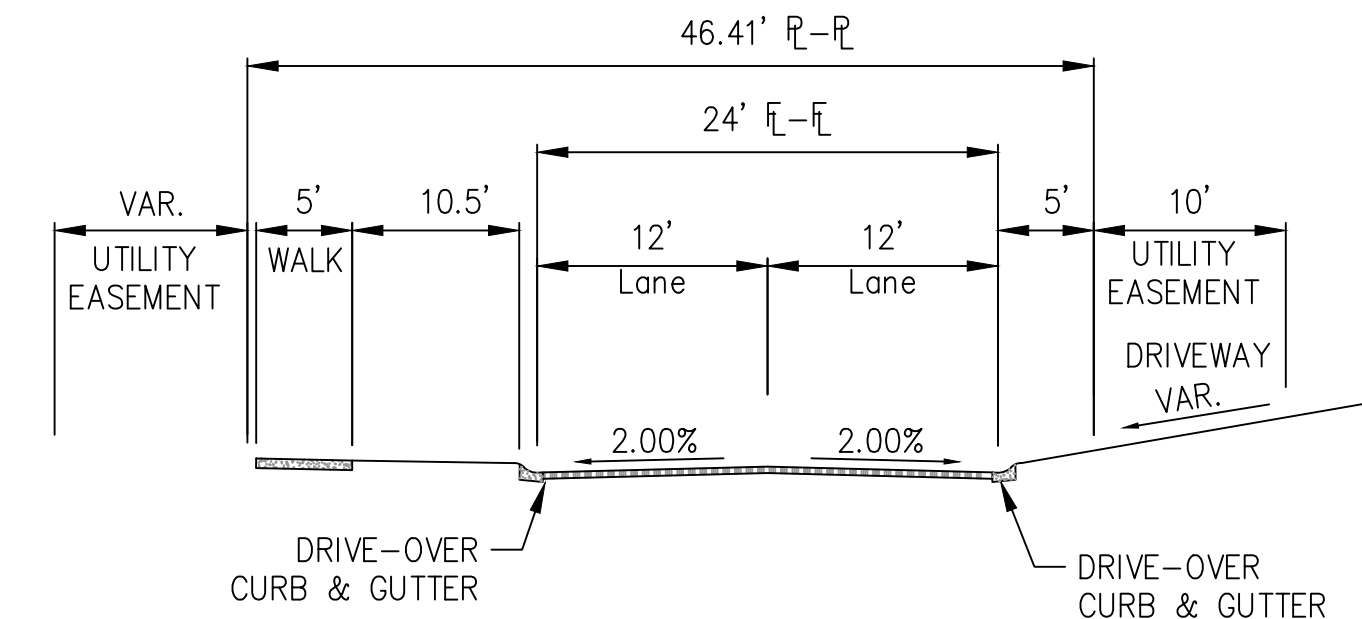
CROSS MOUNTAIN DRIVE - STREET SECTION
(SUPERELEVATED - DETACHED WALK BOTH SIDES) NTS



CANAAN STREET - STREET SECTION
(CENTERLINE CROWN - DETACHED WALK BOTH SIDES) NTS



EAST/WEST HIGGINS CREEK DRIVE, LOGAN PEAK WAY &
WEST END OF ANDREWS CREST DRIVE - STREET SECTION
(CENTERLINE CROWN - NO SIDEWALK) NTS



NORTH/SOUTH HIGGINS CREEK DRIVE
STREET SECTION NTS
(CENTERLINE CROWN - SIDEWALK WEST SIDE)

CALL UTILITY NOTIFICATION CENTER OF
COLORADO



Know what's below.
Call before you dig.

CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU
DIG, GRADE, OR EXCAVATE FOR THE MARKING OF
UNDERGROUND MEMBER UTILITIES.

TOWN OF BERTHOUD APPROVAL

ALL WORK SHALL BE CONSTRUCTED TO THE TOWN STANDARDS AND SPECIFICATIONS. THESE PLANS HAVE BEEN REVIEWED BY THE TOWN OF BERTHOUD FOR CONCEPT ONLY AND GENERAL CONFORMANCE WITH THE TOWN'S STANDARDS AND SPECIFICATIONS. THE REVIEW BY THE TOWN OF BERTHOUD DOES NOT IMPLY RESPONSIBILITY BY THE TOWN OF BERTHOUD OR THE TOWN ENGINEER FOR ACCURACY AND CORRECTNESS OF THE PLANS OR CALCULATIONS.

THESE PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF THE TOWN ENGINEER'S APPROVAL.

APPROVED BY: _____ Date: _____

Town Engineer _____

VANTAGE SUBDIVISION 7TH FILING

COVER SHEET

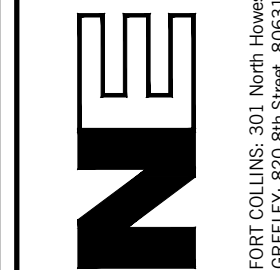
Sheet
CS1

1 of 27

Revisions:
No. _____ Date: _____
REVIEW SET
NOT FOR CONSTRUCTION
04/26/23

These drawings are instruments of service provided by Northern Engineering Services, Inc. in any type of construction unless signed and sealed by the engineer of Northern Engineering Services, Inc.

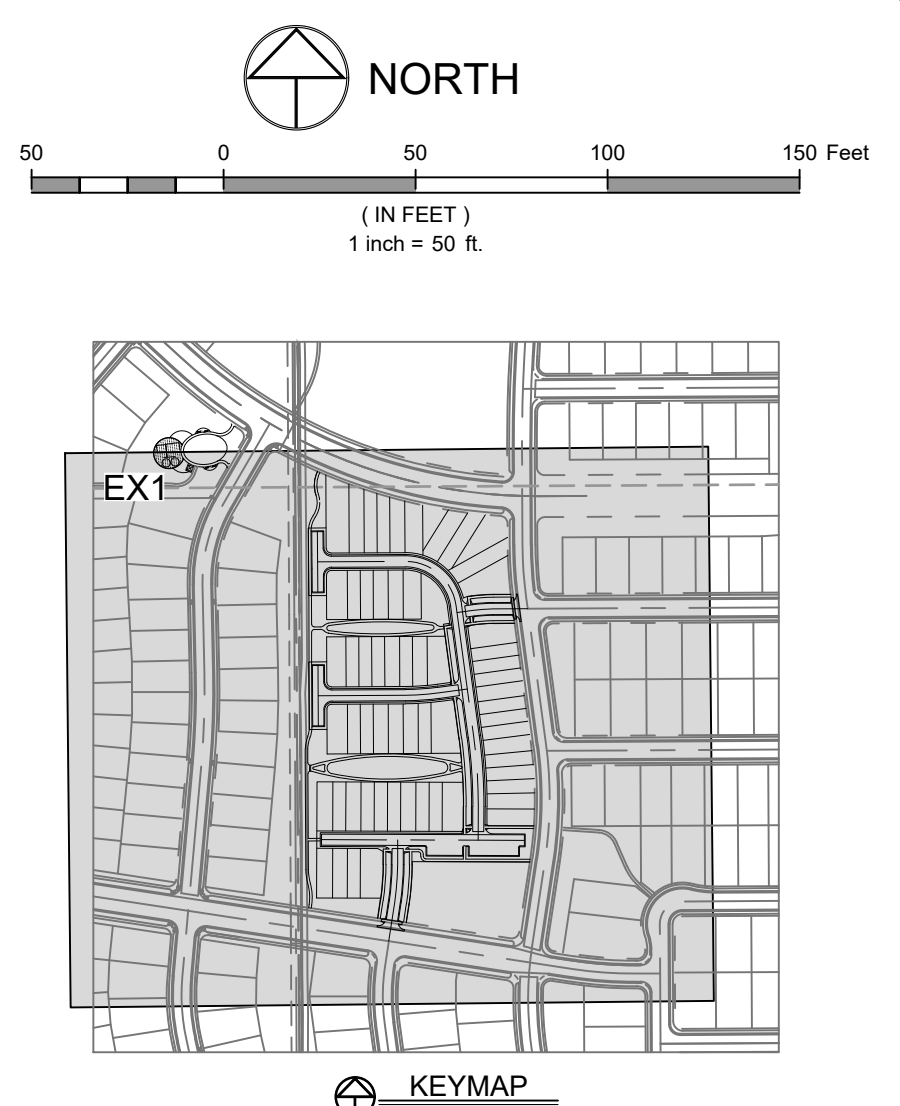
NORTHERN
ENGINEERING



FORT COLLINS: 301 North Howes Street, Suite 100, 80521
GREELEY: 820 8th Street, 80631
northernengineering.com
970.221.4158

PROJECT:	167-025	DATE:	04/26/23	SCALE:	N/A	P. MANAGER:	S. Thomas
DESIGNED BY:	N/A	DRAWN BY:	C. Pape				

DRAWING FILENAME: P:\167-025\Drawings\167-025_020N.dwg LAYOUT NAME: EX1 DATE: Apr 25, 2023 - 11:34am CAD OPERATOR: ingehpna
LIST OF SHEETS: [167-025_010] [167-025_020] [167-025_030] [167-025_040] [167-025_050] [167-025_060] [167-025_070] [167-025_080] [167-025_090] [167-025_100] [167-025_110] [167-025_120] [167-025_130] [167-025_140] [167-025_150] [167-025_160] [167-025_170] [167-025_180] [167-025_190] [167-025_200] [167-025_210] [167-025_220] [167-025_230] [167-025_240] [167-025_250] [167-025_260] [167-025_270] [167-025_280] [167-025_290] [167-025_300] [167-025_310] [167-025_320] [167-025_330] [167-025_340] [167-025_350] [167-025_360] [167-025_370] [167-025_380] [167-025_390] [167-025_400] [167-025_410] [167-025_420] [167-025_430] [167-025_440] [167-025_450] [167-025_460] [167-025_470] [167-025_480] [167-025_490] [167-025_500] [167-025_510] [167-025_520] [167-025_530] [167-025_540] [167-025_550] [167-025_560] [167-025_570] [167-025_580] [167-025_590] [167-025_600] [167-025_610] [167-025_620] [167-025_630] [167-025_640] [167-025_650] [167-025_660] [167-025_670] [167-025_680] [167-025_690] [167-025_700] [167-025_710] [167-025_720] [167-025_730] [167-025_740] [167-025_750] [167-025_760] [167-025_770] [167-025_780] [167-025_790] [167-025_800] [167-025_810] [167-025_820] [167-025_830] [167-025_840] [167-025_850] [167-025_860] [167-025_870] [167-025_880] [167-025_890] [167-025_900] [167-025_910] [167-025_920] [167-025_930] [167-025_940] [167-025_950] [167-025_960] [167-025_970] [167-025_980] [167-025_990] [167-025_1000]

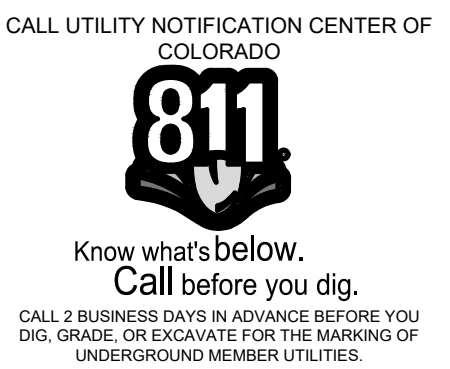


LEGEND:

PROJECT BOUNDARY	---
EXISTING RIGHT-OF-WAY	---
EXISTING MAJOR CONTOUR	---5015---
EXISTING MINOR CONTOUR	---5013---
EXISTING STORM SEWER	---
EXISTING TELEPHONE	---
EXISTING GAS	---
EXISTING SANITARY SEWER	---
EXISTING WATER	---
EXISTING ELECTRIC	---
EXISTING FIBER OPTIC	---
EXISTING CABLE	---
EXISTING OVERHEAD UTILITY	---
EXISTING FENCE	---
EXISTING ELECTRIC VAULT	---
EXISTING FIRE HYDRANT	---
EXISTING IRRIGATION BOX	---
EXISTING WATER METER	---
EXISTING GAS METER	---
EXISTING TELEPHONE PEDESTAL	---
APPROXIMATE LIMITS OF CONCRETE/ ASPHALT REMOVAL	---
CURB & GUTTER TO BE REMOVED	---
SAWCUT	---

NOTES:

1. THE SIZE, TYPE AND LOCATION OF ALL KNOWN UNDERGROUND UTILITIES ARE APPROXIMATE WHEN SHOWN ON THESE DRAWINGS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE OF ALL UNDERGROUND UTILITIES IN THE AREA OF THE WORK. BEFORE COMMENCING NEW CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES AND SHALL BE RESPONSIBLE FOR ALL UNKNOWN UNDERGROUND UTILITIES.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING DEMOLITION, REMOVAL, REPLACEMENT, AND DISPOSAL OF ALL FACILITIES AND MATERIAL.
3. CONTRACTOR IS ENCOURAGED TO PERFORM DEMOLITION IN A MANNER THAT MAXIMIZES SALVAGE, RE-USE, AND RECYCLING OF MATERIALS. THIS INCLUDES APPROPRIATE SORTING AND STORING. IN PARTICULAR, DEMOLISHED CONCRETE, ASPHALT, AND BASE COURSE SHOULD BE RECYCLED IF POSSIBLE.
4. ALL SYMBOLS ARE ONLY GRAPHICALLY REPRESENTED AND ARE NOT TO SCALE.
5. CONTACT THE PROJECT SURVEYOR FOR ANY INQUIRIES RELATED TO THE EXISTING SITE SURVEY.



VANTAGE SUBDIVISION 7TH FILING
EXISTING CONDITIONS &
DEMOLITION PLAN

Revisions:
No. Date:
1
04/26/23
REVIEW SET
NOT FOR CONSTRUCTION

These drawings are instruments of service provided by Northern Engineering Services, Inc. for the project described herein. No other use, reproduction, or distribution of these drawings is permitted without the written consent of Northern Engineering Services, Inc.

NORTHERN ENGINEERING
N
FORT COLLINS, 301 North Hovea Street, Suite 100, 80521
GREELEY, 820 8th Street, 80631
970.221.4158
northernengineering.com

PROJECT:	167-025	DATE:	04/26/23	SCALE:	1" = 50'	P. MANAGER:	S. Thomas
DESIGNED BY:	C. Pope	DRAWN BY:	S. Rzeszut				



 T
 D
 1
 2
 3
 4

PROPOSED SIGNS:

R8
125

R1-1



Know what's below.
Call before you dig.

CIVIL SITE PLAN

Sheet
CSP2
5 of 27

Revisions:

Date:

Revisions: _____ Date: _____

REVIEW SET

NOT FOR CONSTRUCTION

04/12/2023

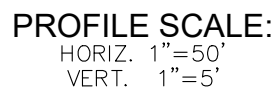
These drawings are instruments of service provided by Northern Engineering Services, Inc. and are not to be used for any type of construction unless signed and sealed by a Professional Engineer in the employ of Northern Engineering Services, Inc.

NE | **NORTHERN
ENGINEERING**

PORT COLLINS, 301 North Haves Street, Suite 100, 89521
DUBLIN, 340 8th Street, 89031

970.221.4158
northernengineering.com

PROJECT: 167-025	DATE: 04/26/23
DESIGNED BY: C. Pape	SCALE: 1" = 30'
DRAWN BY: S. Rzeszut	P. MANAGEE S. Thomas

 **KEYMAP**

- | | |
|-----------------------------|--|
| PROPOSED WATER MAIN | |
| EXISTING WATER MAIN | |
| PROPOSED SANITARY SEWER | |
| EXISTING SANITARY SEWER | |
| PROPOSED SEWER SERVICE | |
| PROPOSED WATER SERVICE | |
| PROPOSED FIRE HYDRANT | |
| EXISTING FIRE HYDRANT | |
| PROPOSED STORM SEWER | |
| EXISTING STORM SEWER | |
| EXISTING TELEPHONE | |
| EXISTING GAS | |
| EXISTING CABLE | |
| PROPOSED CURB & GUTTER | |
| PROPERTY BOUNDARY | |
| PROPOSED LOT LINE | |
| EXISTING LOT LINE | |
| PROPOSED ROW | |
| EXISTING ROW | |
| EASEMENT LINE | |
| PROPOSED STORM INLET | |
| PROPOSED STREET LIGHT | |
| EXISTING TELEPHONE PEDESTAL | |

1. THE SIZE, TYPE AND LOCATION OF ALL KNOWN UNDERGROUND UTILITIES ARE APPROXIMATE WHEN SHOWN ON THESE DRAWINGS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE OF ALL UNDERGROUND UTILITIES IN THE AREA OF THE WORK. BEFORE COMMENCING NEW CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES AND SHALL BE RESPONSIBLE FOR ALL UNKNOWN UNDERGROUND UTILITIES.
2. ALL WATER CONSTRUCTION SHALL BE PER TOWN OF BERTHOUD ENGINEERING AND INSPECTION STANDARDS AND CONSTRUCTION SPECIFICATIONS, LATEST EDITION, EXCEPT FOR THE STANDARDS RELATED TO THE WATER SERVICES, WHICH SHALL BE PER TOWN STANDARDS, EXCEPT THAT NO MECHANICAL JOINT RESTRAINTS ARE REQUIRED BETWEEN FITTINGS UNLESS SPECIFICALLY SHOWN ON THE PLAN OR AS REQUIRED FOR ABNORMAL DEFLECTIONS.
3. ALL WATER FITTINGS AND VALVES ARE ONLY GRAPHICALLY REPRESENTED AND ARE NOT TO SCALE.
4. ALL WATERLINES SHALL HAVE A MINIMUM OF 5' OF COVER FROM FINISHED GRADE TO TOP OF PIPE.
5. PIPE LENGTH LABELS SHOWN IN PLAN VIEW DENOTE THE HORIZONTAL DISTANCE BETWEEN HORIZONTAL FITTINGS, AND DO NOT ACCOUNT FOR VERTICAL BENDS OR DEFLECTIONS.
6. UTILITY SERVICES ARE SHOWN IN A SCHEMATIC FASHION ONLY. EXACT LOCATIONS WILL BE PER THE REQUIREMENTS OF THE RESPECTIVE UTILITY PROVIDERS, AND ARE SUBJECT TO CHANGE IN THE FIELD.
7. MAINTAIN 10' HORIZONTAL AND 18" VERTICAL MINIMUM SEPARATION BETWEEN ALL SANITARY SEWER MAINS, WATER MAINS & SERVICES.
8. REFER TO THE PLAN FOR LOT AREAS, TRACT SIZES, EASEMENTS, LOT DIMENSIONS, UTILITY EASEMENTS, OTHER EASEMENTS, AND OTHER SURVEY INFORMATION.
9. LIMITS OF STREET CUT ARE APPROXIMATE. FINAL LIMITS ARE TO BE DETERMINED IN THE FIELD BY THE TOWN OF BERTHOUD ENGINEERING INSPECTOR. ALL REPAIRS TO BE IN ACCORDANCE WITH TOWN OF BERTHOUD STREET REPAIR STANDARDS.
10. ALL WATER SERVICES SHALL BE 9" UNLESS OTHERWISE NOTED.
11. TOP OF WATER METER TO BE PLACED AT A GRADE OF 4% FROM TOP BACK OF CURB

CALL UTILITY NOTIFICATION CENTER OF
COLORADO



Know what's below.
Call before you dig.
2 BUSINESS DAYS IN ADVANCE BEFORE YOU
GRADE, OR EXCAVATE FOR THE MARKING OF
UNDERGROUND MEMBER UTILITIES.

WATER LINE 1 PLAN & PROFILE

Sheet
VT1

9 of 27

DESIGNED BY:	SCALE:
--------------	--------

DRAWN BY:	P. MANAGE
-----------	-----------

NE NORTHERN
ENGINEERING

FORT COLLINS: 301 North Howes Street, Suite 100, 80521
GREELEY: 820 8th Street, 80631

These drawings are instruments of service provided by Northern Engineering Services, Inc. and are not to be used for any type of construction unless signed and sealed by a Professional Engineer in the employ of Northern Engineering Services, Inc.

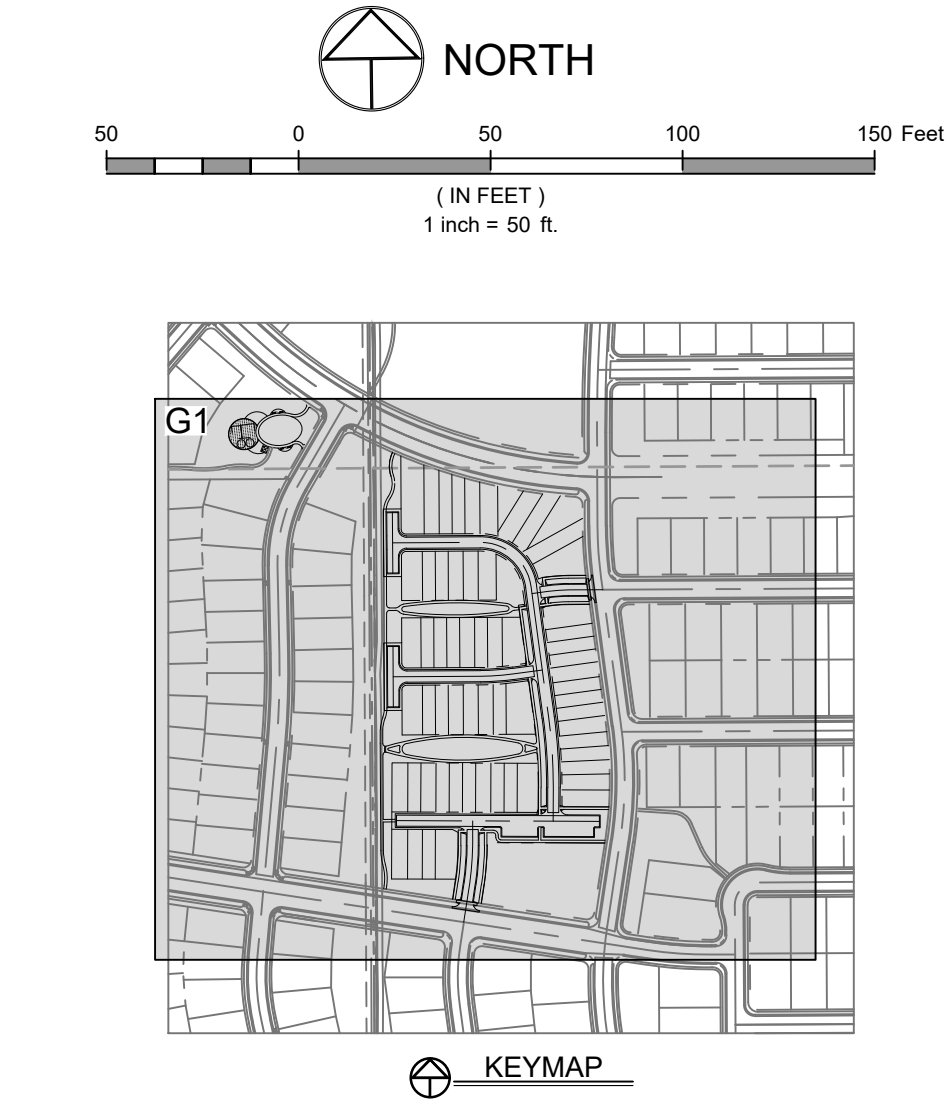
Revisions:

No.

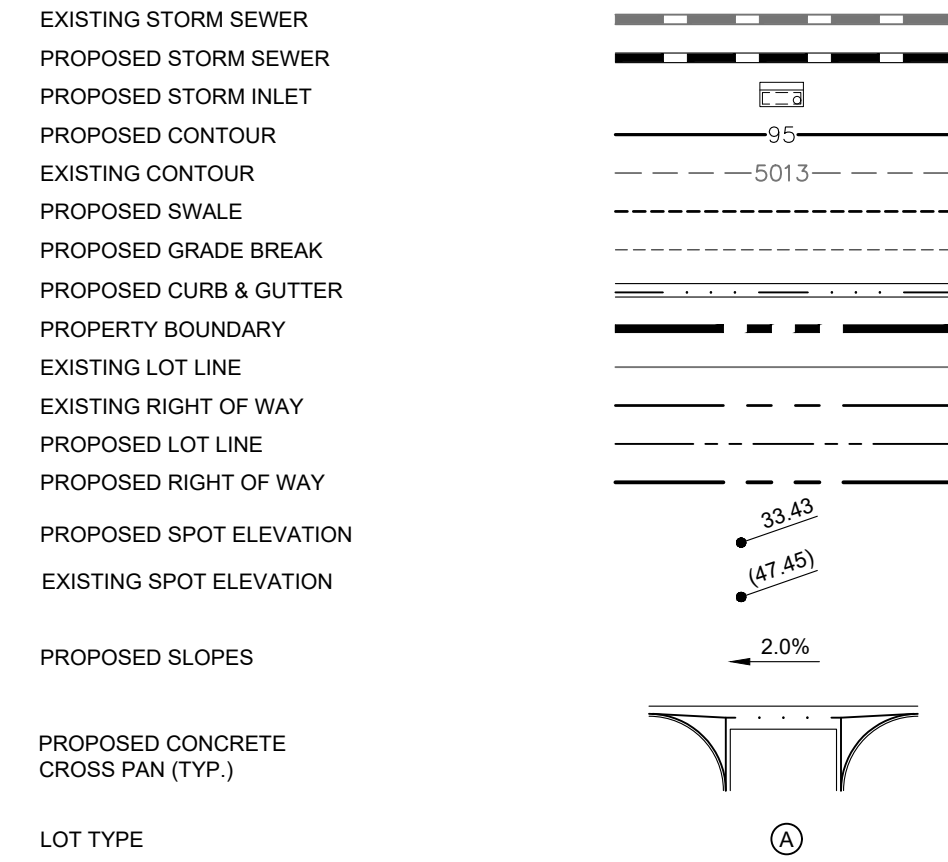
Date: _____

REVIEW OF
NOT FOR CONSTRUCTION
04/26/23

DRAWING FILENAME: P:\167-025\Drawings\167-025_000A.dwg LAYOUT NAME: 001 DATE: Apr 26, 2023 - 11:45am CAD OPERATOR: hpholmes
LIST OF SHEETS: [167-025_000A] [167-025_000B] [167-025_000C] [167-025_000D] [167-025_000E] [167-025_000F] [167-025_000G] [167-025_000H] [167-025_000I] [167-025_000J] [167-025_000K] [167-025_000L] [167-025_000M] [167-025_000N] [167-025_000O] [167-025_000P] [167-025_000Q] [167-025_000R] [167-025_000S] [167-025_000T] [167-025_000U] [167-025_000V] [167-025_000W] [167-025_000X] [167-025_000Y] [167-025_000Z] [167-025_000A1] [167-025_000A2] [167-025_000A3] [167-025_000A4] [167-025_000A5] [167-025_000A6] [167-025_000A7] [167-025_000A8] [167-025_000A9] [167-025_000AA] [167-025_000AB] [167-025_000AC] [167-025_000AD] [167-025_000AE] [167-025_000AF] [167-025_000AG] [167-025_000AH] [167-025_000AI] [167-025_000AJ] [167-025_000AK] [167-025_000AL] [167-025_000AM] [167-025_000AN] [167-025_000AO] [167-025_000AP] [167-025_000AQ] [167-025_000AR] [167-025_000AS] [167-025_000AT] [167-025_000AU] [167-025_000AV] [167-025_000AW] [167-025_000AX] [167-025_000AY] [167-025_000AZ] [167-025_000BA] [167-025_000BB] [167-025_000BC] [167-025_000BD] [167-025_000BE] [167-025_000BF] [167-025_000BG] [167-025_000BH] [167-025_000BI] [167-025_000BJ] [167-025_000BK] [167-025_000BL] [167-025_000BM] [167-025_000BN] [167-025_000BO] [167-025_000BP] [167-025_000BQ] [167-025_000BR] [167-025_000BS] [167-025_000BT] [167-025_000BU] [167-025_000BV] [167-025_000BW] [167-025_000BX] [167-025_000BY] [167-025_000BZ] [167-025_000CA] [167-025_000CB] [167-025_000CC] [167-025_000CD] [167-025_000CE] [167-025_000CF] [167-025_000CG] [167-025_000CH] [167-025_000CI] [167-025_000CJ] [167-025_000CK] [167-025_000CL] [167-025_000CM] [167-025_000CN] [167-025_000CO] [167-025_000CP] [167-025_000CQ] [167-025_000CR] [167-025_000CS] [167-025_000CT] [167-025_000CU] [167-025_000CV] [167-025_000CW] [167-025_000CX] [167-025_000CY] [167-025_000CZ] [167-025_000DA] [167-025_000DB] [167-025_000DC] [167-025_000DD] [167-025_000DE] [167-025_000DF] [167-025_000DG] [167-025_000DH] [167-025_000DI] [167-025_000DJ] [167-025_000DK] [167-025_000DL] [167-025_000DM] [167-025_000DN] [167-025_000DO] [167-025_000DP] [167-025_000DQ] [167-025_000DR] [167-025_000DS] [167-025_000DT] [167-025_000DU] [167-025_000DV] [167-025_000DW] [167-025_000DX] [167-025_000DY] [167-025_000DZ] [167-025_000EA] [167-025_000EB] [167-025_000EC] [167-025_000ED] [167-025_000EE] [167-025_000EF] [167-025_000EG] [167-025_000EH] [167-025_000EI] [167-025_000EJ] [167-025_000EK] [167-025_000EL] [167-025_000EM] [167-025_000EN] [167-025_000EO] [167-025_000EP] [167-025_000EQ] [167-025_000ER] [167-025_000ES] [167-025_000ET] [167-025_000EU] [167-025_000EV] [167-025_000EW] [167-025_000EX] [167-025_000EY] [167-025_000EZ] [167-025_000FA] [167-025_000FB] [167-025_000FC] [167-025_000FD] [167-025_000FE] [167-025_000FF] [167-025_000FG] [167-025_000FH] [167-025_000FI] [167-025_000FJ] [167-025_000FK] [167-025_000FL] [167-025_000FM] [167-025_000FN] [167-025_000FO] [167-025_000FP] [167-025_000FQ] [167-025_000FR] [167-025_000FS] [167-025_000FT] [167-025_000FU] [167-025_000FV] [167-025_000FW] [167-025_000FX] [167-025_000FY] [167-025_000FZ] [167-025_000GA] [167-025_000GB] [167-025_000GC] [167-025_000GD] [167-025_000GE] [167-025_000GF] [167-025_000GG] [167-025_000GH] [167-025_000GI] [167-025_000GJ] [167-025_000GK] [167-025_000GL] [167-025_000GM] [167-025_000GN] [167-025_000GO] [167-025_000GP] [167-025_000GQ] [167-025_000GR] [167-025_000GS] [167-025_000GT] [167-025_000GU] [167-025_000GV] [167-025_000GW] [167-025_000GX] [167-025_000GY] [167-025_000GZ] [167-025_000HA] [167-025_000HB] [167-025_000HC] [167-025_000HD] [167-025_000HE] [167-025_000HF] [167-025_000HG] [167-025_000HH] [167-025_000HI] [167-025_000HJ] [167-025_000HK] [167-025_000HL] [167-025_000HM] [167-025_000HN] [167-025_000HO] [167-025_000HP] [167-025_000HQ] [167-025_000HR] [167-025_000HS] [167-025_000HT] [167-025_000HU] [167-025_000HV] [167-025_000HW] [167-025_000HX] [167-025_000HY] [167-025_000HZ] [167-025_000IA] [167-025_000IB] [167-025_000IC] [167-025_000ID] [167-025_000IE] [167-025_000IF] [167-025_000IG] [167-025_000IH] [167-025_000II] [167-025_000IJ] [167-025_000IK] [167-025_000IL] [167-025_000IM] [167-025_000IN] [167-025_000IO] [167-025_000IP] [167-025_000IQ] [167-025_000IR] [167-025_000IS] [167-025_000IT] [167-025_000IU] [167-025_000IV] [167-025_000IW] [167-025_000IX] [167-025_000IY] [167-025_000IZ] [167-025_000JA] [167-025_000JB] [167-025_000JC] [167-025_000JD] [167-025_000JE] [167-025_000JF] [167-025_000JG] [167-025_000JH] [167-025_000JI] [167-025_000JJ] [167-025_000JK] [167-025_000JL] [167-025_000JM] [167-025_000JN] [167-025_000JO] [167-025_000JP] [167-025_000JQ] [167-025_000JR] [167-025_000JS] [167-025_000JT] [167-025_000JU] [167-025_000JV] [167-025_000JW] [167-025_000JX] [167-025_000JY] [167-025_000JZ] [167-025_000KA] [167-025_000KB] [167-025_000KC] [167-025_000KD] [167-025_000KE] [167-025_000KF] [167-025_000KG] [167-025_000KH] [167-025_000KI] [167-025_000KJ] [167-025_000KK] [167-025_000KL] [167-025_000KM] [167-025_000KN] [167-025_000KO] [167-025_000KP] [167-025_000KQ] [167-025_000KR] [167-025_000KS] [167-025_000KT] [167-025_000KU] [167-025_000KV] [167-025_000KW] [167-025_000KX] [167-025_000KY] [167-025_000KZ] [167-025_000LA] [167-025_000LB] [167-025_000LC] [167-025_000LD] [167-025_000LE] [167-025_000LF] [167-025_000LG] [167-025_000LH] [167-025_000LI] [167-025_000LJ] [167-025_000LK] [167-025_000LL] [167-025_000LM] [167-025_000LN] [167-025_000LO] [167-025_000LP] [167-025_000LQ] [167-025_000LR] [167-025_000LS] [167-025_000LT] [167-025_000LU] [167-025_000LV] [167-025_000LW] [167-025_000LX] [167-025_000LY] [167-025_000LZ] [167-025_000MA] [167-025_000MB] [167-025_000MC] [167-025_000MD] [167-025_000ME] [167-025_000MF] [167-025_000MG] [167-025_000MH] [167-025_000MI] [167-025_000MJ] [167-025_000MK] [167-025_000ML] [167-025_000MM] [167-025_000MN] [167-025_000MO] [167-025_000MP] [167-025_000MQ] [167-025_000MR] [167-025_000MS] [167-025_000MT] [167-025_000MU] [167-025_000MV] [167-025_000MW] [167-025_000MX] [167-025_000MY] [167-025_000MZ] [167-025_000NA] [167-025_000NB] [167-025_000NC] [167-025_000ND] [167-025_000NE] [167-025_000NF] [167-025_000NG] [167-025_000NH] [167-025_000NI] [167-025_000NJ] [167-025_000NK] [167-025_000NL] [167-025_000NM] [167-025_000NN] [167-025_000NO] [167-025_000NP] [167-025_000NQ] [167-025_000NR] [167-025_000NS] [167-025_000NT] [167-025_000NU] [167-025_000NV] [167-025_000NW] [167-025_000NX] [167-025_000NY] [167-025_000NZ] [167-025_000OA] [167-025_000OB] [167-025_000OC] [167-025_000OD] [167-025_000OE] [167-025_000OF] [167-025_000OG] [167-025_000OH] [167-025_000OI] [167-025_000OJ] [167-025_000OK] [167-025_000OL] [167-025_000OM] [167-025_000ON] [167-025_000OO] [167-025_000OP] [167-025_000OQ] [167-025_000OR] [167-025_000OS] [167-025_000OT] [167-025_000OU] [167-025_000OV] [167-025_000OW] [167-025_000OX] [167-025_000OY] [167-025_000OZ] [167-025_000PA] [167-025_000PB] [167-025_000PC] [167-025_000PD] [167-025_000PE] [167-025_000PF] [167-025_000PG] [167-025_000PH] [167-025_000PI] [167-025_000PJ] [167-025_000PK] [167-025_000PL] [167-025_000PM] [167-025_000PN] [167-025_000PO] [167-025_000PP] [167-025_000PQ] [167-025_000PR] [167-025_000PS] [167-025_000PT] [167-025_000PU] [167-025_000PV] [167-025_000PW] [167-025_000PX] [167-025_000PY] [167-025_000PZ] [167-025_000QA] [167-025_000QB] [167-025_000QC] [167-025_000QD] [167-025_000QE] [167-025_000QF] [167-025_000QG] [167-025_000QH] [167-025_000QI] [167-025_000QJ] [167-025_000QK] [167-025_000QL] [167-025_000QM] [167-025_000QN] [167-025_000QO] [167-025_000QP] [167-025_000QQ] [167-025_000QR] [167-025_000QS] [167-025_000QT] [167-025_000QU] [167-025_000QV] [167-025_000QW] [167-025_000QX] [167-025_000QY] [167-025_000QZ] [167-025_000RA] [167-025_000RB] [167-025_000RC] [167-025_000RD] [167-025_000RE] [167-025_000RF] [167-025_000RG] [167-025_000RH] [167-025_000RI] [167-025_000RJ] [167-025_000RK] [167-025_000RL] [167-025_000RM] [167-025_000RN] [167-025_000RO] [167-025_000RP] [167-025_000RQ] [167-025_000RR] [167-025_000RS] [167-025_000RT] [167-025_000RU] [167-025_000RV] [167-025_000RW] [167-025_000RX] [167-025_000RY] [167-025_000RZ] [167-025_000SA] [167-025_000SB] [167-025_000SC] [167-025_000SD] [167-025_000SE] [167-025_000SF] [167-025_000SG] [167-025_000SH] [167-025_000SI] [167-025_000SJ] [167-025_000SK] [167-025_000SL] [167-025_000SM] [167-025_000SN] [167-025_000SO] [167-025_000SP] [167-025_000SQ] [167-025_000SR] [167-025_000SS] [167-025_000ST] [167-025_000SU] [167-025_000SV] [167-025_000SW] [167-025_000SX] [167-025_000SY] [167-025_000SZ] [167-025_000TA] [167-025_000TB] [167-025_000TC] [167-025_000TD] [167-025_000TE] [167-025_000TF] [167-025_000TG] [167-025_000TH] [167-025_000TI] [167-025_000TJ] [167-025_000TK] [167-025_000TL] [167-025_000TM] [167-025_000TN] [167-025_000TO] [167-025_000TP] [167-025_000TQ] [167-025_000TR] [167-025_000TS] [167-025_000TT] [167-025_000TU] [167-025_000TV] [167-025_000TW] [167-025_000TX] [167-025_000TY] [167-025_000TZ] [167-025_000UA] [167-025_000UB] [167-025_000UC] [167-025_000UD] [167-025_000UE] [167-025_000UF] [167-025_000UG] [167-025_000UH] [167-025_000UI] [167-025_000UJ] [167-025_000UK] [167-025_000UL] [167-025_000UM] [167-025_000UN] [167-025_000UO] [167-025_000UP] [167-025_000UQ] [167-025_000UR] [167-025_000US] [167-025_000UT] [167-025_000UU] [167-025_000UV] [167-025_000UW] [167-025_000UX] [167-025_000UY] [167-025_000UZ] [167-025_000VA] [167-025_000VB] [167-025_000VC] [167-025_000VD] [167-025_000VE] [167-025_000VF] [167-025_000VG] [167-025_000VH] [167-025_000VI] [167-025_000VJ] [167-025_000VK] [167-025_000VL] [167-025_000VM] [167-025_000VN] [167-025_000VO] [167-025_000VP] [167-025_000VQ] [167-025_000VR] [167-025_000VS] [167-025_000VT] [167-025_000VU] [167-025_000VV] [167-025_000VW] [167-025_000VX] [167-025_000VY] [167-025_000VZ] [167-025_000WA] [167-025_000WB] [167-025_000WC] [167-025_000WD] [167-025_000WE] [167-025_000WF] [167-025_000WG] [167-025_000WH] [167-025_000WI] [167-025_000WJ] [167-025_000WK] [167-025_000WL] [167-025_000WM] [167-025_000WN] [167-025_000WO] [167-025_000WP] [167-025_000WQ] [167-025_000WR] [167-025_000WS] [167-025_000WT] [167-025_000WU] [167-025_000WV] [167-025_000WW] [167-025_000WX] [167-025_000WY] [167-025_000WZ] [167-025_000XA] [167-025_000XB] [167-025_000XC] [167-025_000XD] [167-025_000XE] [167-025_000XF] [167-025_000XG] [167-025_000XH] [167-025_000XI] [167-025_000XJ] [167-025_000XK] [167-025_000XL] [167-025_000XM] [167-025_000XN] [167-025_000XO] [167-025_000XP] [167-025_000XQ] [167-025_000XR] [167-025_000XS] [167-025_000XT] [167-025_000XU] [167-025_000XV] [167-025_000XW] [167-025_000XX] [167-025_000XY] [167-025_000XZ] [167-025_000YA] [167-025_000YB] [167-025_000YC] [167-025_000YD] [167-025_000YE] [167-025_000YF] [167-025_000YG] [167-025_000YH] [167-025_000YI] [167-025_000YJ] [167-025_000YK] [167-025_000YL] [167-025_000YM] [167-025_000YN] [167-025_000YO] [167-025_000YP] [167-025_000YQ] [167-025_000YR] [167-025_000YS] [167-025_000YT] [167-025_000YU] [167-025_000YV] [167-025_000YW] [167-025_000YX] [167-025_000YY] [167-025_000YZ] [167-025_000ZA] [167-025_000ZB] [167-025_000ZC] [167-025_000ZD] [167-025_000ZE] [167-025_000ZF] [167-025_000ZG] [167-025_000ZH] [167-025_000ZI] [167-025_000ZJ] [167-025_000ZK] [167-025_000ZL] [167-025_000ZM] [167-025_000ZN] [167-025_000ZO] [167-025_000ZP] [167-025_000ZQ] [167-025_000ZR] [167-025_000ZS] [167-025_000ZT] [167-025_000ZU] [167-025_000ZV] [167-025_000ZW] [167-025_000ZX] [167-025_000ZY] [167-025_000ZZ]

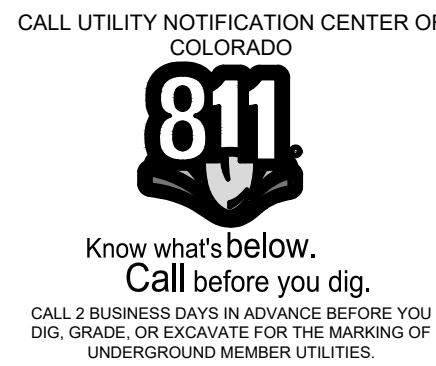


LEGEND:



NOTES:

1. THE SIZE, TYPE AND LOCATION OF ALL KNOWN UNDERGROUND UTILITIES ARE APPROXIMATE WHEN SHOWN ON THESE DRAWINGS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE OF ALL UNDERGROUND UTILITIES IN THE AREA OF THE WORK. BEFORE COMMENCING NEW CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES AND SHALL BE RESPONSIBLE FOR ALL UNKNOWN UNDERGROUND UTILITIES.
2. REFER TO THE PLAT FOR LOT AREAS, TRACT SIZES, EASEMENTS, LOT DIMENSIONS, UTILITY EASEMENTS, OTHER EASEMENTS, AND OTHER SURVEY INFORMATION.
3. ALL PROJECT DATA IS ON VERTICAL DATUM: NAVD88. SEE COVER SHEET FOR BENCHMARK REFERENCES.
4. ALL CURB SPOTS SHOWN ARE FLOWLINE ELEVATIONS. ALL OTHER SPOTS ARE FINISHED GRADE ELEVATIONS.
5. ALL GARAGE PADS/TOP OF DRIVEWAY ELEVATIONS ARE BASED ON EITHER TWO OR THREE STEPS IN THE GARAGE AND A 2% SLOPE GARAGE PAD. MINIMUM BACK OF GARAGE PAD TO BE 0.3' BELOW TOP OF FOUNDATION FOR 2 STEPS AND 0.9' BELOW TOP OF FOUNDATION FOR 3 STEPS. IF MODIFICATIONS TO THESE ASSUMPTIONS ARE MADE, THEY MUST BE SHOWN ON THE PLOT PLAN AND APPROVED BY THE GOVERNING AGENCY.
6. ALL STAIRS CALLED OUT ON PLANS ARE SPACED EVENLY ALONG STRAIGHT SECTIONS. NO STAIRS SHALL BE WITHIN 1' OF PUBLIC ROW. STAIRS CALLED OUT AT TURNING POINTS ARE THE REQUIRED TREAD LENGTH BASED ON RISE, BEYOND THE LANDING. ALL PATIOS HAVE BEEN GRADED WITH THE SAME ASSUMPTIONS WITH TWO 6" STAIRS WITHIN THE PATIO AND ONE ADDITIONAL 6" STAIR AT THE SIDEWALK CONNECTION POINT TO THE PATIO. SEE DETAIL BELOW FOR MORE INFORMATION.
7. ALL ACCESS WALKS TO INDIVIDUAL HOMES ARE 4' IN WIDTH.



VANTAGE SUBDIVISION 7TH FILING

OVERALL GRADING PLAN

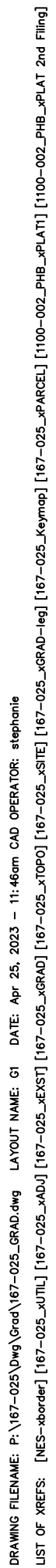
Sheet
OG1
12 of 27

Revisions:
No. 04/26/23
DATE: 04/26/23
DESIGNED BY: C. Pope
DRAWN BY: C. Pope
P. MANAGER: S. Thomas
NORTH
1 inch = 50 ft.
KEYMAP

These drawings are instruments of service provided by Northern Engineering Services, Inc. any type of construction unless signed and sealed by the engineer of Northern Engineering Services, Inc.

NORTHERN ENGINEERING
979.221.4158
FORT COLLINS, 301 North Hovey Street, Suite 100, 80521
GREELEY, 820 8th Street, 80631
northernengineering.com

PROJECT: 167-025
DATE: 04/26/23
SCALE: 1" = 50'
P. MANAGER: S. Thomas
DRAWN BY: C. Pope



A north arrow pointing upwards, labeled "NORTH". Below it is a graphic scale bar with markings at 20, 0, 20, 40, and 60 feet. The text "(IN FEET)" and "1 inch = 20 ft." is centered below the scale bar.



EXISTING STORM SEWER
PROPOSED STORM SEWER
PROPOSED STORM INLET
PROPOSED CONTOUR
EXISTING CONTOUR
PROPOSED SWALE
PROPOSED GRADE BREAK
PROPOSED CURB & GUTTER
PROPERTY BOUNDARY
EXISTING LOT LINE
EXISTING RIGHT OF WAY
PROPOSED LOT LINE
PROPOSED RIGHT OF WAY
PROPOSED SPOT ELEVATION
EXISTING SPOT ELEVATION
PROPOSED SLOPES

95
801.3
33.43
(AT 45)
2.0%

CROSS PAN (TYP.)

1. THE SIZE, TYPE AND LOCATION OF ALL KNOWN UNDERGROUND UTILITIES ARE APPROXIMATE WHEN SHOWN ON THESE DRAWINGS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE OF ALL UNDERGROUND UTILITIES IN THE AREA OF THE WORK. BEFORE COMMENCING NEW CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES AND SHALL BE RESPONSIBLE FOR FOR ALL UNKNOWN UNDERGROUND UTILITIES.
2. REFER TO THE PLAT FOR LOT AREAS, TRACT SIZES, EASEMENTS, LOT DIMENSIONS, UTILITY EASEMENTS, OTHER EASEMENTS, AND OTHER SURVEY INFORMATION.
3. ALL PROJECT DATA IS ON VERTICAL DATUM, NAVD88. SEE COVER SHEET FOR BENCHMARK REFERENCES.
4. ALL CURB SPOTS SHOWN ARE FLOWLINE ELEVATIONS. ALL OTHER SPOTS ARE FINISHED GRADE ELEVATIONS.
5. ALL GARAGE PAD/STOP OF DRIVEWAY ELEVATIONS ARE BASED ON EITHER TWO OR THREE STEPS IN THE GARAGE AND A 2% SLOPE GARAGE PAD. MINIMUM BACK OF GARAGE PAD TO BE 0.3' BELOW TOP OF FOUNDATION FOR 2 STEPS AND 0.9' BELOW TOP OF FOUNDATION FOR 3 STEPS. IF MODIFICATIONS TO THESE ASSUMPTIONS ARISE, THEY MUST BE SHOWN ON THE PLOT PLAN AND APPROVED BY THE GOVERNING AGENCY.
6. ALL STAIRS CALLED OUT ON PLANS ARE SPACED EVENLY ALONG STRAIGHT SECTIONS. NO STAIRS SHALL BE WITHIN 1' OF PUBLIC ROW. STAIRS CALLED OUT AT TURNING POINTS ARE THE REQUIRED TRUED LENGTH BASED ON RISE, BEYOND THE LANDING. ALL PATIOS HAVE BEEN GRADED WITH THE SAME ASSUMPTIONS WITHIN 6" STAIRS AND 12" PATIO. SEE DETAIL 1001 FOR STAIR AT THE SIDEWALK CONNECTION POINT TO THE PATIO. SEE DETAIL 1006 FOR MORE INFORMATION.
7. ALL ACCESS WALKS TO INDIVIDUAL HOMES ARE 4' IN WIDTH.



Know what's below.
Call before you dig.

GRADING PLAN

13 of 27

No. _____ Revisions: _____ Date: _____
REVIEW SET
NOT FOR CONSTRUCTION
 04/26/23

These drawings are instruments of service provided by Northern Engineering Services, Inc. and are not to be used for any type of construction unless signed and sealed by a Professional Engineer in the employ of Northern Engineering Services, Inc.

NORTHERN
ENGINEERING

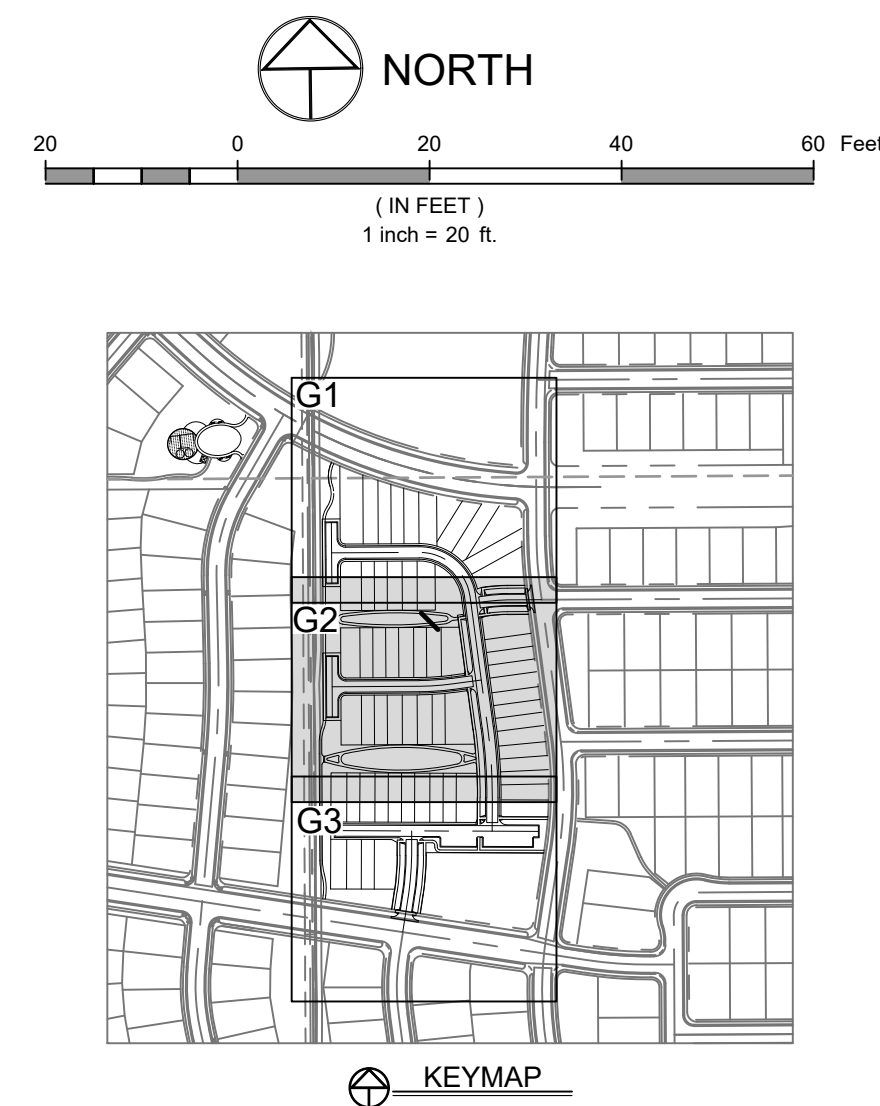
FORT COLLINS: 301 North Howes Street, Suite 100, 80521

DRAWN BY:
S. Braeut

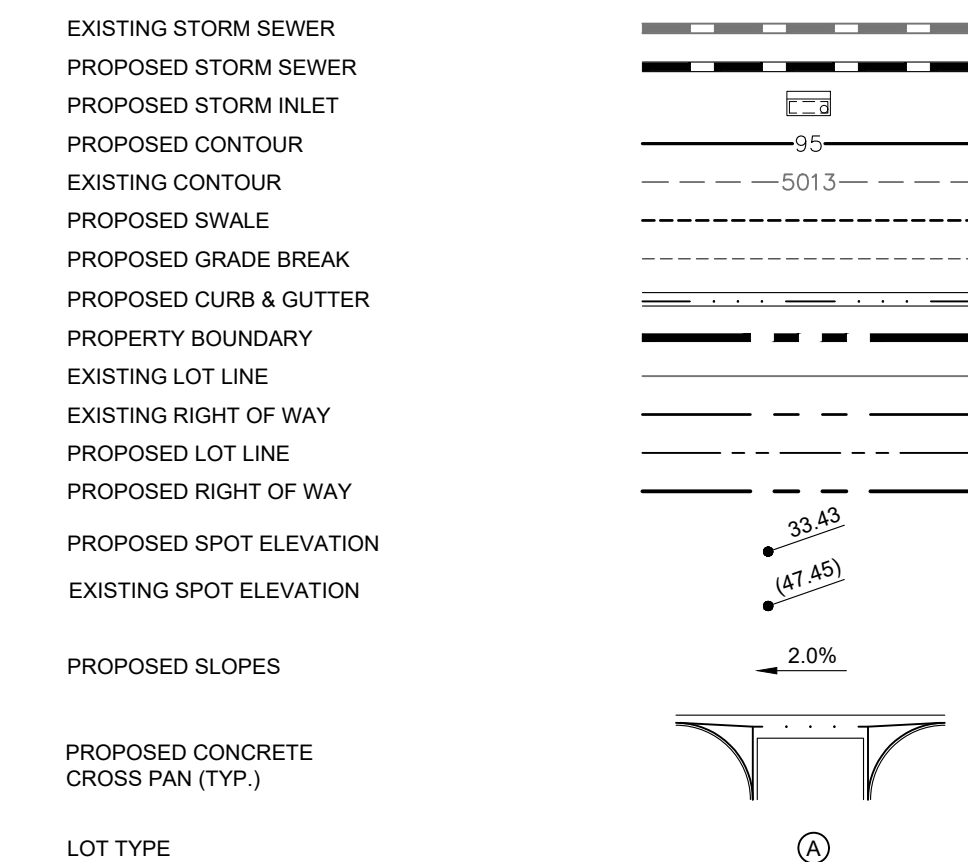
MATCH LINE - SEE SHEET 13



MATCH LINE - SEE SHEET 15

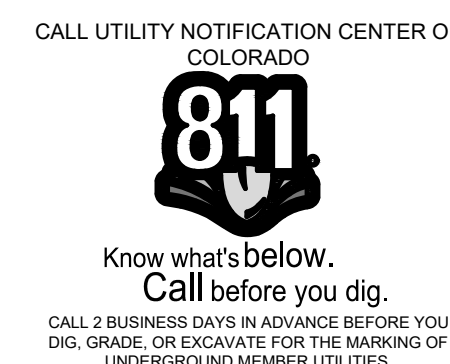


LEGEND:



NOTES:

1. THE SIZE, TYPE AND LOCATION OF ALL KNOWN UNDERGROUND UTILITIES ARE APPROXIMATE WHEN SHOWN ON THESE DRAWINGS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE OF ALL UNDERGROUND UTILITIES IN THE AREA OF THE WORK. BEFORE COMMENCING NEW CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES AND SHALL BE RESPONSIBLE FOR ALL UNKNOWN UNDERGROUND UTILITIES.
2. REFER TO THE PLAT FOR LOT AREAS, TRACT SIZES, EASEMENTS, LOT DIMENSIONS, UTILITY EASEMENTS, OTHER EASEMENTS, AND OTHER SURVEY INFORMATION.
3. ALL PROJECT DATA IS ON VERTICAL DATUM: NAVD88. SEE COVER SHEET FOR BENCHMARK REFERENCES.
4. ALL CURB SPOTS SHOWN ARE FLOWLINE ELEVATIONS. ALL OTHER SPOTS ARE FINISHED GRADE ELEVATIONS.
5. ALL GARAGE PADS/TOP OF DRIVEWAY ELEVATIONS ARE BASED ON EITHER TWO OR THREE STEPS IN THE GARAGE AND A 2% SLOPE GARAGE PAD. MINIMUM BACK OF GARAGE PAD TO BE 0.3' BELOW TOP OF FOUNDATION FOR 2 STEPS AND 0.9' BELOW TOP OF FOUNDATION FOR 3 STEPS. IF MODIFICATIONS TO THESE ASSUMPTIONS ARE MADE, THEY MUST BE SHOWN ON THE PLOT PLAN AND APPROVED BY THE GOVERNING AGENCY.
6. ALL STAIRS CALLED OUT ON PLANS ARE SPACED EVENLY ALONG STRAIGHT SECTIONS. NO STAIRS SHALL BE WITHIN 1' OF PUBLIC ROW. STAIRS CALLED OUT AT TURNING POINTS ARE THE REQUIRED TREAD LENGTH BASED ON RISE. BEYOND THE LANDING, ALL PATIOS HAVE BEEN GRADED WITH THE SAME ASSUMPTIONS WITH TWO 6" STAIRS WITHIN THE PATIO AND ONE ADDITIONAL 6" STAIR AT THE SIDEWALK CONNECTION POINT TO THE PATIO. SEE DETAIL BELOW FOR MORE INFORMATION.
7. ALL ACCESS WALKS TO INDIVIDUAL HOMES ARE 4' IN WIDTH.



VANTAGE SUBDIVISION 7TH FILING

GRADING PLAN

Sheet
G2

14 of 27

Revisions:
No. 04/26/23
Date: 04/26/23
REVIEW SET
NOT FOR CONSTRUCTION

These drawings are instruments of service provided by Northern Engineering Services, Inc. for the project described herein. They are not to be used for any other project without the written consent of Northern Engineering Services, Inc.

NORTHERN ENGINEERING
N
FORT COLLINS, 301 North Hovey Street, Suite 100, 80521
GREELEY, 820 8th Street, 80631
970.221.4158
northernengineering.com

PROJECT: 167-025
DATE: 04/26/23
DESIGNED BY: C. Pope
SCALE: 1" = 20'
DRAWN BY: S. Rzeszut
P. MANAGER: S. Thomas

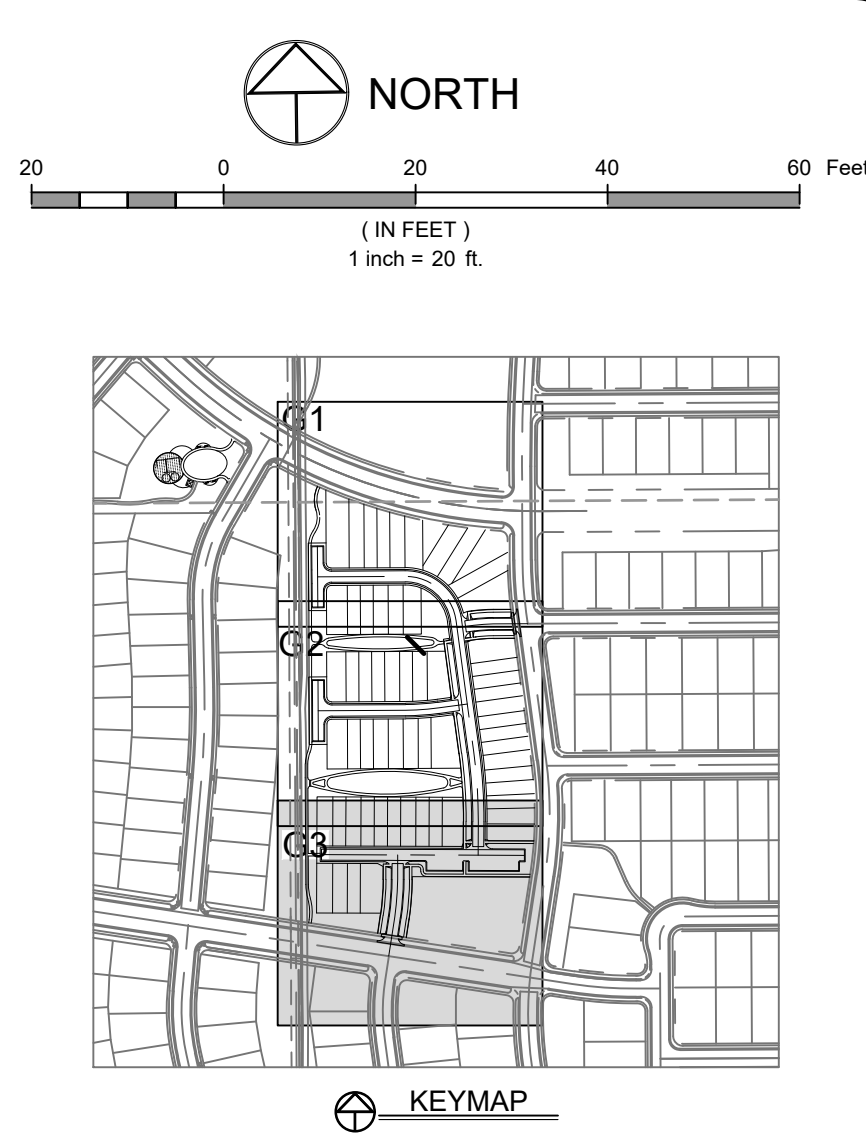
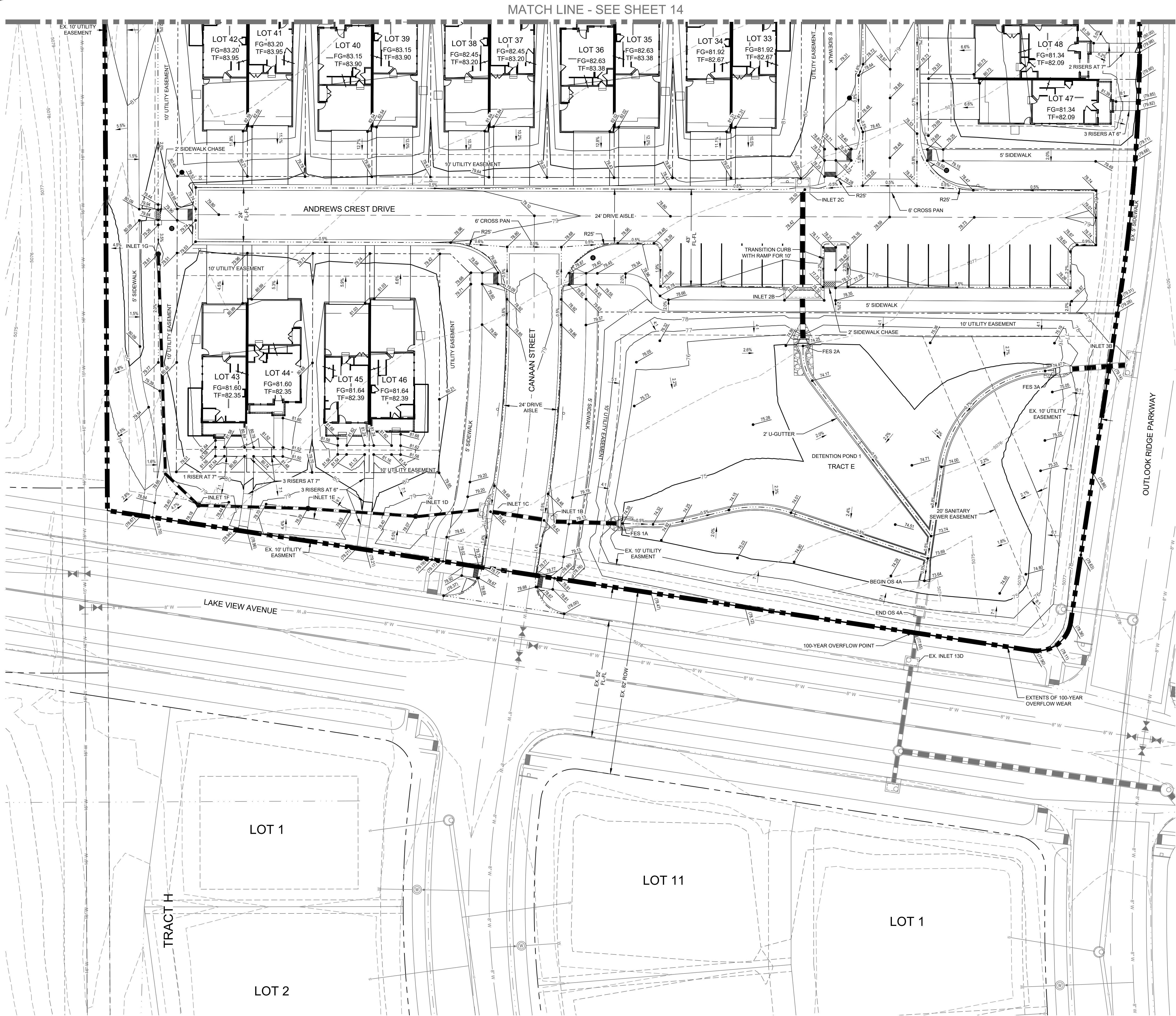
VANTAGE SUBDIVISION 7TH FILING

GRADING PLAN

Sheet
G2

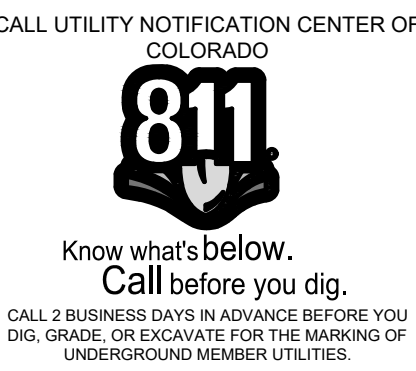
14 of 27

DRAWING FILENAME: P:\167-025\Drawings\167-025_GRADE.dwg LAYOUT NAME: 03 DATE: Apr 25, 2023 - 11:47am CAD OPERATOR: stephane
LIST OF SHEETS: [RES-00000] [167-025_01] [167-025_02] [167-025_03] [167-025_04] [167-025_05] [167-025_06] [167-025_07] [167-025_08] [167-025_09] [167-025_10] [167-025_11] [167-025_12] [167-025_13] [167-025_14] [167-025_15] [167-025_16] [167-025_17] [167-025_18] [167-025_19] [167-025_20] [167-025_21] [167-025_22] [167-025_23] [167-025_24] [167-025_25] [167-025_26] [167-025_27] [167-025_28] [167-025_29] [167-025_30] [167-025_31] [167-025_32] [167-025_33] [167-025_34] [167-025_35] [167-025_36] [167-025_37] [167-025_38] [167-025_39] [167-025_40] [167-025_41] [167-025_42] [167-025_43] [167-025_44] [167-025_45] [167-025_46] [167-025_47] [167-025_48] [167-025_49] [167-025_50] [167-025_51] [167-025_52] [167-025_53] [167-025_54] [167-025_55] [167-025_56] [167-025_57] [167-025_58] [167-025_59] [167-025_60] [167-025_61] [167-025_62] [167-025_63] [167-025_64] [167-025_65] [167-025_66] [167-025_67] [167-025_68] [167-025_69] [167-025_70] [167-025_71] [167-025_72] [167-025_73] [167-025_74] [167-025_75] [167-025_76] [167-025_77] [167-025_78] [167-025_79] [167-025_80] [167-025_81] [167-025_82] [167-025_83] [167-025_84] [167-025_85] [167-025_86] [167-025_87] [167-025_88] [167-025_89] [167-025_90] [167-025_91] [167-025_92] [167-025_93] [167-025_94] [167-025_95] [167-025_96] [167-025_97] [167-025_98] [167-025_99] [167-025_100]



- LEGEND:**
- EXISTING STORM SEWER
 - PROPOSED STORM SEWER
 - PROPOSED STORM INLET
 - PROPOSED CONTOUR
 - EXISTING CONTOUR
 - PROPOSED SWALE
 - PROPOSED GRADE BREAK
 - PROPOSED CURB & GUTTER
 - PROPERTY BOUNDARY
 - EXISTING LOT LINE
 - EXISTING RIGHT OF WAY
 - PROPOSED LOT LINE
 - PROPOSED RIGHT OF WAY
 - PROPOSED SPOT ELEVATION
 - EXISTING SPOT ELEVATION
 - PROPOSED SLOPES
 - PROPOSED CONCRETE CROSS PAN (TYP.)
 - LOT TYPE

- NOTES:**
- THE SIZE, TYPE AND LOCATION OF ALL KNOWN UNDERGROUND UTILITIES ARE APPROXIMATE WHEN SHOWN ON THESE DRAWINGS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE OF ALL UNDERGROUND UTILITIES IN THE AREA OF THE WORK. BEFORE COMMENCING NEW CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES AND SHALL BE RESPONSIBLE FOR ALL UNKNOWN UNDERGROUND UTILITIES.
 - REFER TO THE PLAT FOR LOT AREAS, TRACT SIZES, EASEMENTS, LOT DIMENSIONS, UTILITY EASEMENTS, OTHER EASEMENTS, AND OTHER SURVEY INFORMATION.
 - ALL PROJECT DATA IS ON VERTICAL DATUM: NAVD88. SEE COVER SHEET FOR BENCHMARK REFERENCES.
 - ALL CURB SPOTS SHOWN ARE FLOWLINE ELEVATIONS. ALL OTHER SPOTS ARE FINISHED GRADE ELEVATIONS.
 - ALL GARAGE PADS/TOP OF DRIVEWAY ELEVATIONS ARE BASED ON EITHER TWO OR THREE STEPS IN THE GARAGE AND A 2% SLOPE GARAGE PAD. MINIMUM BACK OF GARAGE PAD TO BE 0.3' BELOW TOP OF FOUNDATION FOR 2 STEPS AND 0.9' BELOW TOP OF FOUNDATION FOR 3 STEPS. IF MODIFICATIONS TO THESE ASSUMPTIONS ARE MADE, THEY MUST BE SHOWN ON THE PLOT PLAN AND APPROVED BY THE GOVERNING AGENCY.
 - ALL STAIRS CALLED OUT ON PLANS ARE SPACED EVENLY ALONG STRAIGHT SECTIONS. NO STAIRS SHALL BE WITHIN 1' OF PUBLIC ROW. STAIRS CALLED OUT AT TURNING POINTS ARE THE REQUIRED TREAD LENGTH BASED ON RISE. BEYOND THE LANDING, ALL PATIOS HAVE BEEN GRADED WITH THE SAME ASSUMPTIONS WITH TWO 6" STAIRS WITHIN THE PATIO AND ONE ADDITIONAL 6" STAIR AT THE SIDEWALK CONNECTION POINT TO THE PATIO. SEE DETAIL BELOW FOR MORE INFORMATION.
 - ALL ACCESS WALKS TO INDIVIDUAL HOMES ARE 4' IN WIDTH.



Revisions:

No.

Date:

04/26/23

04/26/23

These drawings are instruments of service provided by Northern Engineering Services, Inc. in the state of Colorado. No part of these drawings shall be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of Northern Engineering Services, Inc.

NORTHERN ENGINEERING

970.221.4158
nortnengr.com

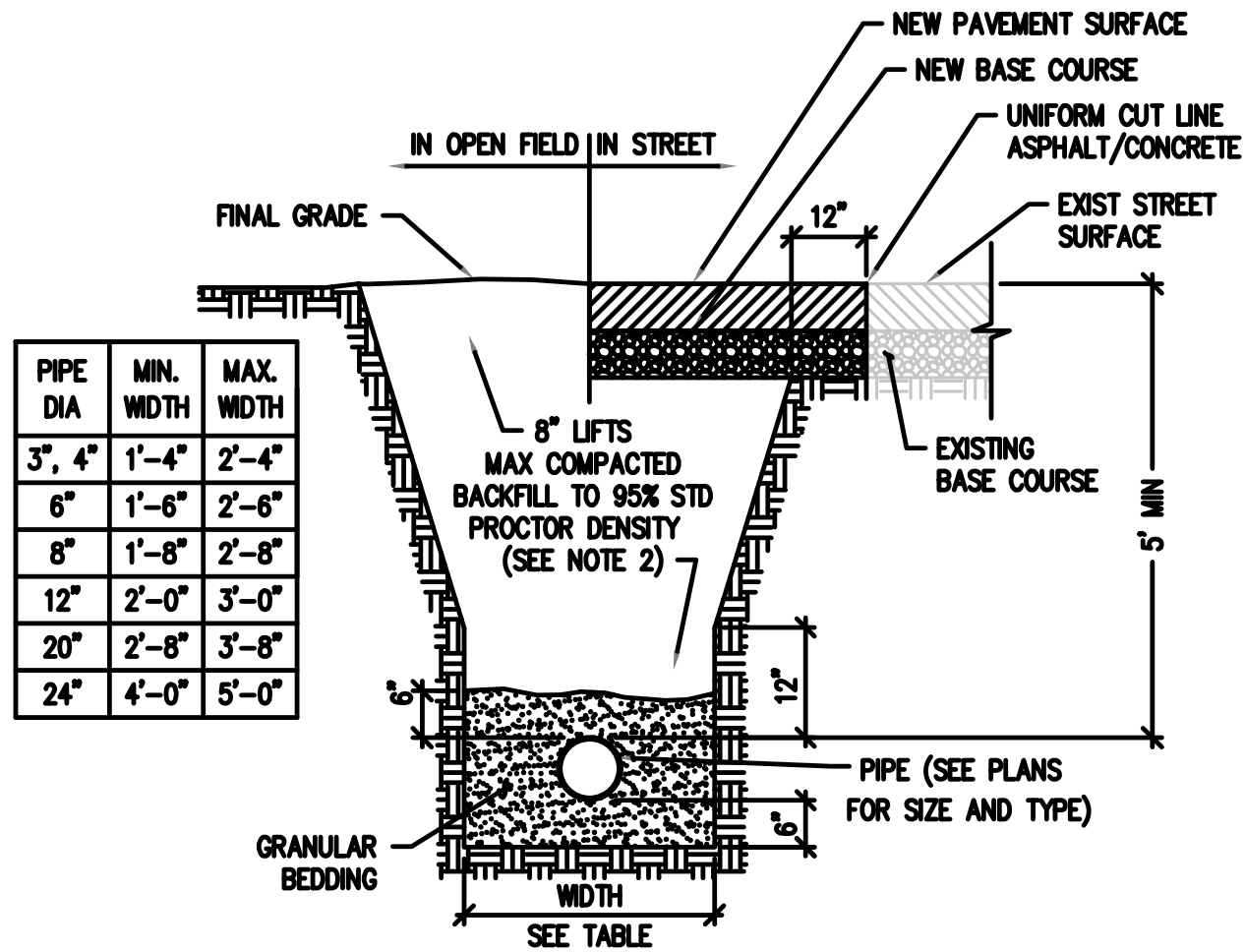
FORT COLLINS: 301 North Hovey Street, Suite 100, 80521
GREELEY: 820 8th Street, 80631

VANTAGE SUBDIVISION 7TH FILING

GRADING PLAN

Sheet
G3

15 of 27

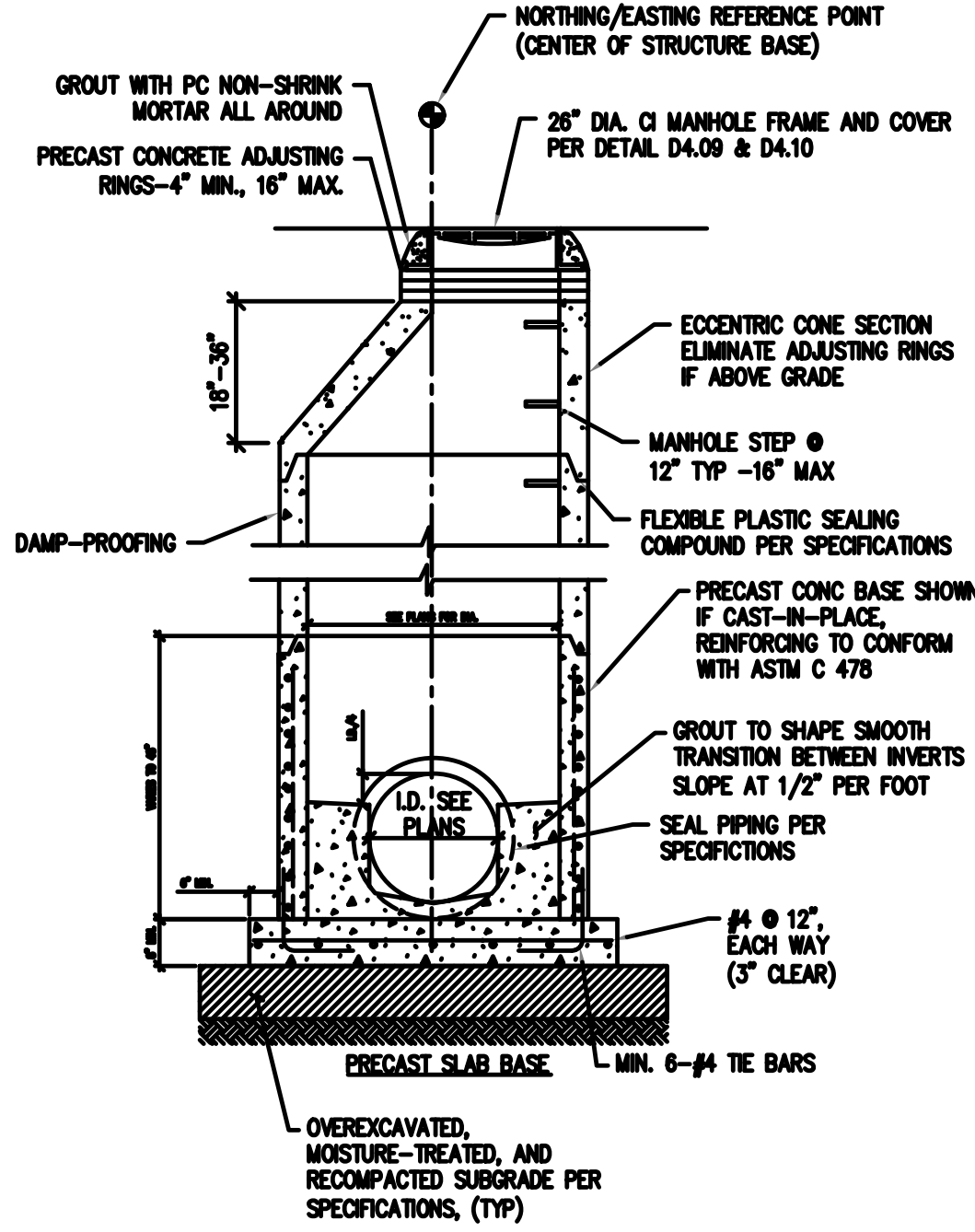


- NOTES:**
1. MINIMUM COVER 5' FOR WATER AND SANITARY SEWER
 2. COMPACTED BACKFILL TO 90% STD PROCTOR DENSITY IN NON-DRIVING SURFACES AND 95% UNDER PAVEMENT
 3. SHOULD THE TRENCH BE EXCAVATED WIDER THAN ALLOWED, A CONCRETE CRADLE SHALL BE PLACED WITH 2500PSI CONCRETE FROM TRENCH BOTTOM TO PIPE SPRINGLINE
 4. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR THE SAFETY OF THE WORKERS AND THE PROTECTION OF OTHER UTILITIES IN ACCORDANCE WITH LOCAL, STATE, FEDERAL, & OSHA SAFETY REGULATIONS
 5. PAVING SHALL COMPLY WITH LOCAL AUTHORITY JURISDICTION
- SCALE: NTS

	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA		D0.01
	GENERAL DETAILS		
		TYPICAL TRENCH DETAIL	

DATE:12/2020

100
D1
TYPICAL TRENCH DETAIL
NOT TO SCALE

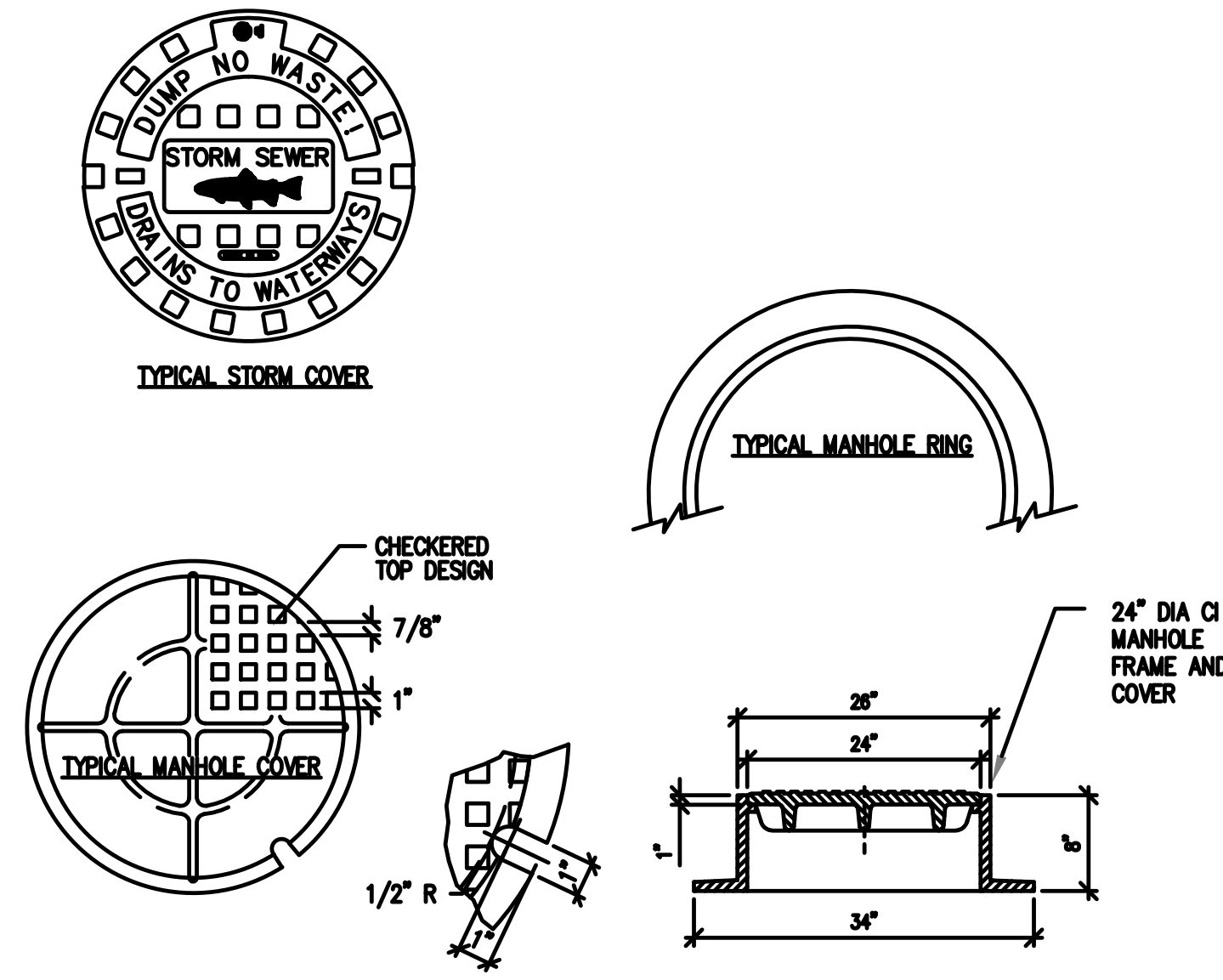


- NOTES:**
1. SHAPING FOR SMOOTH MANHOLE INVERTS MUST BE DONE BY FORMING OR SHAPING BASE CONCRETE.
 2. BLOCK-OUTS WHEN APPROVED SHALL EXTEND A MAX OF 6\"/>
- SCALE: NTS

	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA		D0.03
	GENERAL DETAILS		
	STANDARD MANHOLE		DATE: 12/2020

DATE: 12/2020

101
D1
STANDARD MANHOLE
NOT TO SCALE

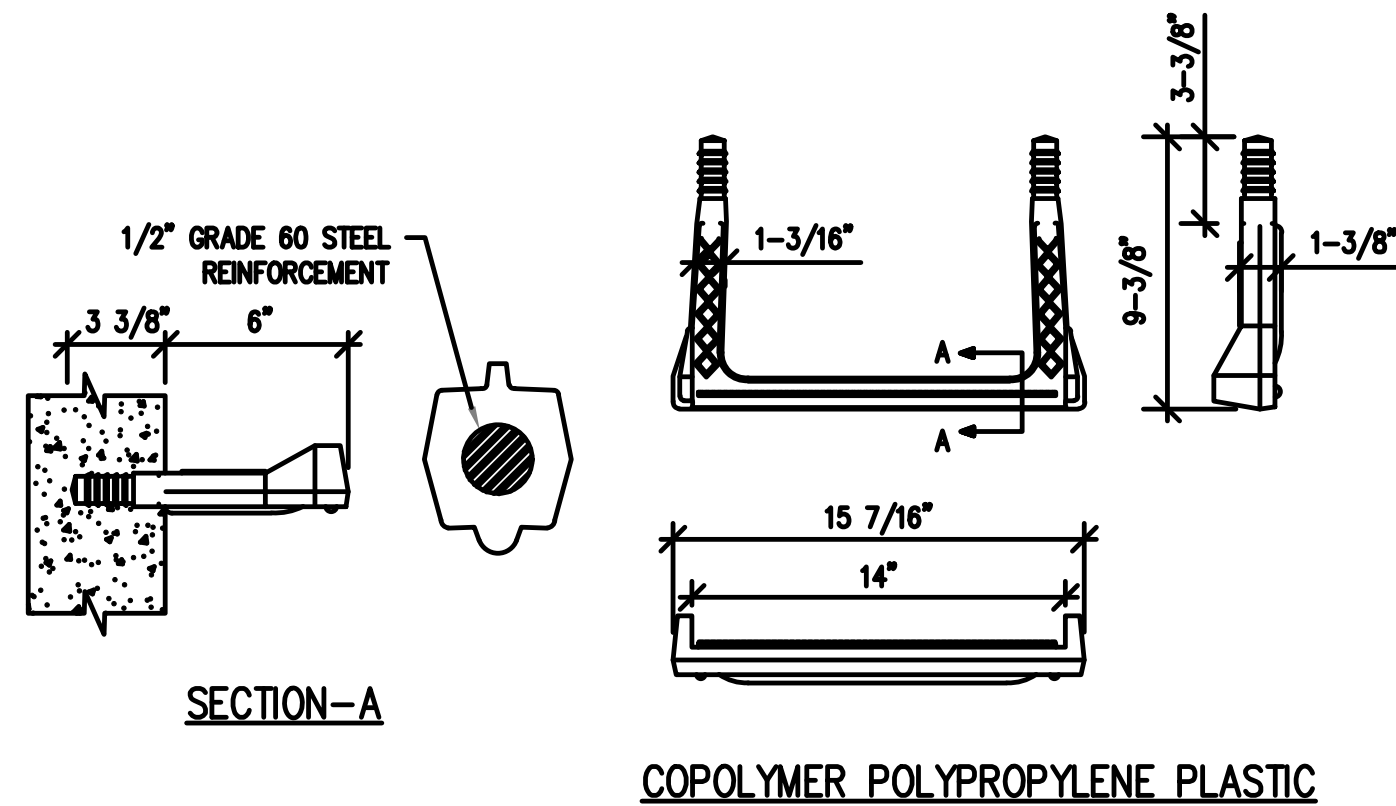


- NOTES:**
1. ASTM DESIGNATION A-48 CLASS 35B (UNPAINTED) W/ MIN TENSILE STRENGTH KSI (CLASS 25)
 2. 1-1/2\"/>
- SCALE: NTS

	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA		D0.04
	GENERAL DETAILS		
	MANHOLE RING AND COVER – NON-BOLTED		

DATE: 12/2020

102
D1
MANHOLE RING AND COVER - NON-BOLTED
NOT TO SCALE



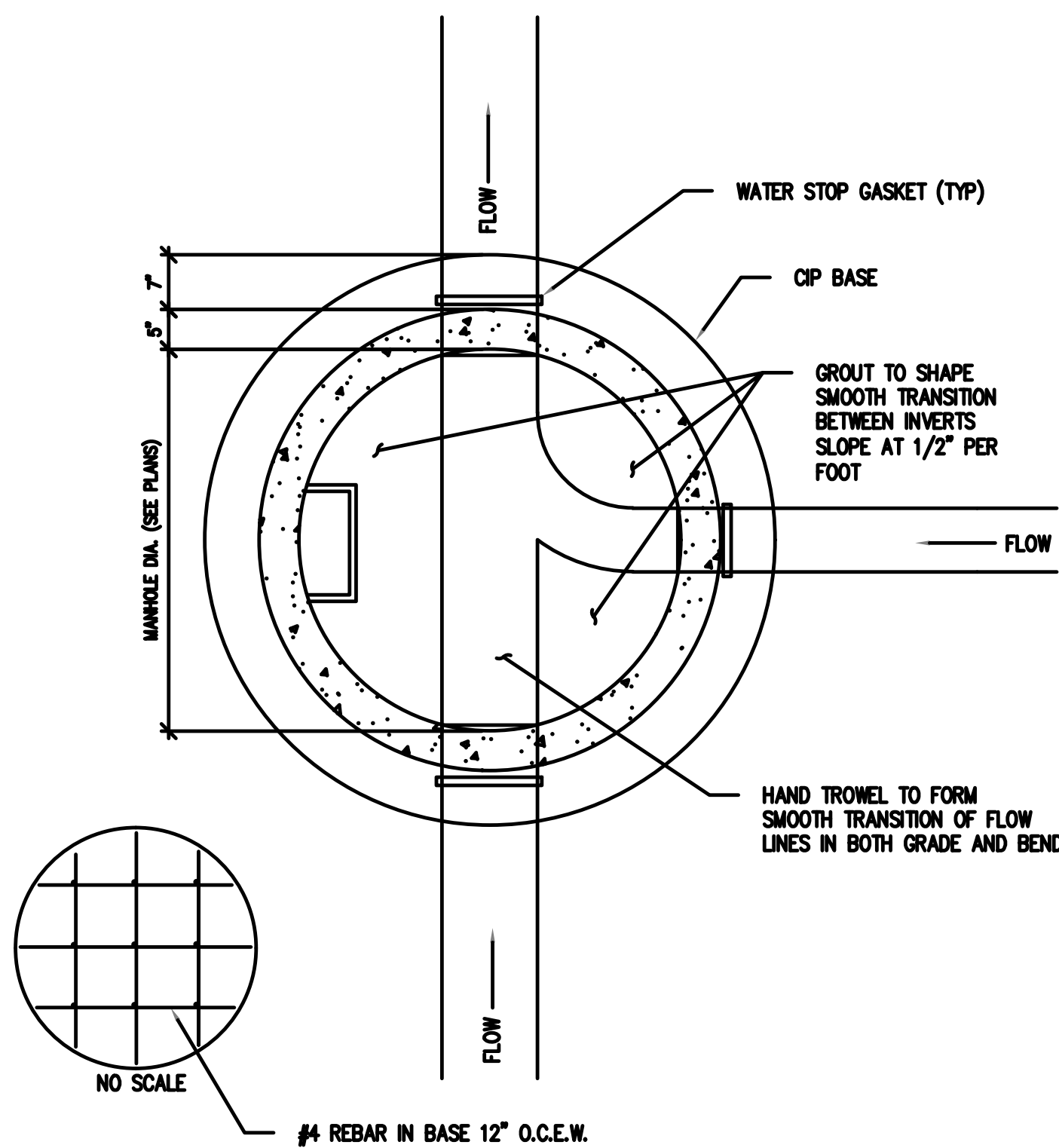
- NOTES:**
1. AS MANUFACTURED BY M.A. INDUSTRIES (MODEL NO. PS2-PF) OR APPROVED SUBSTITUTION SPACED AT 12\"/>
- SCALE: NTS

	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA		D0.06
	GENERAL DETAILS		
	PLASTIC MANHOLE STEP		

DATE: 12/2020

DATE: 12/2020

103
D1
PLASTIC MANHOLE STEP
NOT TO SCALE

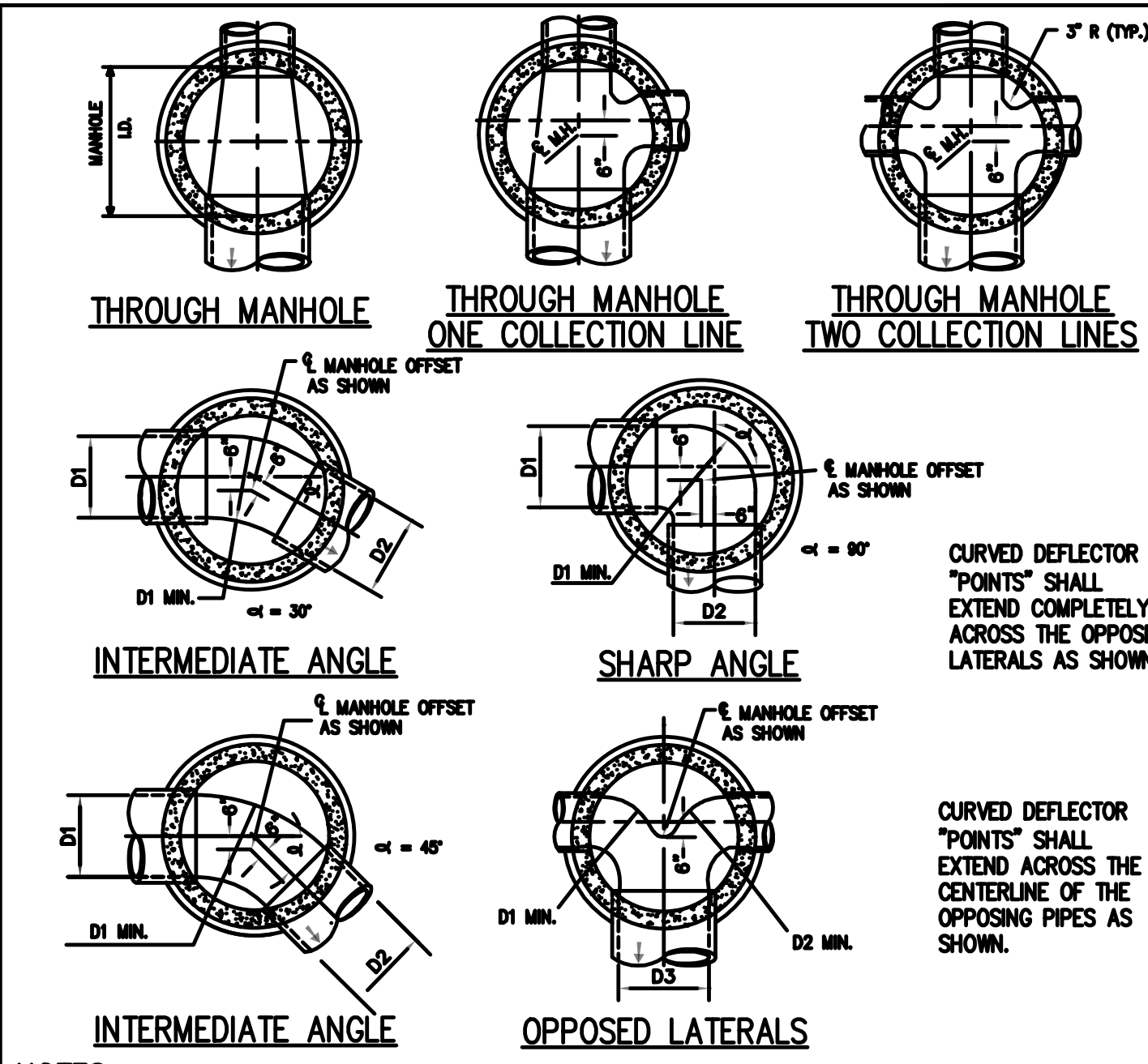


- NOTES:**
1. FLOW DIRECTION CHANGE 90 DEGREES, MINIMUM
- SCALE: NTS

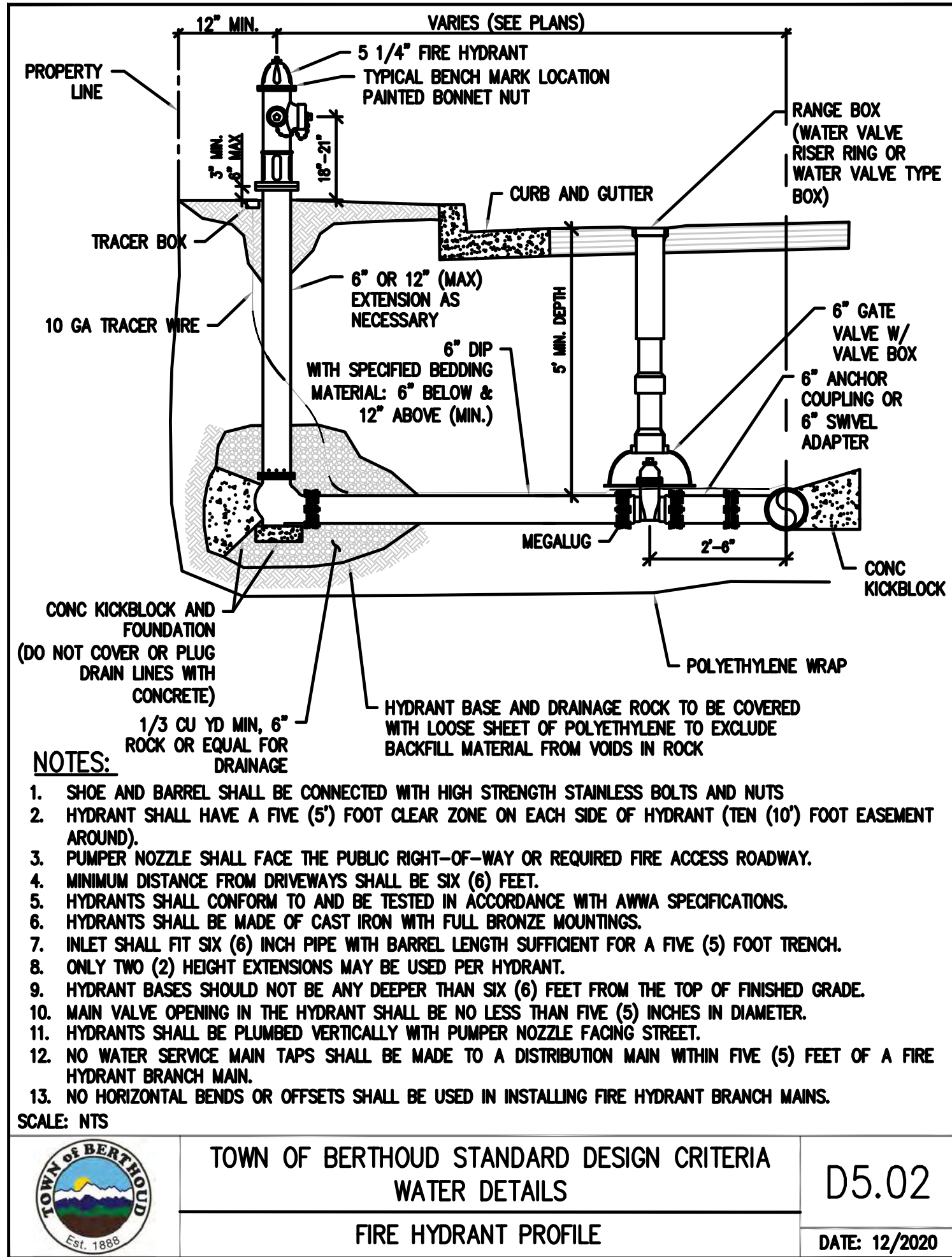
	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA		D0.07
	GENERAL DETAILS		
		MANHOLE BASE	

DATE: 12/2020

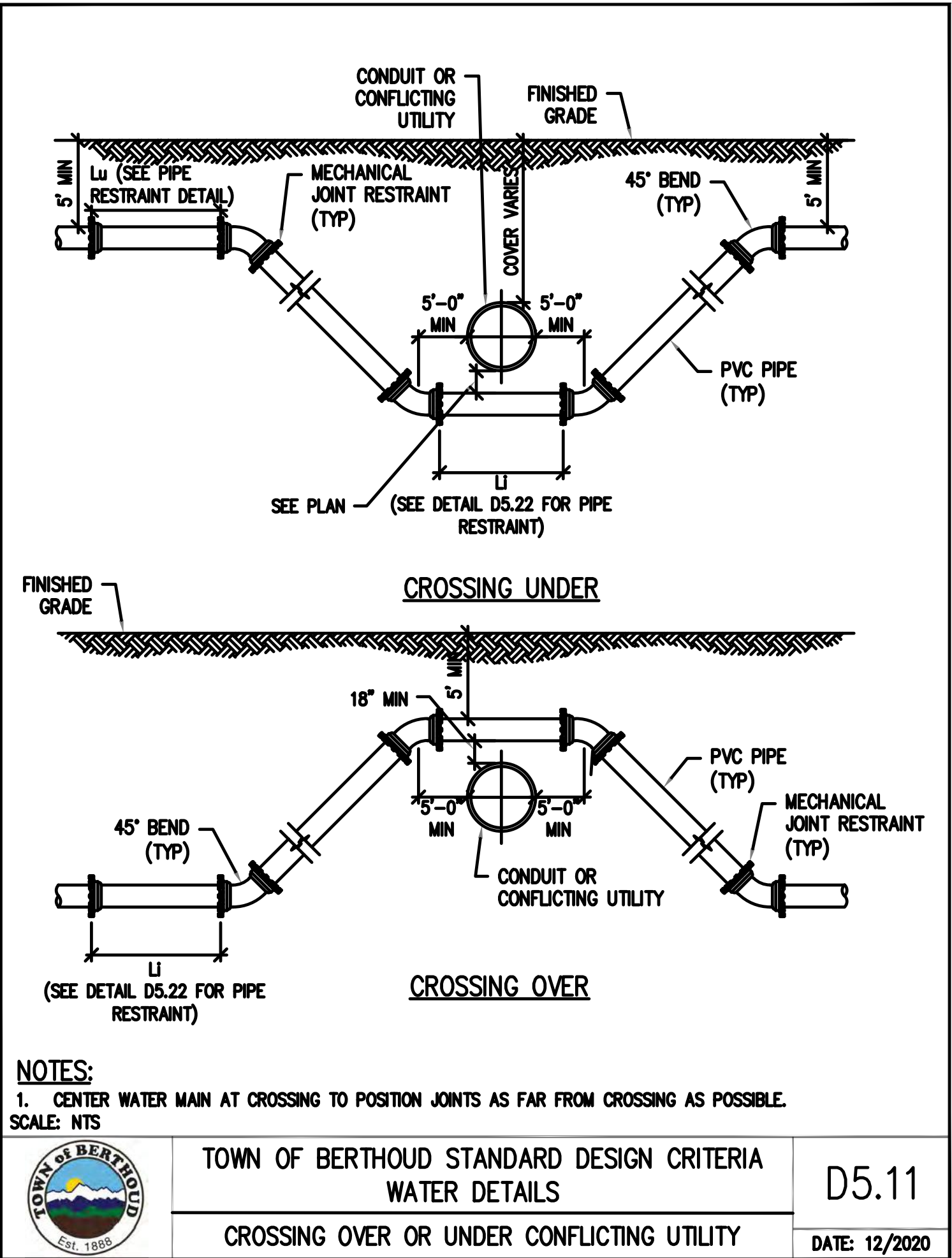
104
D1
MANHOLE BASE
NOT TO SCALE



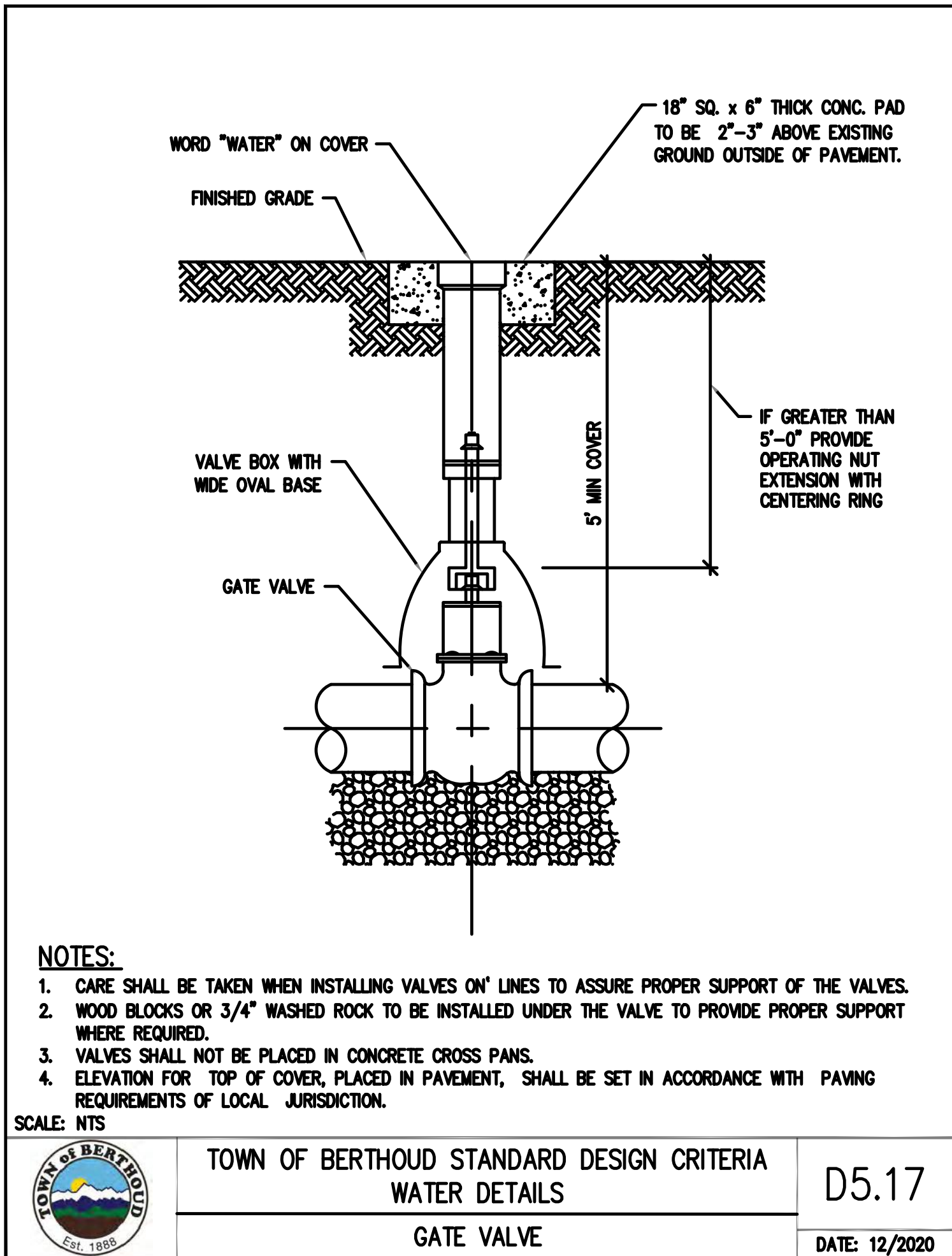
DRAWING FILENAME: P:\UT-025\DWG\Utility\UT-025_DET_01.dwg LAYOUT NAME: D3 DATE: Apr 25, 2023 - 11:47am CAD OPERATOR: ingehaile
LIST OF SHEETS: [RES=shorter]



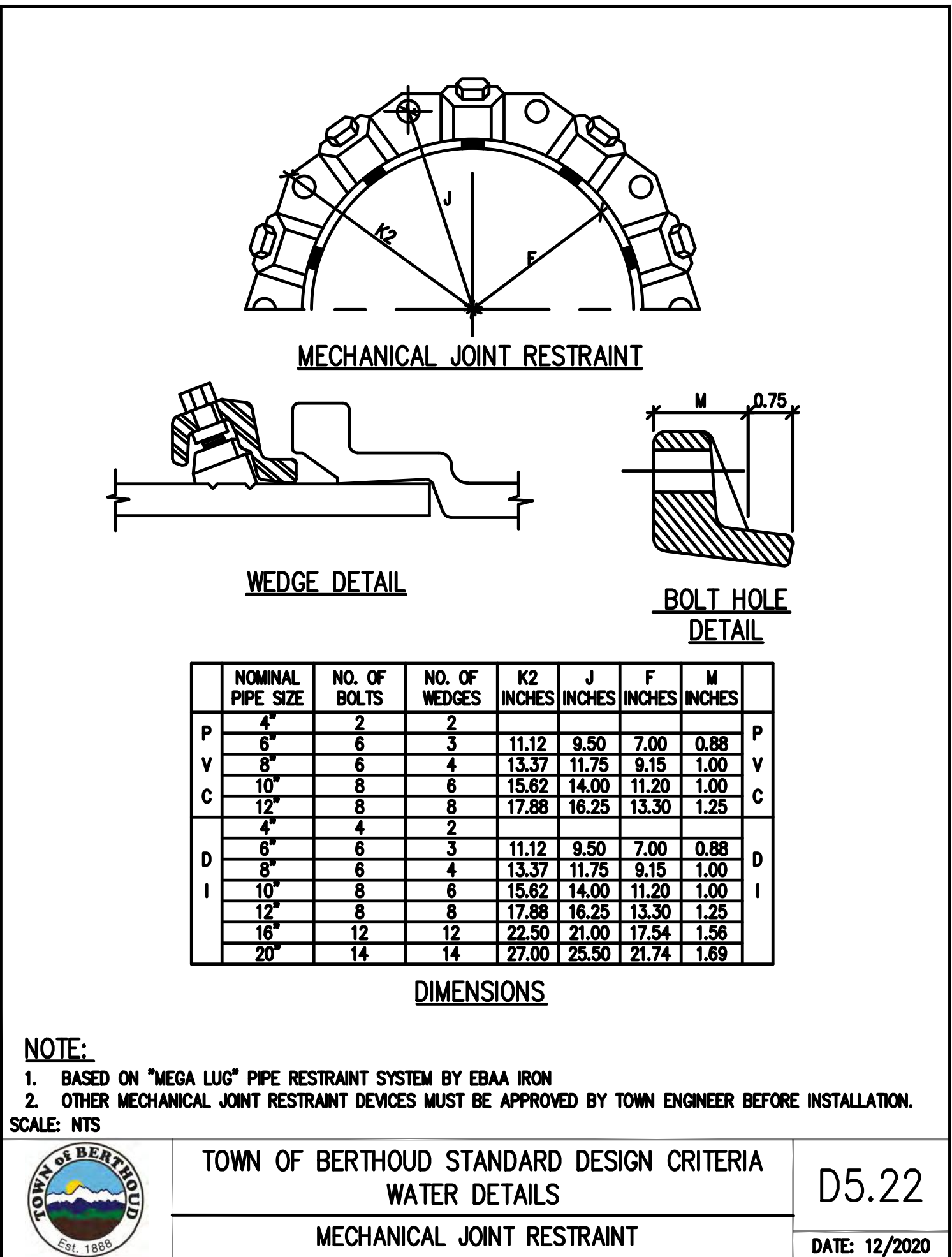
300
D3
FIRE HYDRANT PROFILE
NOT TO SCALE



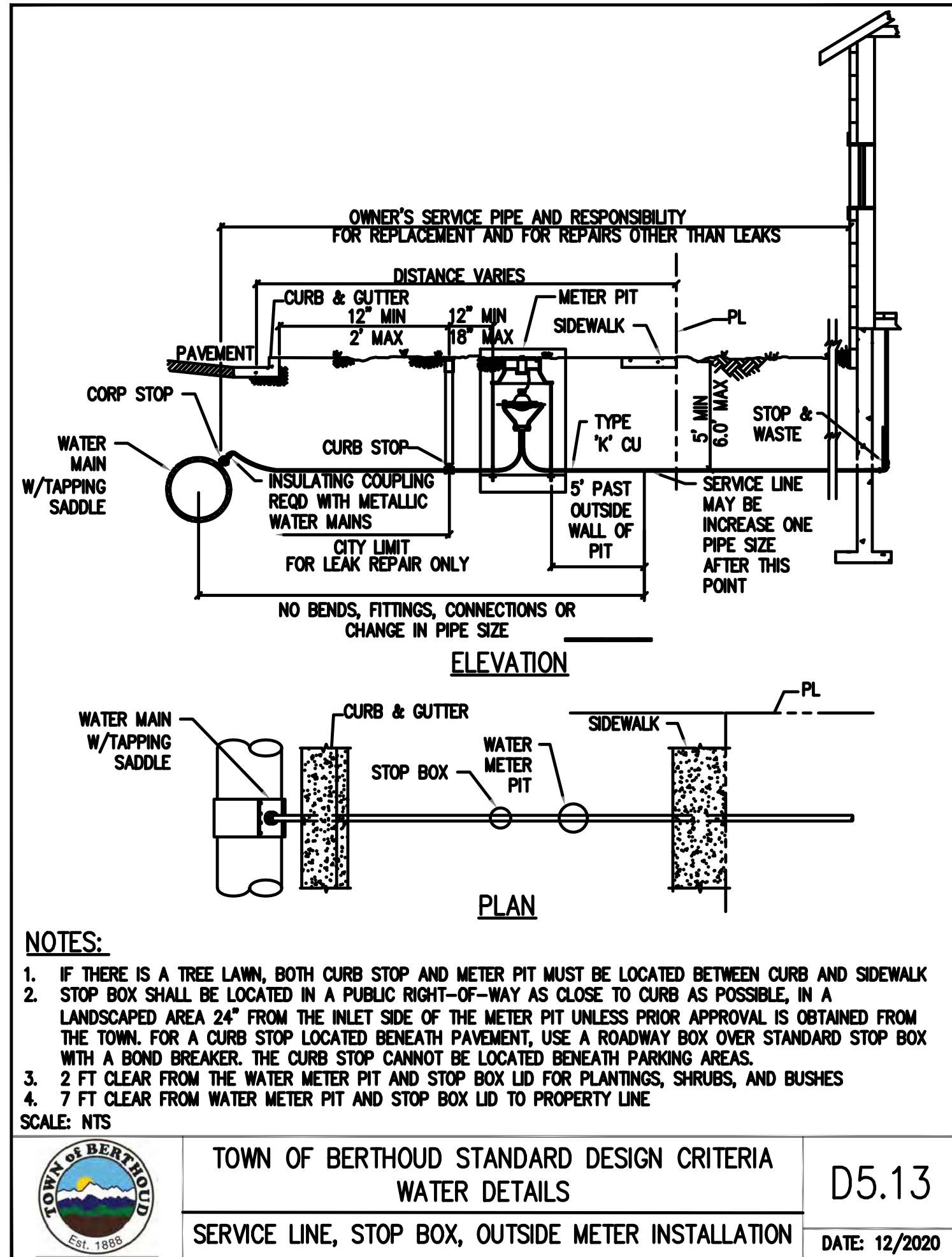
301
D3
CROSSING OVER OR UNDER CONFLICTING UTILITY
NOT TO SCALE



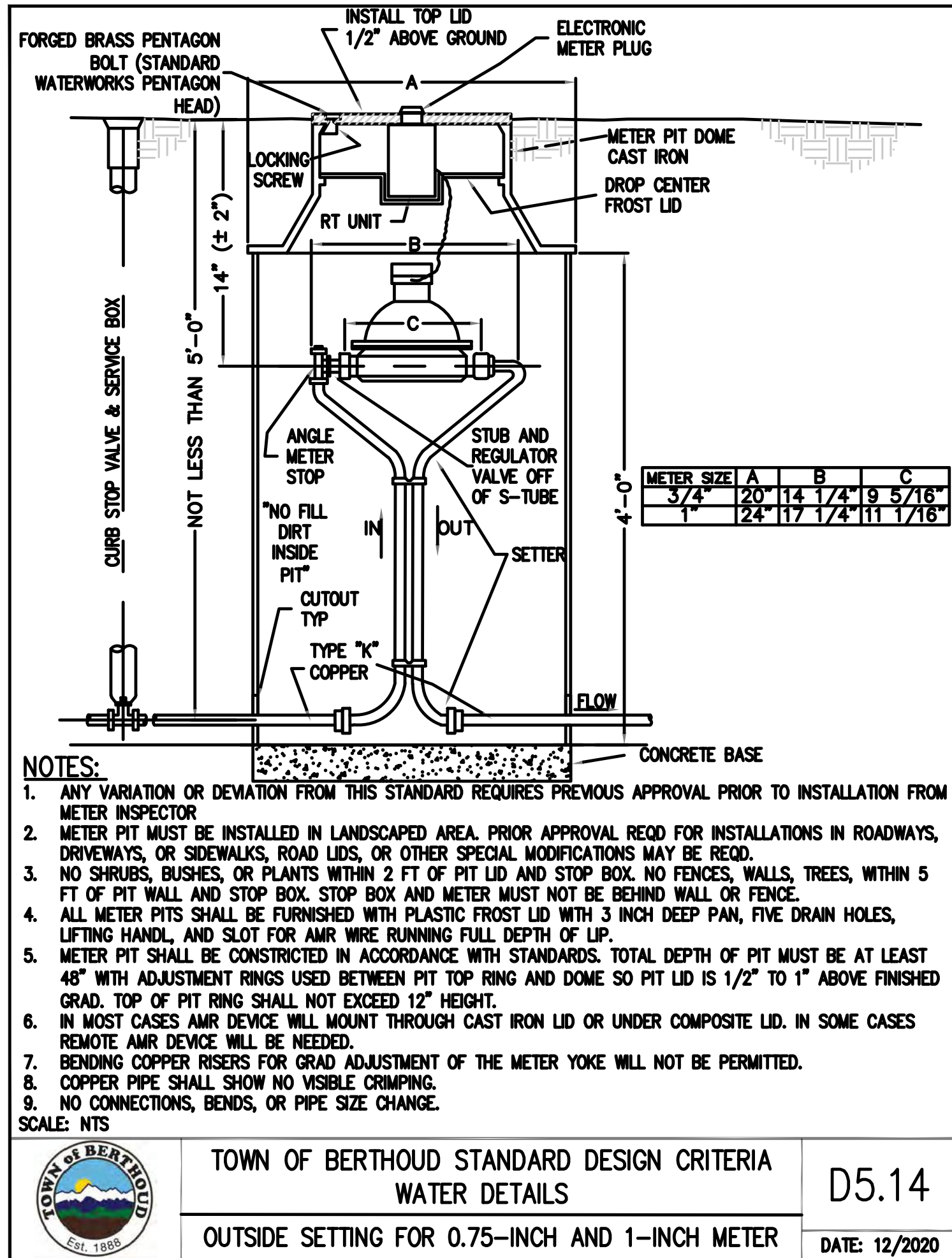
304
D3
GATE VALVE
NOT TO SCALE



305
D3
MECHANICAL JOINT RESTRAINT
NOT TO SCALE



302
D3
OUTSIDE SETTING FOR 0.75-INCH AND 1-INCH METER
NOT TO SCALE



303
D3
OUTSIDE SETTING FOR 0.75-INCH AND 1-INCH METER
NOT TO SCALE

VANTAGE SUBDIVISION 7TH FILING

WATERLINE DETAILS

PROJECT:	DATE:	SCALE:	P. MANAGER:
167-025	04/26/23	N/A	S. Thomas
DESIGNED BY:			
DRAWN BY:			

These drawings are instruments of service provided by Northern Engineering Services, Inc. any type of construction unless signed and sealed by the employee of Northern Engineering Services, Inc.

Revisions:

No.	Date:	Revision:

04/26/23

REVIEW SET

NOT FOR CONSTRUCTION

NORTHERN ENGINEERING

971.221.4158
nortneng.com

FORT COLLINS, 301 North Hovea Street, Suite 100, 80521
GREELEY, 620 8th Street, 80631

CALL UTILITY NOTIFICATION CENTER OF COLORADO

811

Know what's below.
Call before you dig.

CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

DRAWING FILENAME: P:\UT-025\Draw\Details\UT-025_DET_01.dwg LAYOUT NAME: D4 DATE: Apr 25, 2023 - 11:48am CAD OPERATOR: ingrapha
LIST OF SHEETS: [RES=shorter]

90° BENDS ONLY

DEAD END

TEE

TYPICAL CROSS SECTION

SIZE OF PIPE	SURFACE AREA (SQ FT)	
	TEE OR DEAD END	90° BENDS
4"	1.50	2.0
6"	3.00	4.5
8"	5.25	8.0
12"	11.25	17.0
16"	19.00	27.00
20"	25.00	35.50
24"	36.00	51.00

MINIMUM BEARING SURFACE AREA (IN SQUARE FEET)

PIPE OD
70% EMBEDMENT
#6 EPOXY COATED REBAR

NOTES:

- BEARING SURFACES SHOWN IN CHART ARE MINIMUM
- BASED ON 150 PSI INTERNAL PIPE PRESSURE PLUS WATER HAMMER
- 6", 8", & 12" WATER HAMMER = 110 PSI
- 16", 20" AND 24" WATER HAMMER = 70 PSI
- BASED ON 3000 PSI SOIL BEARING CAPACITY
- THRUST BLOCK SHALL NOT INTERFERE W/MECHANICAL JOINT BOLT OPERATION

SCALE: NTS

TOWN OF BERTHOUD STANDARD DESIGN CRITERIA
WATER DETAILS

D5.23

CONCRETE THRUST BLOCKS 1 OF 2

DATE: 12/2020

400

D4

CONCRETE THRUST BLOCKS 1 OF 2

NOT TO SCALE

CONCRETE THRUST BLOCKS

WATER MAIN AND TAP SIZE COMBINATIONS WHICH REQUIRE A CONC THRUST BLOCK BEHIND THE MAIN AT THE TAPPING SLEEVE OR SADDLE

ALL WATER MAINS

☒ INDICATED CONC THRUST BLOCK REQD

MAIN SIZE (INCHES)

TAP SIZE (INCHES)

4	6	8	10	12	14	16	18	20	22	24	26	28	30	36	42
4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
6	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
8	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
10	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
12	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
14	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
16	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
18	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
20	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
22	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
24	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
26	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
28	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
30	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
36	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
42	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

NOTES:

- ANY THRUST BLOCK REQUIREMENTS FOR WATER MAIN AND TAP SIZED COMBINATIONS OTHER THAN THOSE SHOWN ABOVE WILL REQUIRE SPECIAL DESIGN APPROVAL BY THE TOWN ENGINEER

SCALE: NTS

TOWN OF BERTHOUD STANDARD DESIGN CRITERIA
WATER DETAILS

D5.24

CONCRETE THRUST BLOCKS 2 OF 2

DATE: 12/2020

401

D4

CONCRETE THRUST BLOCKS 2 OF 2

NOT TO SCALE

STEP-1

STEP-2

STEP-3

FIELD INSTALLATION-POLYETHYLENE WRAP

STEP-1 PLACE TUBE OF POLYETHYLENE MATERIAL AROUND PIPE PRIOR TO LOWERING PIPE INTO TRENCH

STEP-2 PULL THE TUBE OVER THE LENGTH OF THE PIPE. TAPE TUBE TO PIPE AT JOINT FOLD MATERIAL AROUND THE ADJACENT SPIGOT END AND WRAP WITH THREE CIRCUMFERENTIAL TURNS OF TWO-INCH WIDE PLASTIC TAPE TO HOLD PLASTIC TUBE AROUND SPIGOT END

STEP-3 ADJACENT TUBE OVERLAPS FIRST TUBE AND IS SECURED WITH PLASTIC ADHESIVE TAPE. THE POLYETHYLENE TUBE MATERIAL COVERING THE PIPE WILL BE LOOSE. EXCESS MATERIAL AND SHOULD BE NEATLY DRAWN UP AROUND THE PIPE BARREL, FOLDED INTO AN OVERLAP ON TOP OF THE PIPE AND HELD IN PLACE BY MEANS OF PIECES OF THE PLASTIC TAPE AT APPROXIMATELY THREE TO FIVE FOOT INTERVALS

NOTE:

- ALL RODDING TO BE ENCASED IN POLYETHYLENE SEPARATED FROM THE PIPE

SCALE: NTS

TOWN OF BERTHOUD STANDARD DESIGN CRITERIA
WATER DETAILS

D5.27

POLYETHYLENE WRAP

DATE: 12/2020

402

D4

POLYETHYLENE WRAP

NOT TO SCALE

CALL UTILITY NOTIFICATION CENTER OF COLORADO

Know what's below.
Call before you dig.

CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

VANTAGE SUBDIVISION 7TH FILING

WATERLINE DETAILS

Sheet
D4

19 of 27

Revisions:

No.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

62

63

64

65

66

67

68

69

70

71

72

73

74

75

76

77

78

79

80

81

82

83

84

85

86

87

88

89

90

91

92

93

94

95

96

97

98

99

100

101

102

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

137

138

139

140

141

142

143

144

145

146

147

148

149

150

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167

168

169

170

171

172

173

174

175

176

177

178

179

180

181

182

183

184

185

186

187

188

189

190

191

192

193

194

195

196

197

198

199

200

201

202

203

204

205

206

207

208

209

210

211

212

213

214

215

216

217

218

219

220

221

222

223

224

225

226

227

228

229

230

231

232

233

234

235

236

237

238

239

240

241

242

243

244

245

246

247

248

249

250

251

252

253

254

255

256

257

258

259

260

261

262

263

264

265

266

267

268

269

270

271

272

273

274

275

276

277

278

279

280

281

282

283

284

285

286

287

288

289

290

291

292

293

294

295

296

297

298

299

300

301

302

303

304

305

306

307

308

309

310

311

312

313

314

315

316

317

318

319

320

321

322

323

324

325

326

327

328

329

330

331

332

333

334

335

336

337

338

339

340

341

342

343

344

345

346

347

348

349

350

351

352

353

354

355

356

357

358

359

360

361

362

363

364

365

366

367

368

369

370

371

372

373

374

375

376

377

378

379

380

381

382

383

384

385

386

387

388

389

390

391

392

393

394

395

396

397

398

399

400

401

402

403

404

405

406

407

408

409

410

411

412

413

414

415

416

417

418

419

420

421

422

423

424

425

426

427

428

429

430

431

432

433

434

435

436

437

438

439

440

441

442

443

444

445

446

447

448

449

450

451

452

453

454

455

456

457

458

459

460

461

462

463

464

465

466

467

468

469

470

471

472

473

474

475

476

477

478

479

480

481

482

483

484

485

486

487

488

489

490

491

492

493

494

495

496

497

498

499

500

501

502

503

504

505

506

507

508

509

510

511

512

513

514

515

516

517

518

519

520

521

522

523

524

525

526

527

528

529

530

531

532

533

534

535

536

537

538

539

540

541

542

543

544

545

546

547

548

549

550

551

552

553

554

555

556

557

558

559

560

561

562

563

564

565

566

567

568

569

570

571

572

573

574

575

576

577

578

579

580

581

582

583

584

585

586

587

588

589

590

591

592

593

594

595

596

597

598

599

600

601

602

603

604

605

606

607

608

609

610

611

612

613

614

615

616

617

618

619

620

621

622

623

624

625

626

627

628

629

630

631

632

633

634

635

636

637

638

639

640

641

642

643

644

645

646

647

648

649

650

651

652

653

654

655

656

657

658

659

660

661

662

663

664

665

666

667

668

669

670

671

672

673

674

675

676

677

678

679

680

681

682

683

684

685

686

687

688

689

690

691

692

693

694

695

696

697

698

699

700

701

702

703

704

705

706

707

708

709

710

711

712

713

714

715

716

717

718

719

720

721

722

723

724

725

726

727

728

729

730

731

732

733

734

735

736

737

738

739

740

741

742

743

744

745

746

747

748

749

750

751

752

753

754

755

756

757

758

759

760

761

762

763

764

765

766

767

768

769

770

771

772

773

774

775

776

777

778

779

780

781

782

783

784

785

786

787

788

789

790

791

792

793

794

795

796

797

798

799

800

801

802

803

804

805

806

807

808

809

810

811

812

813

814

815

816

817

818

819

820

821

822

823

824

825

826

827

828

829

830

831

832

833

834

835

836

837

838

839

840

841

842

843

844

845

846

847

848

849

850

851

852

853

854

855

856

857

858

859

860

861

862

863

864

865

866

867

868

869

870

871

872

873

874

875

876

877

878

879

880

881

882

883

884

885

886

887

888

889

890

891

892

893

894

895

896

897

898

899

900

901

902

903

904

905

906

907

908

909

910

911

912

913

914

915

916

917

918

919

920

921

922

923

924

925

926

927

928

929

930

931

932

933

934

935

936

937

938

939

940

941

942

943

944

945

946

947

948

949

950

951

952

953

954

955

956

957

958

959

960

961

962

963

964

965

966

967

968

969

970

971

972

973

974

975

976

977

978

979

980

981

982

983

984

985

986

987

988

989

990

991

992

993

994

995

996

997

998

999

1000

1001

1002

1003

1004

1005

1006

1007

1008

1009

1010

1011

1012

1013

1014

1015

1016

1017

1018

1019

1020

1021

1022

1023

1024

1025

1026

1027

1028

1029

1030

1031

1032

1033

1034

1035

1036

1037

1038

1039

1040

1041

1042

1043

1044

1045

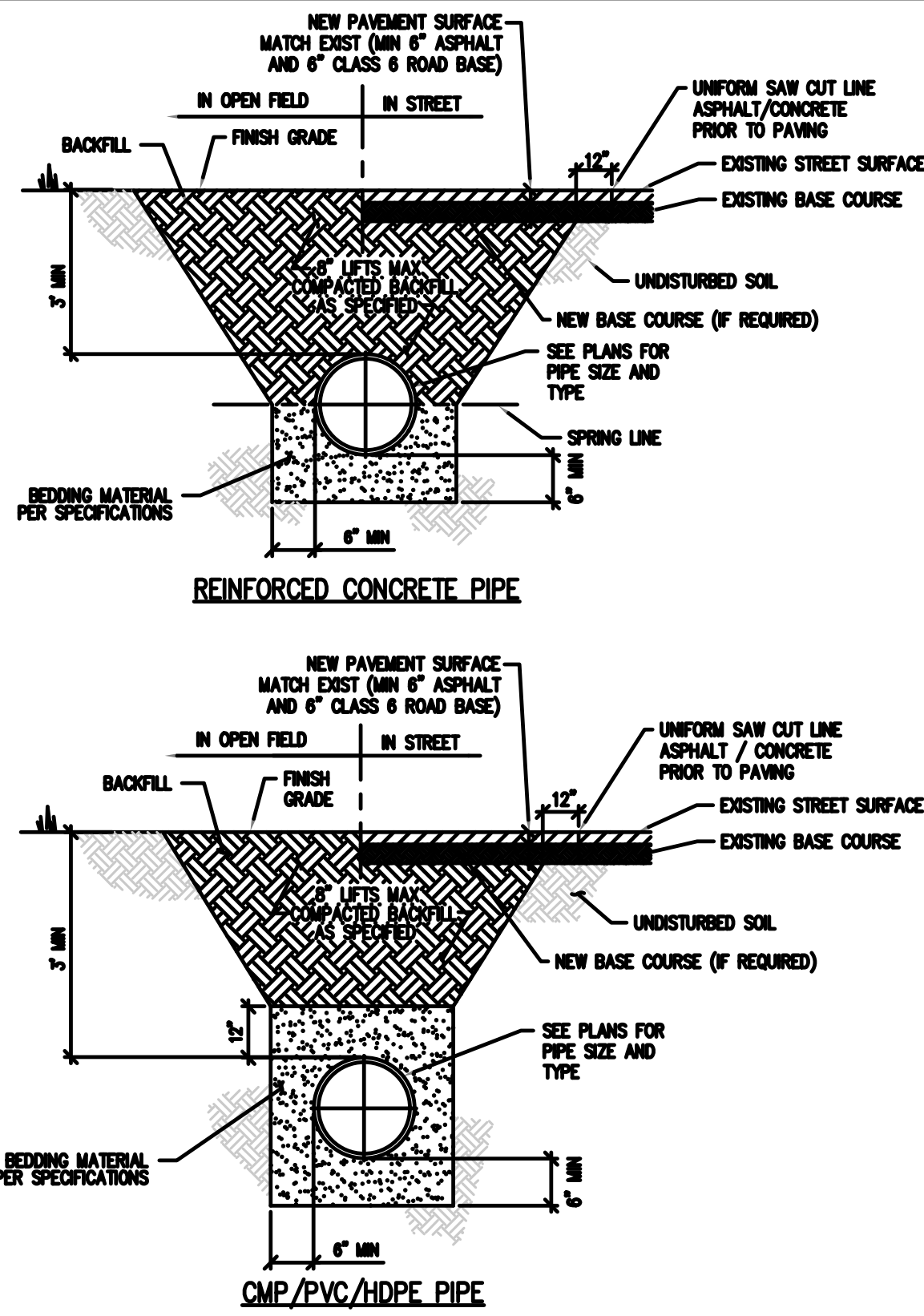
1046

1047

1048

1049

<



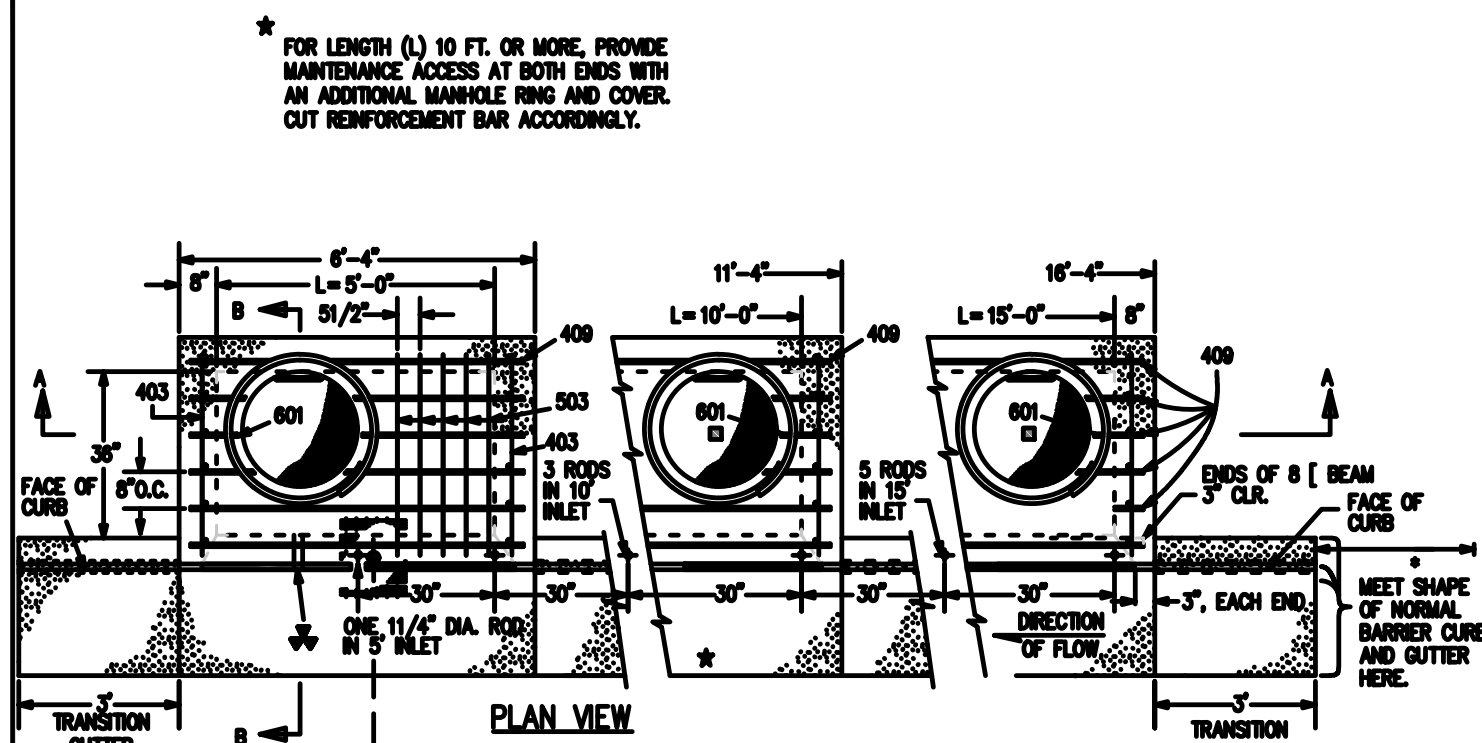
- NOTES:
1. IF UNSTABLE MATERIALS ARE FOUND IN TRENCH, OVEREXCAVATE PER SPECIFICATIONS OR AS REQUIRED.
 2. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR THE SAFETY OF THE WORKERS AND THE PROTECTION OF OTHER UTILITIES.
- SCALE: NTS



TOWN OF BERTHOUD STANDARD DESIGN CRITERIA
STORM SEWER BEDDING DETAILS

D6.02

DATE: 12/2020



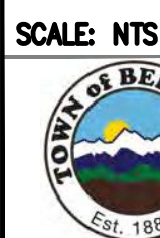
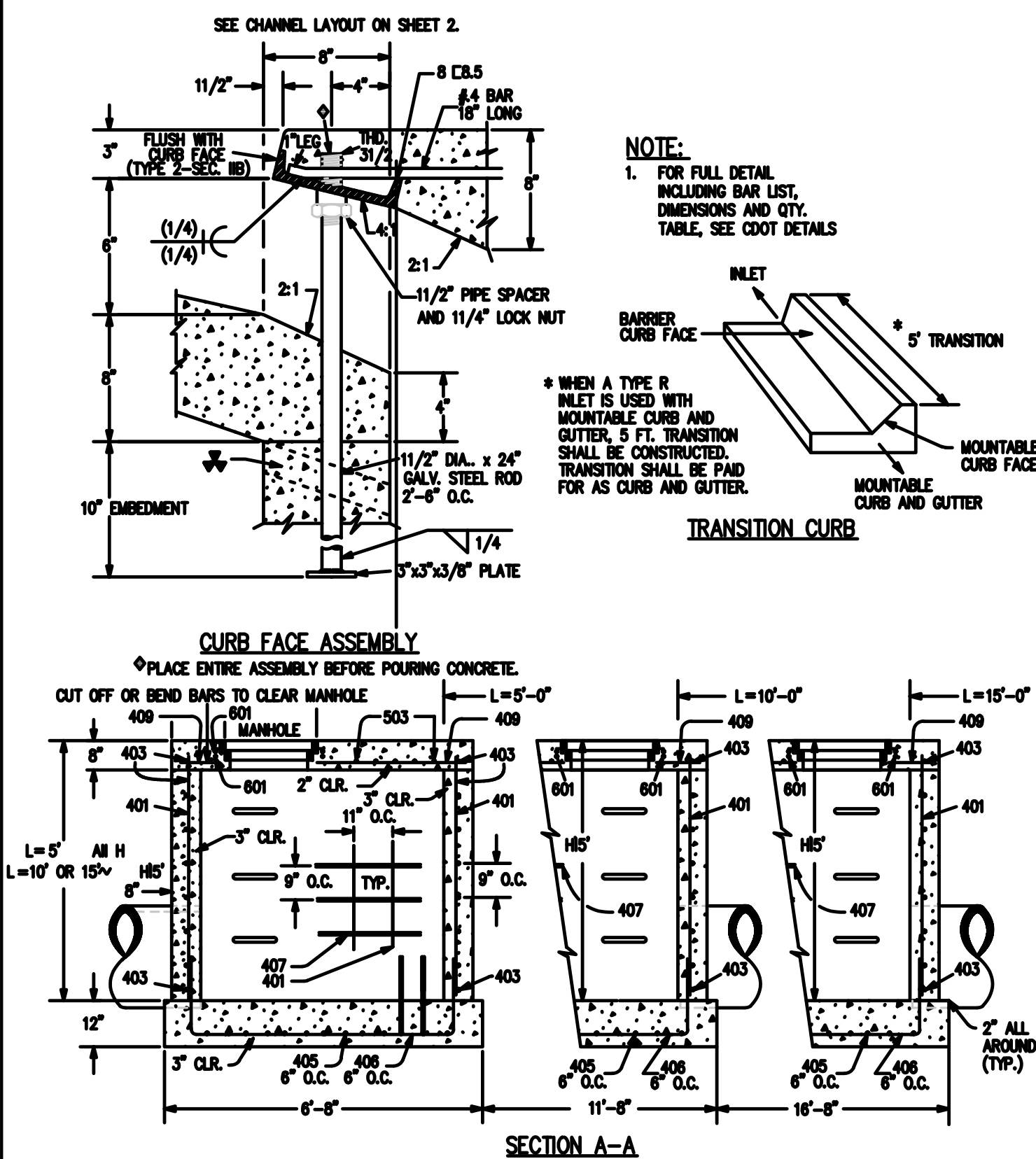
- NOTES:
1. USE OF A TYPE R INLET MUST BE APPROVED BY THE TOWN.
 2. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST-IN-PLACE OR PRECAST.
 3. CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES AND SHALL BE 8 IN. THICK.
 4. INLET STEPS SHALL BE IN CONFORMANCE WITH AASHTO M 198.
 5. CURB FACE ASSEMBLY SHALL BE GALVANIZED AFTER WELDING. 5. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4 IN. CURB AND OUTLET CORNERS SHALL BE FINISHED TO MATCH THE EXISTING CURB AND OUTLET BEYOND THE TRANSITION GUTTER.
 6. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A 2 IN. MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
 7. DIMENSIONS AND HEIGHTS OF TYPICAL MANHOLE RING AND COVER ARE NOMINAL.
 8. MATERIAL FOR MANHOLE RINGS AND COVERS SHALL BE GRAY OR DUCILE CAST IRON IN ACCORDANCE WITH SUBSECTION 712.04.
 9. SINCE PIPE ENTRIES INTO THE INLET ARE VARIABLE, THE DIMENSIONS SHOWN ARE TYPICAL. ACTUAL DIMENSIONS AND QUANTITIES FOR CONCRETE AND REINFORCEMENT SHALL BE AS REQUIRED IN THE WORK. QUANTITIES INCLUDE VOLUMES OCCUPIED BY PIPES.
 10. STRUCTURAL STEEL SHALL BE GALVANIZED AND SHALL BE IN ACCORDANCE WITH SUBSECTION 712.04.
 11. ALL MANHOLE COVERS SHALL BE CAST WITH A "NO DUMPING DRAINS TO STREAM" MESSAGE AND A FISH SYMBOL. THE SURFACE OF THE MANHOLE COVER SHALL HAVE A NON-SLIP PATTERN.
 12. FOR FULL DETAIL INCLUDING BAR LIST AND DIMENSION TABLE, SEE CDDT DETAIL M-404-12 SHEETS 1 AND 2
- SCALE: NTS



TOWN OF BERTHOUD STANDARD DESIGN CRITERIA
STORM SEWER DETAILS
TYPE R CURB INLET (1 OF 3)

D6.09A

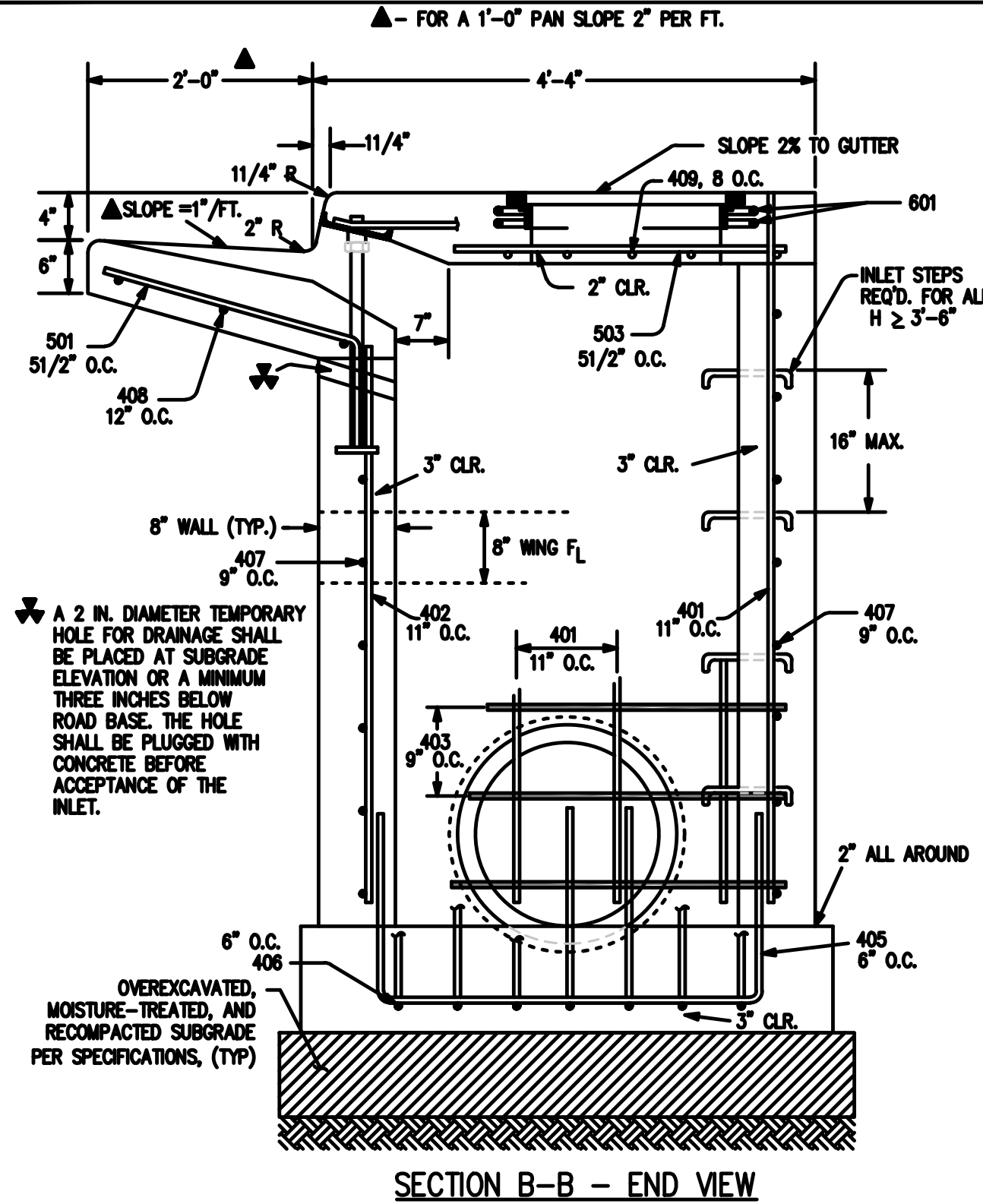
DATE: 12/2020



TOWN OF BERTHOUD STANDARD DESIGN CRITERIA
STORM SEWER DETAILS
TYPE R CURB INLET (2 OF 3)

D6.09B

DATE: 12/2020



- NOTES:
1. FOR FULL DETAIL INCLUDING BAR LIST, DIMENSIONS AND QTY. TABLE, SEE CDDT DETAILS
 2. MANHOLE RING AND COVER, STATION POINT AND OUTFLOW PIPE SHALL BE LOCATED AT THE SAME END OF THE INLET
- SCALE: NTS



TOWN OF BERTHOUD STANDARD DESIGN CRITERIA
STORM SEWER DETAILS
TYPE R CURB INLET (3 OF 3)

D6.09C

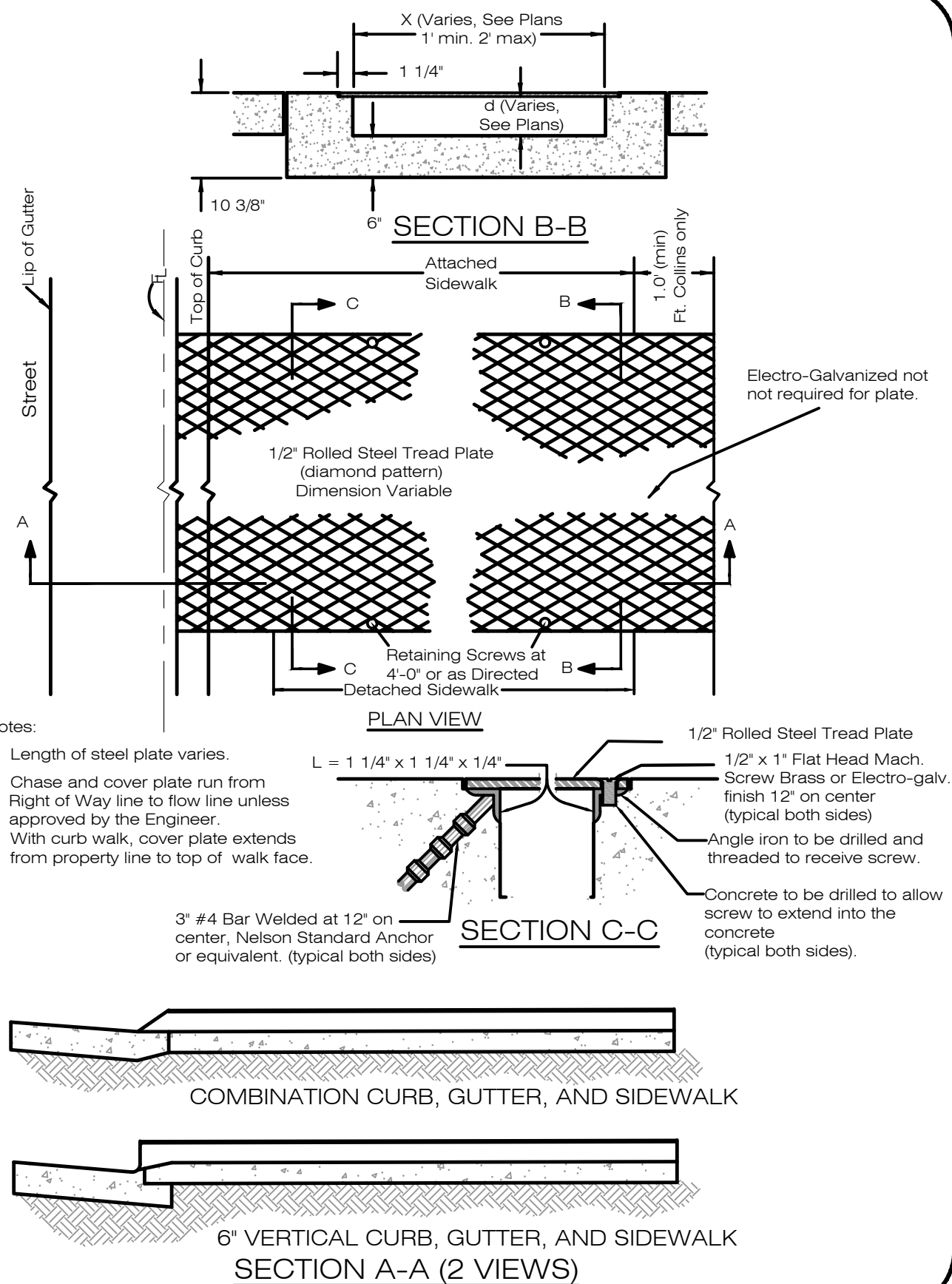
DATE: 12/2020

500
D5
STORM SEWER BEDDING DETAIL
NOT TO SCALE

501
D5
TYPE R CURB INLET (1 OF 3)
NOT TO SCALE

502
D5
TYPE R CURB INLET (2 OF 3)
NOT TO SCALE

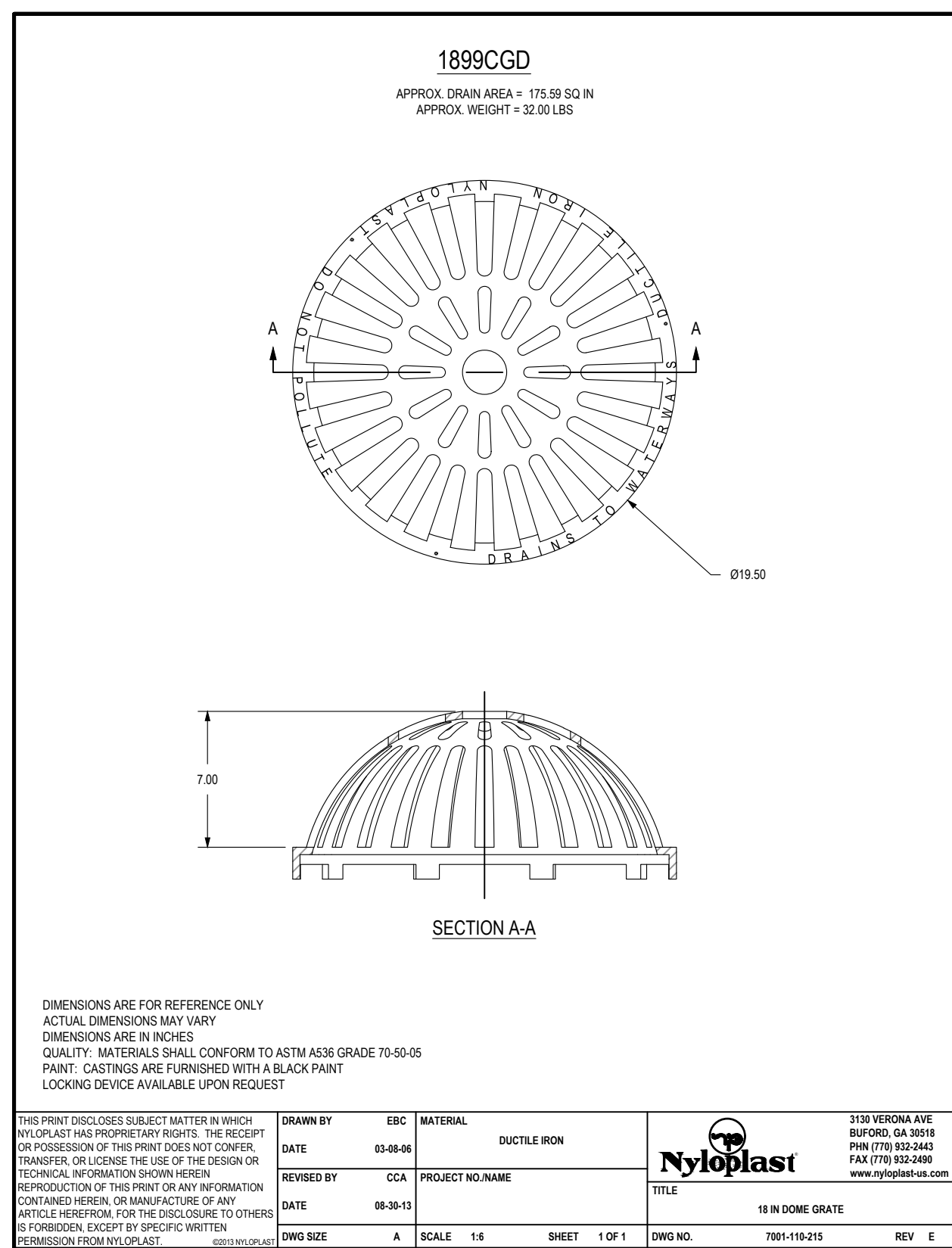
503
D5
TYPE R CURB INLET (3 OF 3)
NOT TO SCALE



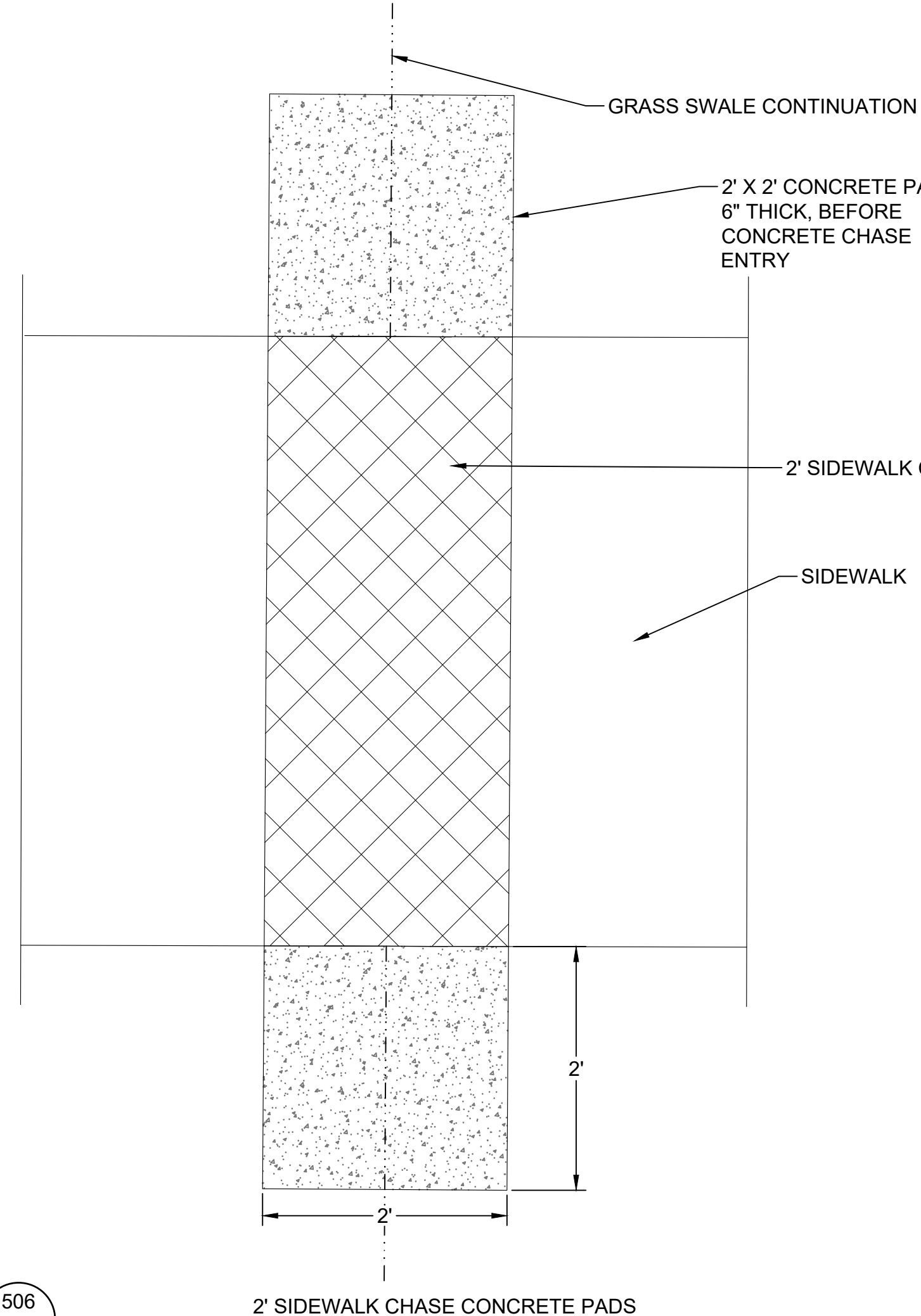
STANDARD DETAILS FOR DRAINAGE UNDER SIDEWALK

LARIMER COUNTY URBAN AREA STREET STANDARDS	CONSTRUCTION DRAWINGS	REVISION NO: 1 DATE: 08/01/21	DRAWING 709
--	--------------------------	----------------------------------	----------------

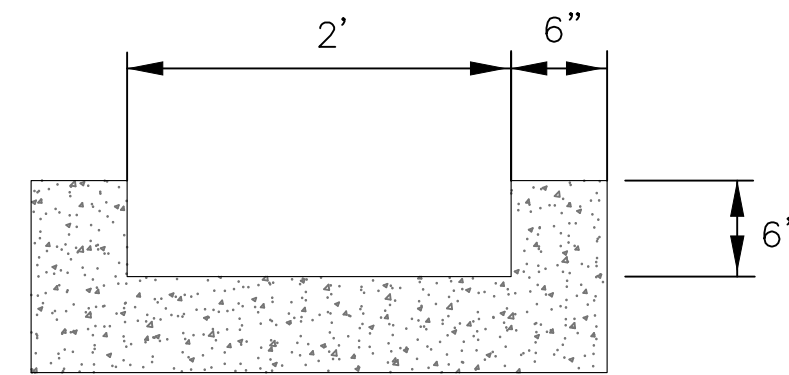
504
D5
METAL SIDEWALK CHASE
NOT TO SCALE



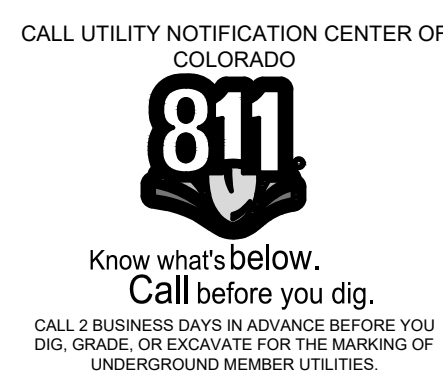
505
D5
NYLOPLAST GRATE
NOT TO SCALE



506
D5
2' SIDEWALK CHASE CONCRETE PADS
NOT TO SCALE



507
D5
POND 2' U-GUTTER TRICKLE PAN
NOT TO SCALE



VANTAGE SUBDIVISION 7TH FILING

DRAINAGE DETAILS

Sheet
D5

20 of 27

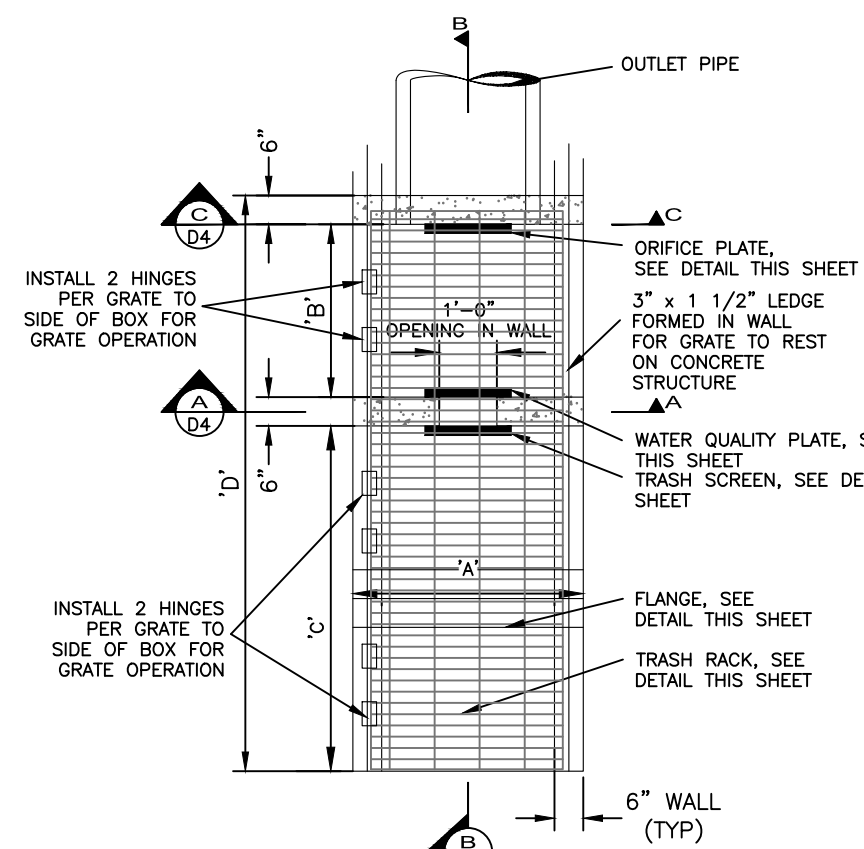
Revisions:
No. Description
1. REVIEW SET
NOT FOR CONSTRUCTION
04/26/23

These drawings are instruments of service provided by Northern Engineering Services, Inc. any type of construction unless signed and sealed by the employee of Northern Engineering Services, Inc.

NORTHERN
ENGINEERING

PORT COLLINS, 301 North Howe Street, Suite 100, 80521
GREELEY, 820 8th Street, 80631
970.221.4158
northerneng.com

PROJECT: 167-025
DATE: 04/26/23
DESIGNED BY: C. PAPE
SCALE: N/A
DRAWN BY: S. THOMAS
P. MANAGER: S. THOMAS



NOTES:
1. ALL METAL PARTS SHALL BE STAINLESS STEEL, ALUMINUM, OR STEEL. STEEL SHALL BE HOT DIP GALVANIZED AND MAY BE PAINTED AFTER GALVANIZING.
2. TRASH RACK SHALL BE GALVANIZED STEEL.
3. MINIMUM CONCRETE MIX SHALL BE 5 1/2 SACK, 3000 PSI. CONCRETE TO BE REINFORCED WITH #4 BARS 12" O.C. EACH DIRECTION. 1" CHAMFER ON ALL EXPOSED CORNERS OF WALLS.

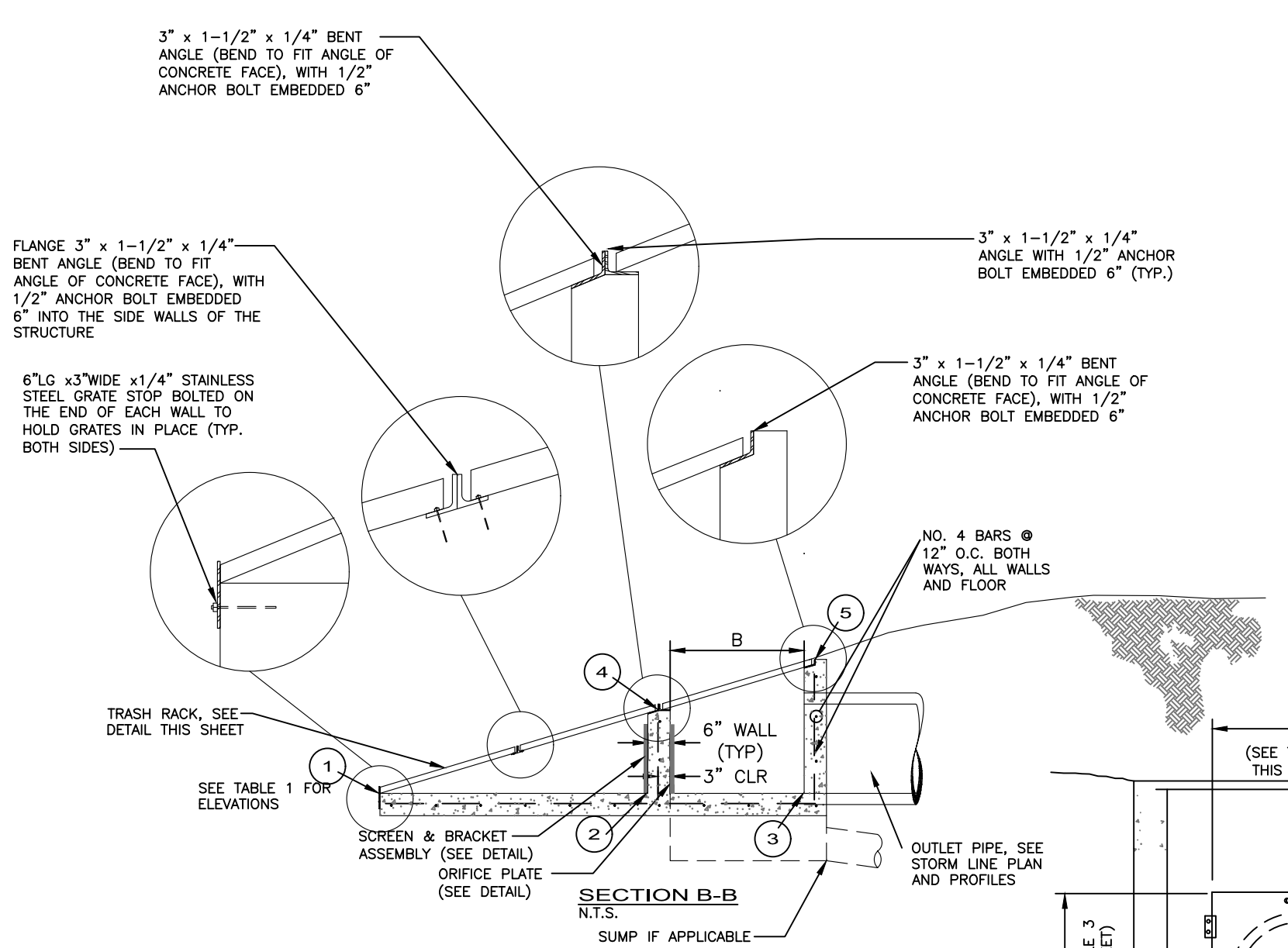
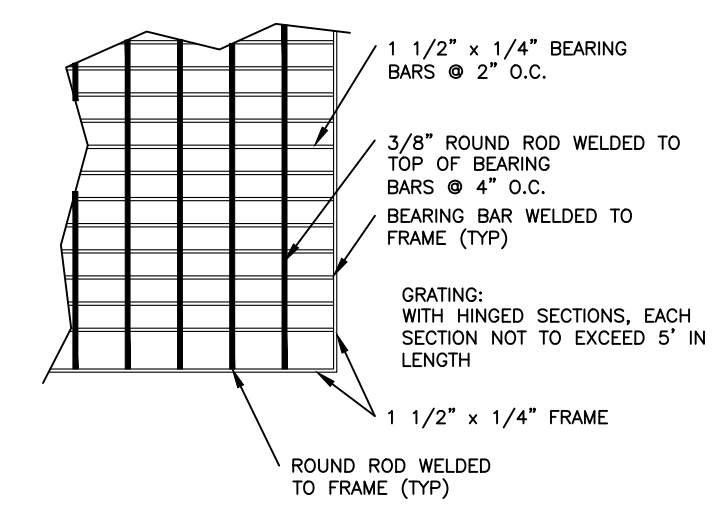
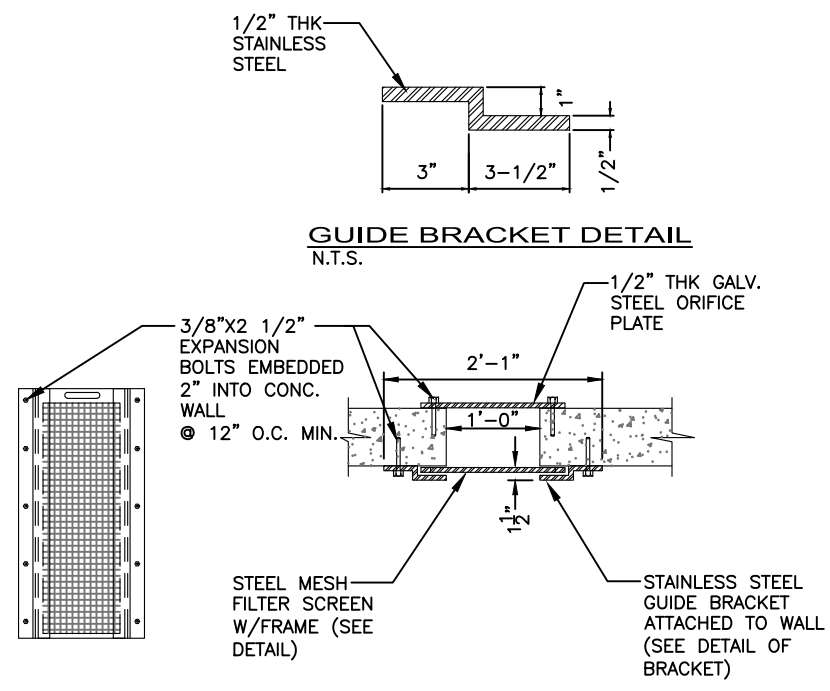
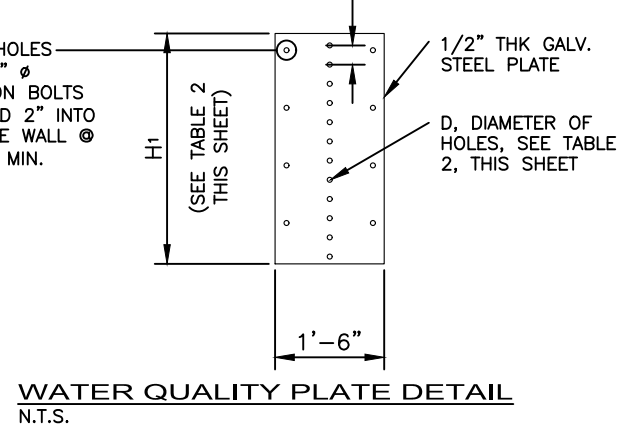
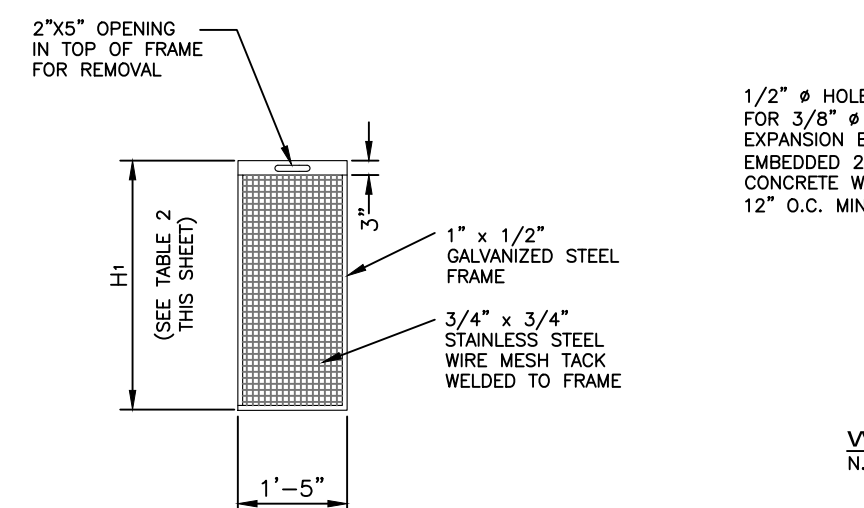
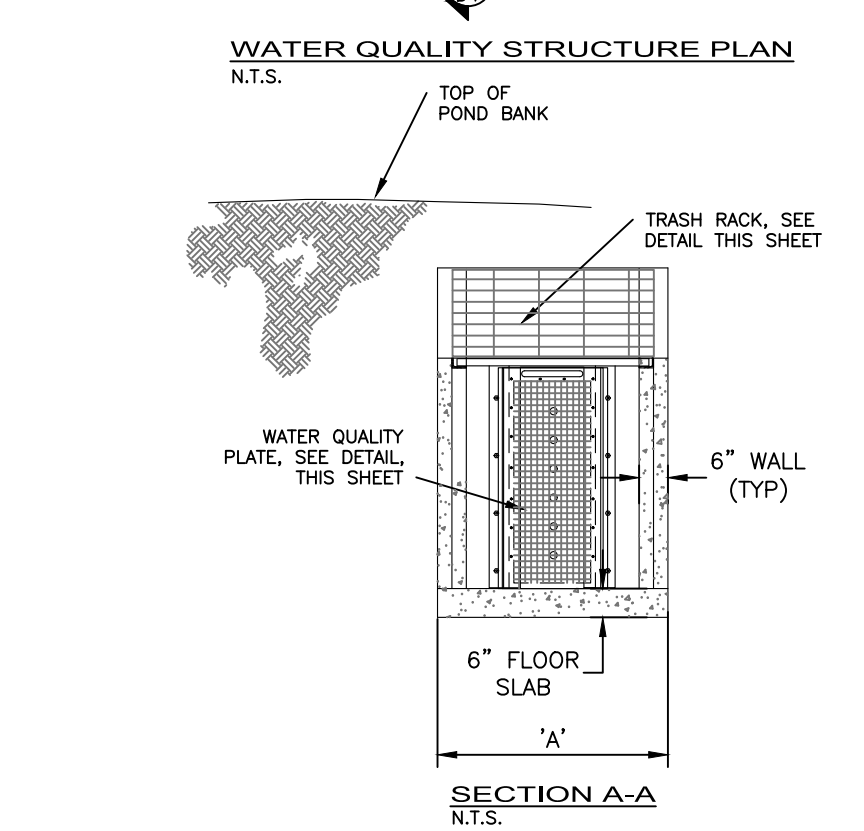


Table 1					
Pond	Elev 1	Elev 2	Elev 3	Elev 4	Elev 5
Pond I	5073.64	5073.58	5073.56	5075.88	5076.50

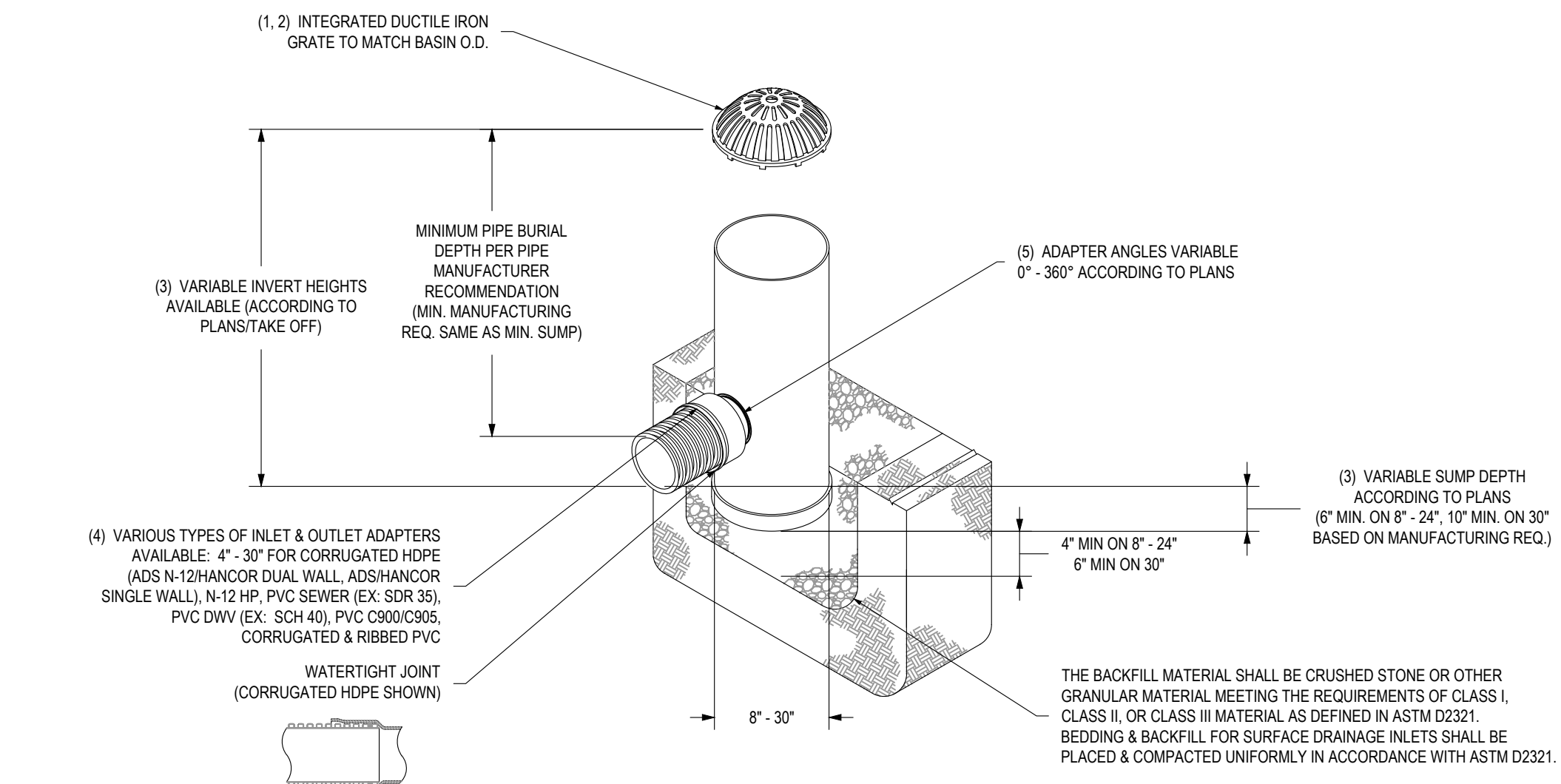
Table 2							
Pond	No. of Rows	No. of Columns	Plate Width, P (inch)	Concrete Opening Width, Q (inch)	WQ Hole Dia., DWQ (inch)	Plate Height, H1 (ft)	Plate Thickness (in)
Pond I	3	1	18	12	0.92	1.63	0.50

Table 3			
Pond	Plate Width, W (inch)	Plate Height, H2 (inch)	Orifice Dia (inch)
Pond I	29.0	23.5	5.0

Table 4				
Pond	Dimension A (ft)	Dimension B (ft)	Dimension C (ft)	Dimension D (ft)
Pond I	5.00	4.00	11.50	16.00

OUTLET STRUCTURES DETAILS

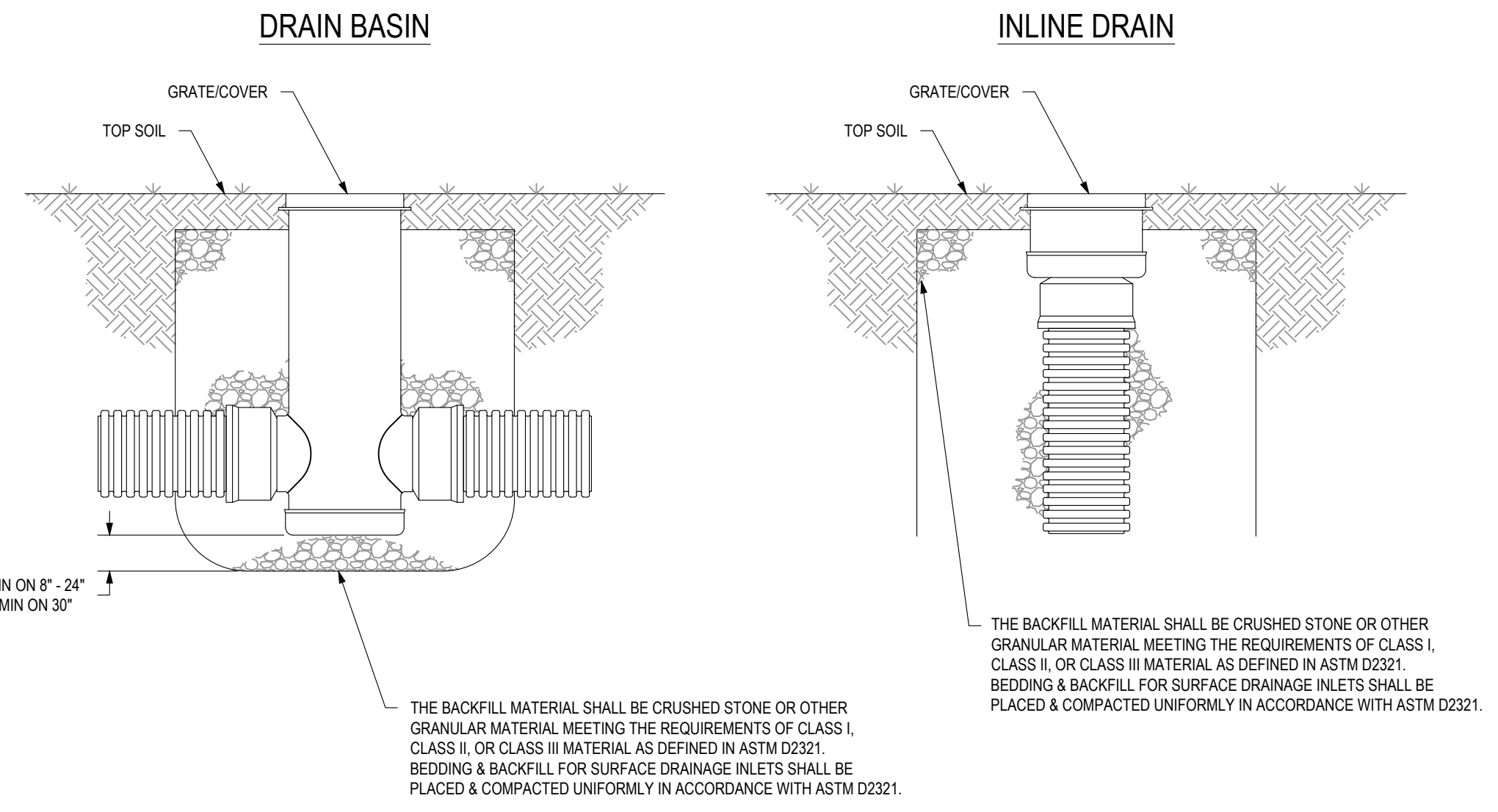
NYLOPLAST DRAIN BASIN WITH DOME GRATE



1 - 8" - 30" DOME GRATES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05	THIS PRINT DISCLOSES SUBJECT MATTER IN WHICH NYLOPLAST HAS PROPRIETARY RIGHTS. THE RECEIPT OR POSSESSION OF THIS PRINT DOES NOT CONFER, TRANSFER, OR LICENSE THE USE OF THE DESIGN OR TECHNICAL INFORMATION SHOWN HEREIN. REPRODUCTION OF THIS PRINT OR ANY INFORMATION CONTAINED HEREIN, OR MANUFACTURE OF ANY ARTICLE HEREFROM, FOR THE DISCLOSURE TO OTHERS IS FORBIDDEN, EXCEPT BY SPECIFIC WRITTEN PERMISSION FROM NYLOPLAST.	DRAWN BY EBC	MATERIAL	3130 VERONA AVE BURLINGTON, MA 01803 PHN (773) 932-2443 FAX (773) 932-2490 www.nyloplast-us.com
2 - 8" & 10" DOME GRATES FIT ONTO THE DRAIN BASINS WITH THE USE OF A PVC BODY TOP. SEE DRAWING NO. 7001-110-045		DATE 03-25-10		
3 - DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS. RISERS ARE NEEDED FOR BASINS OVER 84" DUE TO SHIPPING RESTRICTIONS. SEE DRAWING NO. 7001-110-055		REVISED BY NMH	PROJECT NO. NAME	
4 - DRAINAGE CONNECTION SUBJ. JOINT TIGHTNESS SHALL CONFORM TO ASTM D2321 FOR CORRUGATED HDPE (ADS N-12HANCOR DUAL WALL), N-12 HP, PVC SEWER (EX. SDR 35), PVC DWV (EX. SCH 40), PVC C900/C905, CORRUGATED & RIBBED PVC		DATE 03-11-16		
5 - ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360° TO DETERMINE MINIMUM ANGLE BETWEEN ADAPTERS SEE DRAWING NO. 7001-110-012		DWG SIZE A	SCALE 1:40	SHEET 1 OF 1
6 - 8" - 30" DOME GRATES HAVE NO LOAD RATING.		DWG NO. 7001-110-397	REV D	

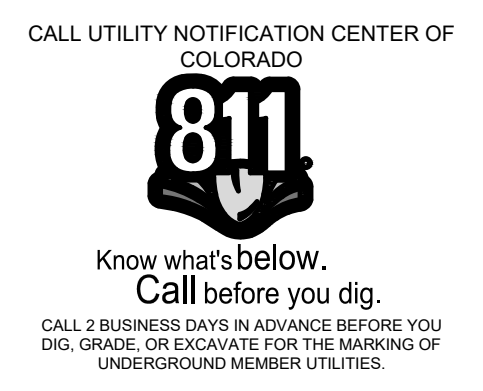
24" NYLOPLAST DRAINAGE BASIN

NON TRAFFIC INSTALLATION



THIS PRINT DISCLOSES SUBJECT MATTER IN WHICH NYLOPLAST HAS PROPRIETARY RIGHTS. THE RECEIPT OR POSSESSION OF THIS PRINT DOES NOT CONFER, TRANSFER, OR LICENSE THE USE OF THE DESIGN OR TECHNICAL INFORMATION SHOWN HEREIN. REPRODUCTION OF THIS PRINT OR ANY INFORMATION CONTAINED HEREIN, OR MANUFACTURE OF ANY ARTICLE HEREFROM, FOR THE DISCLOSURE TO OTHERS IS FORBIDDEN, EXCEPT BY SPECIFIC WRITTEN PERMISSION FROM NYLOPLAST.	DRAWN BY CJA	MATERIAL	3130 VERONA AVE BURLINGTON, MA 01803 PHN (773) 932-2443 FAX (773) 932-2490 www.nyloplast-us.com
DATE 9-30-99			
REVISED BY NMH	PROJECT NO. NAME		
DATE 03-11-16			
DWG SIZE A	SCALE 1:25	SHEET 1 OF 1	
DWG NO. 7001-110-111	REV E		

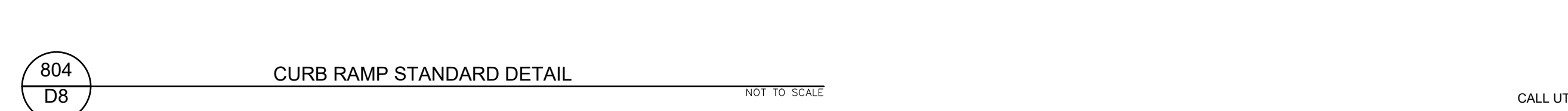
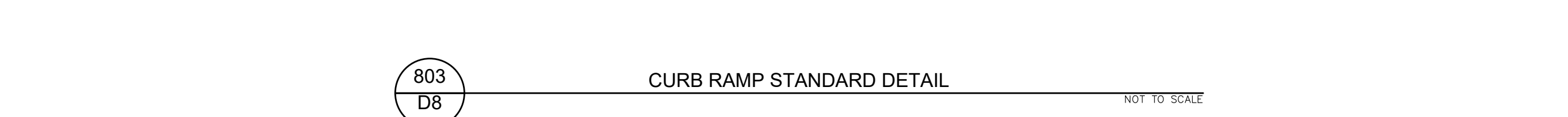
NYLOPLAST NON TRAFFIC INSTALLATION

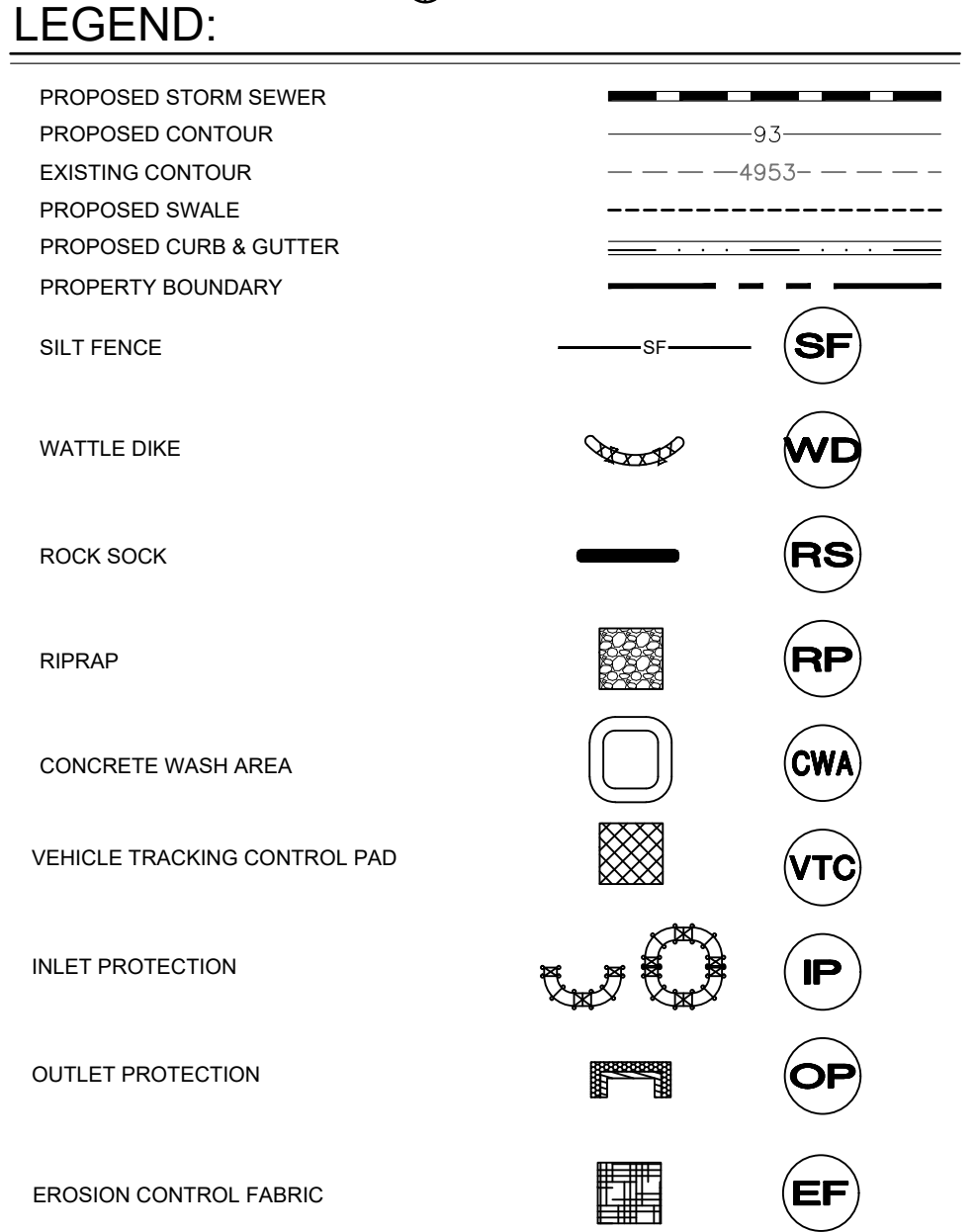




802 CURB RAMP STANDARD DETAIL
D8

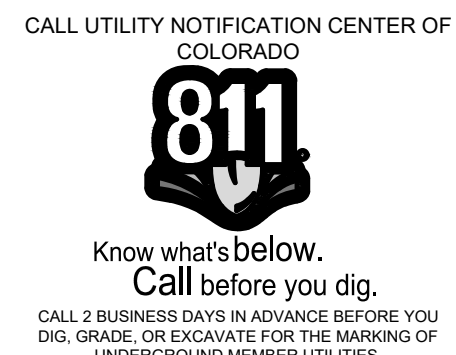
CURB RAMP	STANDARD PLAN NO.
	W 608.1
	Sheet No. 1 of 10
Issued By: Project Development Branch July 4, 2012	

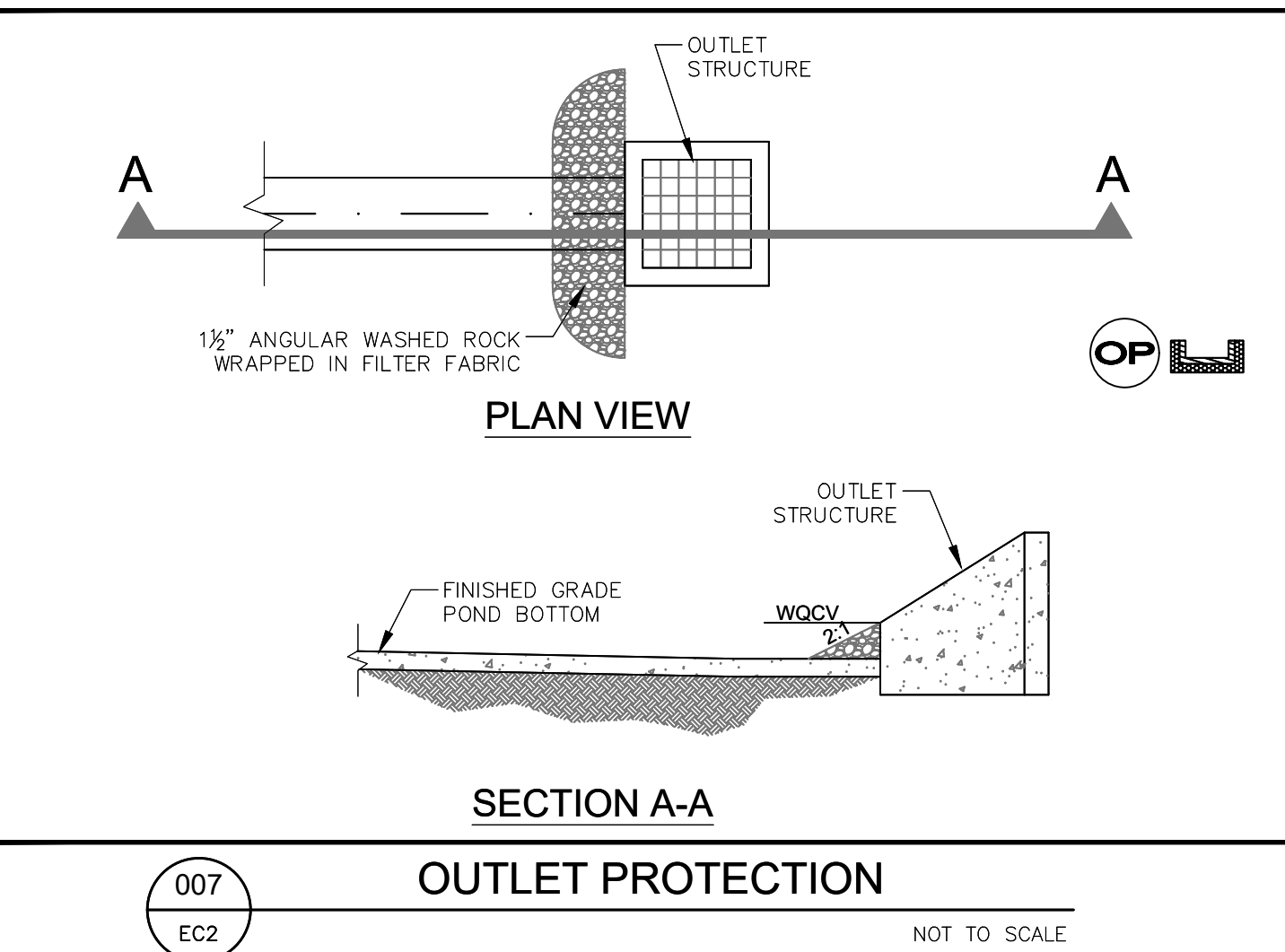




Basis of Bearings
West line of the Southwest Quarter of said Section 11, bearing North 00°15'09"
West, being a grid bearing of the Colorado State Plane Coordinate System,
North Zone, North America Datum 1983/92, a distance of 2649.26 feet.

1. CONTRACTOR SHALL IMMEDIATELY STABILIZE ALL DISTURBED SLOPES BY CRIMP MULCHING OR SIMILAR METHODS.
2. SWMP ADMINISTRATOR:
 Contact _____
 Company _____
 Address _____
 Phone _____
3. CONTRACTOR TO PROVIDE VEHICLE TRACKING CONTROL FOR CONCRETE WASHOUT AREA IF ACCESS IS OFF PAVEMENT.
4. REFER TO THE Drainage Report for Vantage Subdivision 7th Filing, dated April 24, 2023 by NORTHERN ENGINEERING FOR ADDITIONAL INFORMATION.







These drawings are instruments of service provided by Northern Engineering Services, Inc. and are not to be used for any type of construction unless signed and sealed by a Professional Engineer in the employ of Northern Engineering Services, Inc.

NE | **NORTHERN
ENGINEERING**

FORT COLLINS, 301 North Howard Street, Suite 100, 80521
GREELEY, 820 8th Street, 80631
970.221.4158
northernengineering.com

NOTES:

1. REFER TO THE "Drainage Report for Vantage Subdivision 7th Filing, dated April 24, 2023"
FOR ADDITIONAL INFORMATION.

Rational Flow Summary Developed Basin Flow Rates						
Basin	TOTAL AREA (acres)	Tc (min)	C2	C100	Q2 (cfs)	Q100 (cfs)
I-1	5.71	13.8	0.47	0.75	5.82	30.34
I-2	0.44	5.0	0.66	0.84	0.97	4.19
I-3	0.66	5.0	0.29	0.65	0.63	4.87
I-4	0.32	12.5	0.38	0.70	0.26	1.63
I-5	1.13	14.0	0.08	0.55	0.02	0.52
I-Pond	0.70	5.8	0.04	0.53	0.09	4.20
B5	2.42	14.6	0.08	0.42	0.45	6.33

PROJECT: 167-025	DATE: 04/26/23
DESIGNED BY: C. PAPE	SCALE: 1" = 50'
DRAWN BY: C. PAPE	P. MANAGER: S. Thomas

DRAINAGE EXHIBIT

VANTAGE SUBDIVISION 7TH FILING

Sheet
DR1
27 of 27

FOR DRAINAGE REVIEW ONLY
NOT FOR CONSTRUCTION



PLANNING COMMISSION INFORMATION

COMMUNITY DEVELOPMENT DEPARTMENT



Meeting Date:	August 10, 2023
Agenda Title/Subject:	Public Hearing to consider a request for a Preliminary Plat known as Westside Crossing Commercial located north of Mountain Avenue and west of Meadowlark Drive
Type of Item:	Public Hearing
Purpose:	Request for approval of a Preliminary Plat for Westside Crossing Commercial
Presented by:	Anne Johnson, Community Development Director Tawn Hillenbrand, Senior Planner Will Charles, Planner, Baseline Engineering

ATTACHMENTS:

- Staff Report
- Application materials
- Presentation materials

BACKGROUND:

The 11.9-acre property is zoned C-2 for Commercial uses. The location of this proposal is within the greater Gateway development and more specifically located north of Mountain Avenue and west of Meadowlark Drive. The property is within the Mountain Avenue Overlay District. The applicants are proposing seven commercial lots.

UPDATE/NEXT STEPS:

After the Planning Commission public hearing, the Board of Trustees will hear the request in on August 22, 2023. If approved, any Conditions of Approval will need to be met before the Final Plat materials will be presented to the Planning Commission in a public hearing. Each individual lot within the proposed development will be required to apply for a Special Use Permit (public hearings) or a Site Plan (administrative review) for future land uses proposed for the property.

FISCAL IMPACT AND FUND SOURCE:

There is no negative impact to the Town in consideration of this request.

COMMUNITY TOUCHSTONES:

Consideration of this request does not negatively impact community touchstones. The property was zoned C-2 and this proposal is requesting a subdivision to accommodate commercial land uses.

RECOMMENDED ACTION(S):

Staff recommends approval of the request. See suggested motions in the Staff Report.



STAFF REPORT: WESTSIDE CROSSING REPLAT #2 PRELIMINARY PLAT

DATE: August 10, 2023

GENERAL INFORMATION

Applicant:	Scott Charpentier	Size: 11.90 acres
Site Location:	The property is located at the NE corner of Mountain Avenue and US Highway 287	
Applicant's Request:	The Applicant is requesting a preliminary plat for the creation of 7 commercial lots.	
Current Zoning:	C2 General Commercial District	

ZONING DISTRICT INFORMATION

	<u>C2</u>
Max Density	20 per acre
Min. Lot Area	N/A
Min. Lot Width	50'
Front Setback	25'
Side Setback	0'/25' depending on adjacent land uses
Rear Setback	0'/35' depending on adjacent land uses
Max Building Height:	50'

SURROUNDING ZONING, LAND USE AND REQUIRED BUFFERS

	<u>Adjacent Zoning</u>	<u>Adjacent Land Uses</u>	<u>Setbacks for Adjacent Zoning</u>
North	R4	Single/Multi Family	N/A
South	C2	Commercial	N/A
East	PUD	Single Family / Vacant	N/A
West	PUD	Vacant	N/A

Proposal

The applicant proposes to subdivide the existing parcel into 7 lots. The preliminary plat, if approved, would allow the applicant to apply for a final plat that would formally subdivide the lots.

Background

This property is part of the Westside Crossing development. In April of 2021, a neighborhood masterplan and rezoning was approved for this commercial area of the site, as well as the residential neighborhood directly to the North that is currently under construction. Additionally, in March of 2022 a preliminary plat was approved for this area that had a slightly different lot configuration to what is currently being proposed. Due to development interests in the property, the lot configuration has been adjusted to work with end user designs.

Preliminary Plat Review Criteria

In addition to all provisions of this Code, the Town shall use the following criteria to evaluate the applicant's request:

30-6-107(B) Review Criteria	Finding	Rationale
1. The preliminary plat represents a functional system of land use and is consistent with the rationale and criteria set forth in this Code.	Yes	The preliminary plat is a functional system of land use that connects with the existing road network. The proposed subdivision meets the standards of the C2 zone district.
2. The application is consistent with the approved concept plan and incorporates the Town's recommendations and any conditions of approval.	Yes	The plan is consistent with the approved neighborhood master plan. The neighborhood masterplan showed multiple commercial pad sites along HWY 287 and Mountain Avenue with one larger site in the North East corner of the site.
3. The land use mix within the project conforms to Berthoud's Zoning District Map and Preferred Land Use Map and furthers the goals and policies of the Comprehensive Plan and PORT Plan.	Yes	The proposed land use for this area is commercial, which conforms to the C2 General Commercial District. The future land use map identifies this area as Suburban Business which allows for development like what is proposed. Lastly, the project will be bordered by public sidewalks and have multiple pedestrian access points to allow walkability of the site, and connections to the neighboring residential areas.
4. The utility and transportation design is adequate, given existing and planned capacities of those systems.	Yes	Plans were reviewed by Town Staff as well as outside referral agencies. The applicant has provided adequate plans for utilities and transportation designs.
5. Negative impacts on adjacent land uses including, but not limited to: solar access, heat, dust, glare, traffic and noise have been identified and satisfactorily mitigated.	Yes	The application is consistent with the overall plan for the area.

30-6-107(B) Review Criteria	Finding	Rationale
6. There is a need or desirability within the community for the applicant's development and the development will help achieve a balance of land use and/or housing types within Berthoud.	Yes	The future land use map anticipates this area to be developed as suburban business. This development is consistent with the goals of the Comprehensive Plan, and provides additional commercial areas at a major intersection.
7. How the applicant has addressed comments received from the public, during the Public Comment portion of the process.	Yes	All comments received were provided to the applicant and are attached. Public comments have been satisfactorily addressed during the public comment process.

PUBLIC NOTICE AND COMMENT

Notice of the Planning Commission Public Hearing has been mailed to property owners within 500 feet of the subject property on August 3rd, a legal ad published on August 3rd, and the property was posted as required by the Development Code by August 3rd, 2023. In addition, the application was sent out to all property owners within 500 feet, with an invitation to comment on the request within three weeks of receipt. Comments received are attached to this submittal.

FINDINGS AND RECOMMENDATIONS

- **Staff recommends Planning Commission make a motion to recommend approval of the Preliminary Plat to the Board of Trustees, subject to the following condition:**
 - **Revise the preliminary plat materials to address outstanding staff comments attached to this staff report.**

Attachments

1. Application form
2. Preliminary Plat
3. Neighborhood Master Plan – Illustrative Masterplan
4. Traffic Impact Study
5. Preliminary Drainage Report
6. Outstanding Staff Comments
7. Presentation from Staff
8. Presentation from Applicant



Town of Berthoud
807 Mountain Ave.
P.O. Box 1229
Berthoud, CO 80513
970.532.2643

DEVELOPMENT REVIEW APPLICATION

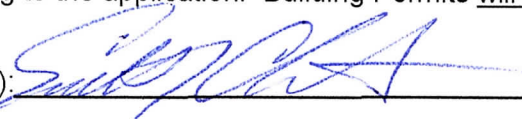
All required information must be provided before submittal will be accepted and deemed complete.
To be complete, the application must include all items identified on the submittal checklist.
Please complete both sides of application form.

Parcel Number(s):		
Site Address: Northeast corner of US HWY 287 Bypass and HWY 56		
Project Name: Westside Crossing		
Brief description of project: Retail, commercial development on +/- 11.9 acres		
APPLICATION TYPE (Check as appropriate):		
☐ Annexation	☒ Preliminary Subdivision Plat	☐ Final Site Plan
☐ Rezoning	☐ Final Subdivision Plat	☐ PUD Amendment
☐ Concept Plan	☐ Plat Amendment	☐ PUD Preliminary Development Plan
☐ Minor Subdivision	☐ Oil and Gas	☐ PUD Final Development Plan
☐ Special Use Review	☐ ROW Vacation	☐ Other _____
APPLICANT		
Name: Scott Charpentier		
E-mail: scott@fcmoney.com	Mailing Address: 8340 Loudon Circle	
Phone: 970-484-5626	City/State/Zip: Windsor, CO 80528	
CONTACT PERSON (will receive correspondence from Town Staff/Referral Agencies)		
Name: Jay Stoner (Land Developers, Inc.)		
E-mail: jay@ldcolorado.com	Mailing Address: 5655 Bridlespur Ridge Place	
Phone: 970-484-5626	City/State/Zip: Colorado Springs, CO 80918	
OWNER(S) (If different than applicant)		
Name:		
E-mail:	Mailing Address:	
Phone:	City/State/Zip:	
CONSULTANT (Engineer, Surveyor, or Planner)		
Name: Steve Wiens		
E-mail: steve@stacklot.com	Mailing Address: 5639 South Curtice St	
Phone: 303-808-4523	City/State/Zip: Littleton, CO 80120	

LAND USE INFORMATION							
Existing Use: Vacant Land Proposed Use: Commercial Existing Zoning: C2 Proposed Zoning: (if applicable): Number of acres: 11.9+ Proposed Access: HWY 56 and Meadowlark	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center; background-color: #e0f0e0;">Adjacent zoning / land use:</th> </tr> </thead> <tbody> <tr> <td style="width: 50%;">East Side: Residential and Commercial</td> <td style="width: 50%;">North Side: Residential</td> </tr> <tr> <td>West Side: HWY 287</td> <td>South Side: HWY 56</td> </tr> </tbody> </table>	Adjacent zoning / land use:		East Side: Residential and Commercial	North Side: Residential	West Side: HWY 287	South Side: HWY 56
Adjacent zoning / land use:							
East Side: Residential and Commercial	North Side: Residential						
West Side: HWY 287	South Side: HWY 56						
UTILITY SERVICE INFORMATION							
Water: Berthoud	Sewer: Berthoud						
PROJECT INFORMATION							
Number of proposed units: N/A Number of phases: N/A Number of Units per phase: N/A Number of lots proposed: N/A Lot size minimum: N/A Lot size maximum: N/A Lot size average: N/A Gross density (units/acre): N/A Net density (units/acre): N/A Area and percent open space: N/A	Non-Residential Building Area (Sq. Ft.) Proposed: +/- 125,000 Non-Residential Construction Floor Area Ratio Proposed: 15%-25% Total Number of Parking Spaces: Per Code <u>Acreage of Site:</u> a. Gross: 11.9 commercial b. Right-of-Way: N/A c. Net (a-b) <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center; background-color: #e0f0e0;">Type of Housing Proposed (please check):</th> </tr> </thead> <tbody> <tr> <td style="width: 50%; vertical-align: top;"> ☐ Future Single Family ☐ Duplex ☐ Multi-family (# of units:) </td> <td style="width: 50%; vertical-align: top;"> ☐ Townhouse ☐ Condominium </td> </tr> </tbody> </table>	Type of Housing Proposed (please check):		☐ Future Single Family ☐ Duplex ☐ Multi-family (# of units:)	☐ Townhouse ☐ Condominium		
Type of Housing Proposed (please check):							
☐ Future Single Family ☐ Duplex ☐ Multi-family (# of units:)	☐ Townhouse ☐ Condominium						

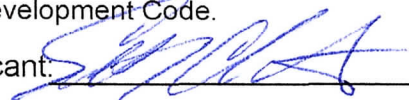
Signatures are required for ALL Property Owners and the Applicant

I hereby certify that I am the lawful owner of the parcel(s) of land that this application concerns and consent to the action. I hereby permit Town of Berthoud staff to enter upon the property for the purposes of inspection relating to the application. Building Permits will not be accepted while this application is in process.

Property Owner(s):  Date: 1-3-23

Property Owner(s): _____ Date: _____

In submitting the application materials and signing this application agreement, I acknowledge and agree that the application is subject to the applicable processing and public hearing requirements set forth in the Development Code.

Applicant:  Date: 1-3-23

FOR OFFICE USE ONLY

Received By:

Date:

O:\20220491-A\dwg\20220491A-SUB.dwg, sh (1), 7/6/2023 8:29:33 AM, 1:1

PRELIMINARY PLAT
WESTSIDE CROSSING REPLAT #2

Being a Replat of Tract A, Westside Crossing,
Situate in the South Half of the Southwest Quarter of Section 15, Township 4 North, Range 69 West of the 6th P.M.,
Town of Berthoud, County of Larimer, State of Colorado

LEGAL DESCRIPTION:

KNOW ALL MEN BY THESE PRESENTS: That the undersigned, being the owners of a portion of the Southwest Quarter Section Fifteen (15), Township Four North (T.4N.), Range Sixty-nine West (R.69W.) of the 6th Principal Meridian, Town of Berthoud, County of Larimer, State of Colorado, more particularly described as follows:

Tract A, Westside Crossing, recorded July 5, 2022 as Reception No. 20220042194 of the Records of Larimer County.

Said described parcel of land contains 11.901 Acres, more or less (±).

Have laid out, platted, and subdivided the above described land, under the name and style of WESTSIDE CROSSING REPLAT #2, and by these presents do dedicate to the Town of Berthoud in fee simple the street and public "rights-of-way" as shown on the plats, and grants to the Town of Berthoud such easements as are created hereby and depicted or, by note, referenced hereon, along with the right to install, maintain, and operate mains, transmission lines, service lines, and appurtenances, either directly or through the various public utilities, as may be necessary to provide such utility, cable television, and sanitary services within this subdivision or property contiguous thereto, through, over, under, and across streets, utility and other easements, and other public places as shown on the plat.

OWNER: Berthoud Gateway LLC, a Colorado limited liability company

By: _____ As: _____

NOTARIAL CERTIFICATE

STATE OF _____)
ss
COUNTY OF _____)

The foregoing dedication was acknowledged before me this _____ day of _____, 20 ____
by _____ as _____

Witness my hand and official seal. (SEAL)

My commission expires _____

Notary Public

LEINHOLDER: Westland Holdings, Inc.

By: _____ As: _____

NOTARIAL CERTIFICATE

STATE OF _____)
ss
COUNTY OF _____)

The foregoing dedication was acknowledged before me this _____ day of _____, 20 ____
by _____ as _____

Witness my hand and official seal. (SEAL)

My commission expires _____

Notary Public

LEINHOLDER: Camco LLC

By: _____ As: _____

NOTARIAL CERTIFICATE

STATE OF _____)
ss
COUNTY OF _____)

The foregoing dedication was acknowledged before me this _____ day of _____, 20 ____
by _____ as _____

Witness my hand and official seal. (SEAL)

My commission expires _____

Notary Public

BASIS OF BEARINGS AND LINEAL UNIT DEFINITION

Assuming the East line of the South Half of the Southwest Quarter of Section 15, T.4N., R.69W, being monumentalized by a #6 rebar with a 2" Aluminum Cap stamped "LS 27936" on the North end and by a #6 rebar with a 3 1/4" aluminum cap stamped "LS 16415" on the South end, as bearing South 00°34'48" East, being a Grid Bearing of the Colorado State Plane Coordinate System, North Zone, North American Datum 1983/2011, a distance of 1330.11 feet with all other bearings contained herein relative thereto.

The lineal dimensions as contained herein are based upon the "U.S. Survey Foot."

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. (13-80-105 C.R.S. 2012)

TITLE COMMITMENT NOTE

This survey does not constitute a title search by King Surveyors to determine ownership or easements of record. For all information regarding easements, rights-of-way and title of records, King Surveyors relied upon Title Commitment Number FC25193574.1-6, dated June 22, 2023 as prepared by Land Title Guarantee Company to delineate the aforesaid information.

SURVEYOR'S CERTIFICATE:

I, Paul B. Groves, a Registered Land Surveyor in the State of Colorado, do hereby certify that the survey of WESTSIDE CROSSING REPLAT #2 was made under my supervision and the accompanying plat accurately and properly shows said subdivision and is in compliance with the Subdivision Regulations of the Town of Berthoud.

PRELIMINARY

Paul B. Groves — On Behalf Of King Surveyors
Colorado Licensed Professional
Land Surveyor #38209

RIGHT TO FARM STATEMENT:

The Town of Berthoud has adopted a "Right to Farm" policy. All new and existing residents are expected to read and understand the policy. For a copy of the policy, please contact the Town of Berthoud.

APPROVAL CERTIFICATES:

Approved by the Town of Berthoud, Colorado,

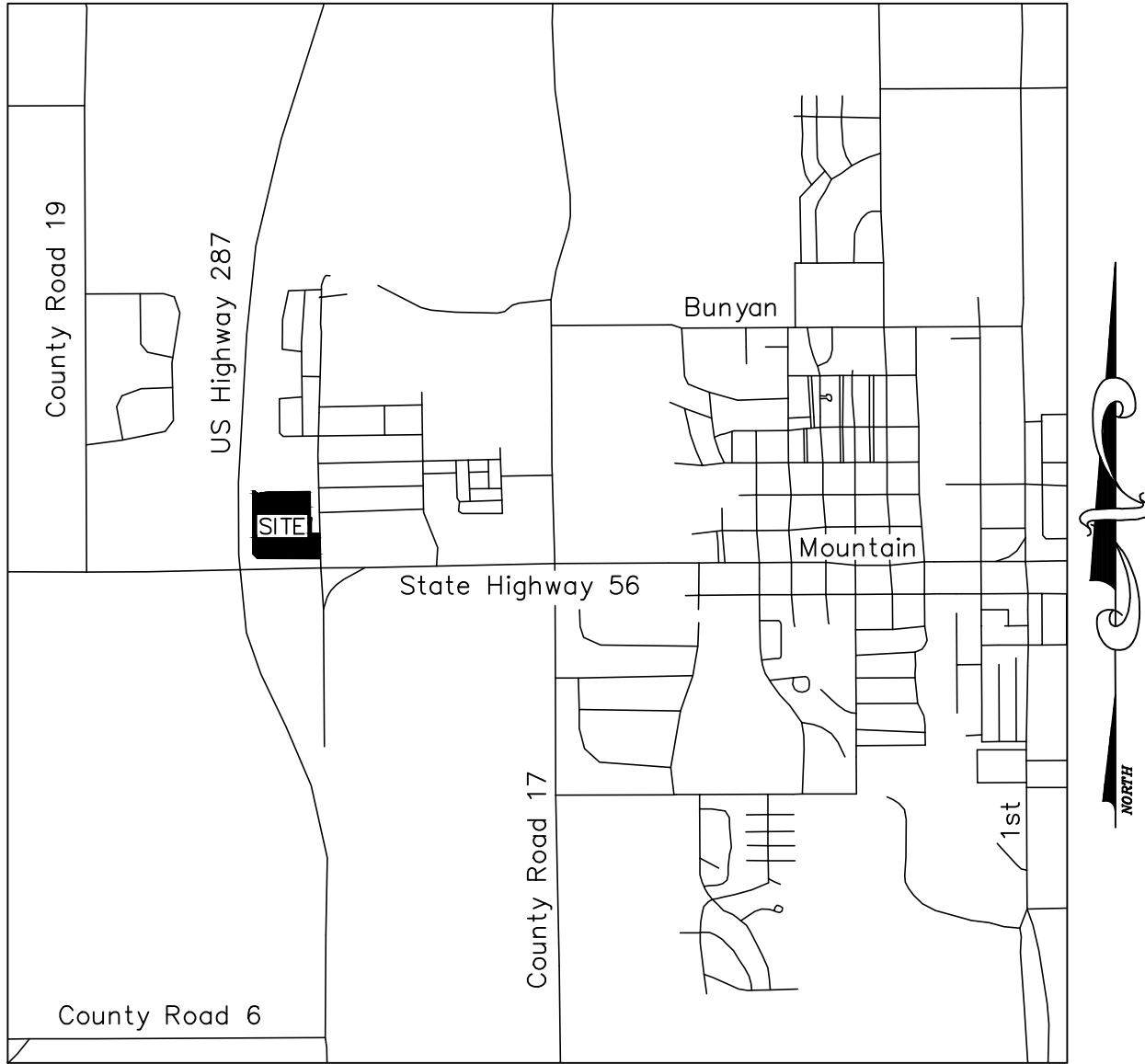
this _____ day of _____, A.D., 20 ____.

Mayor

The foregoing plat is approved for filing and accepted by the Town of Berthoud, Colorado,

this _____ day of _____, A.D., 20 ____.

ATTEST: _____
Town Clerk



VICINITY MAP

SCALE: 1"=2000'

DATE:	12/13/2022
FILE NAME:	20220491A-SUB
SCALE:	1"=30'
DRAWN BY:	CSK
CHECKED BY:	PG

KING SURVEYORS
650 E. Garden Drive | Windsor, Colorado 80550
phone: (970) 686-5011 | email: contact@KingSurveyors.com



REVISIONS:	DATE:
REVISED ESMIS & LOTS	CSK 5/1/23
REVISED ESMIS & LOTS	CSK 7/6/23

WESTSIDE CROSSING REPLAT #2
FOR
BERTHOUD GATEWAY LLC
8340 LOUDEN CIRCLE
WINDSOR, CO 80528

PROJECT #:
20220491-A

1
SHEET 1 OF 2

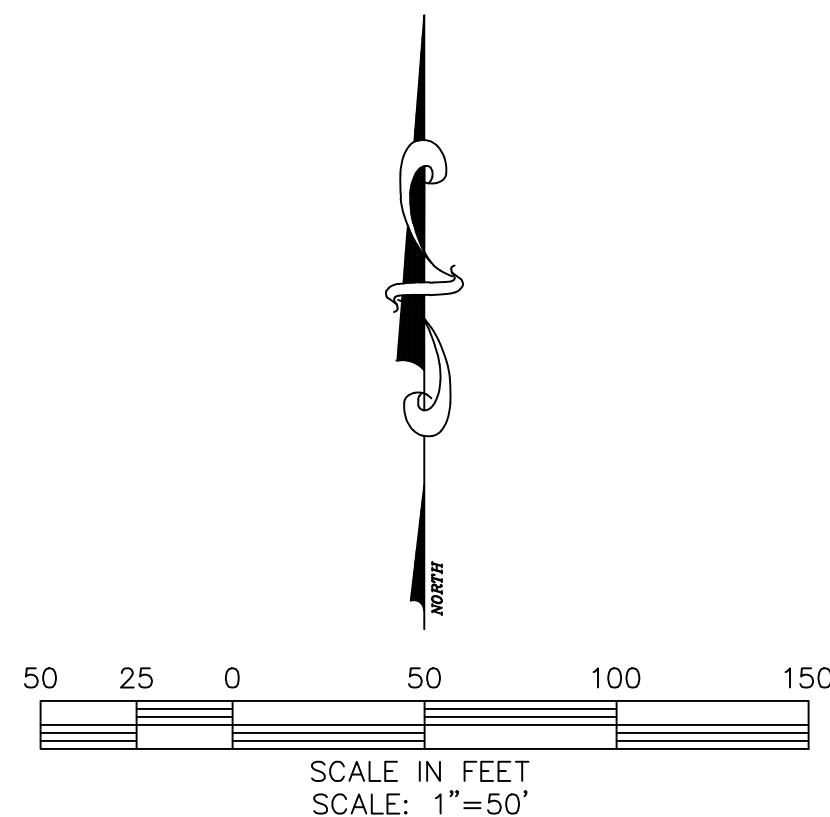
PRELIMINARY PLAT
WESTSIDE CROSSING REPLAT #2

Being a Replat of Tract A, Westside Crossing,
Situate in the South Half of the Southwest Quarter of Section 15, Township 4 North, Range 69 West of the 6th P.M.,
Town of Berthoud, County of Larimer, State of Colorado

CURVE TABLE					
CURVE	LENGTH	RADIUS	DELTA	CHORD	CH BEARING
C1	176.56'	11862.50'	0°51'10"	176.56'	N00°26'05"E
C2	60.06'	94.50'	36°24'51"	59.05'	S59°25'52"E
C3	37.80'	82.00'	26°24'53"	37.47'	N88°38'43"E
C4	45.88'	188.00'	13°58'56"	45.77'	N82°25'45"E
C5	176.56'	11848.50'	0°51'14"	176.56'	S00°26'07"W
C6	39.27'	25.00'	90°00'00"	35.36'	S45°34'47"E
C7	39.27'	25.00'	90°00'00"	35.36'	N45°34'47"W
C8	39.27'	25.00'	90°00'00"	35.36'	S44°25'13"W

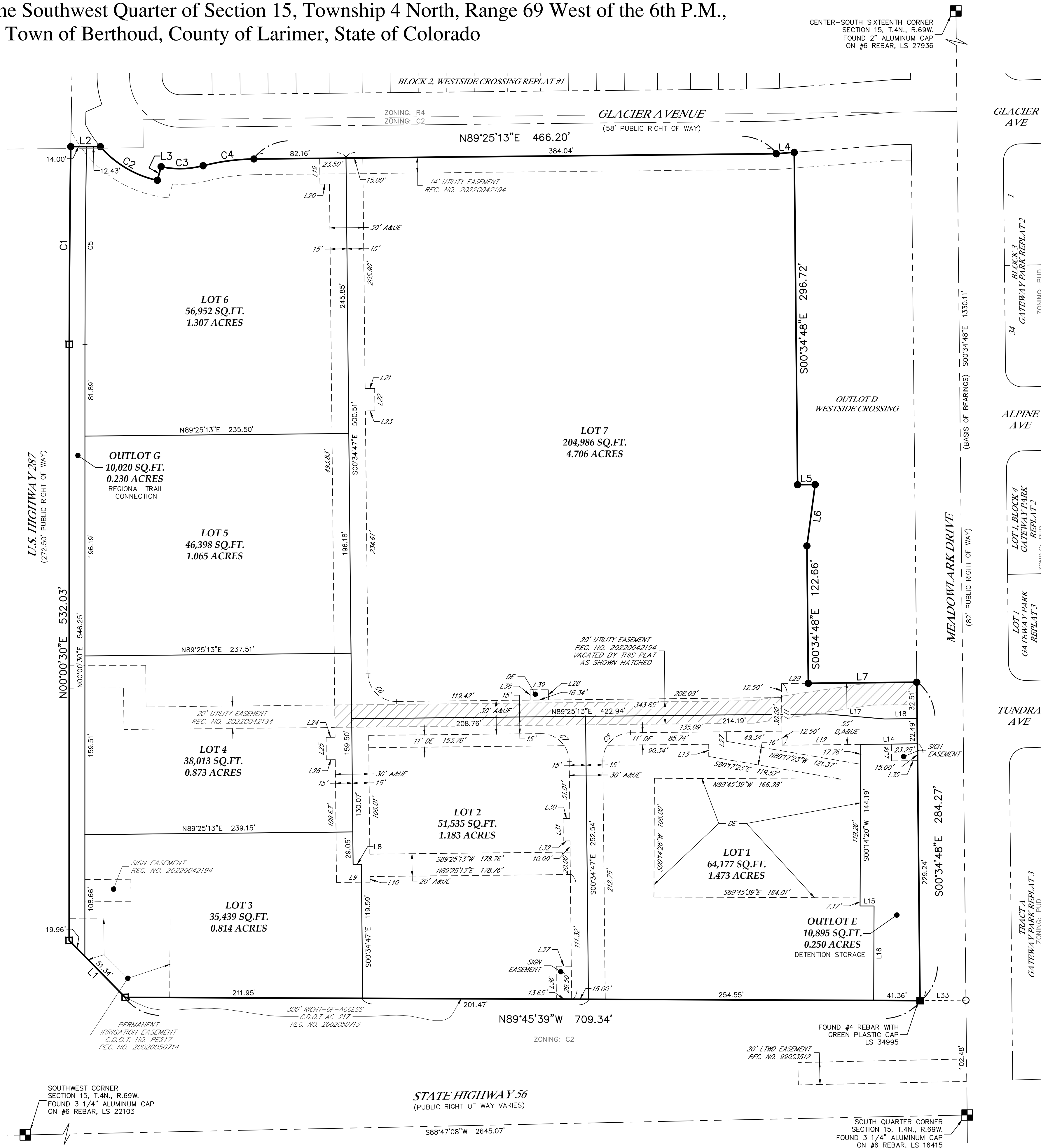
LINE TABLE		
LINE	BEARING	LENGTH
L1	N44°32'38"W	71.30'
L2	N90°00'00"E	26.43'
L3	N15°41'54"E	12.52'
L4	N85°37'33"E	16.04'
L5	N89°25'50"E	15.68'
L6	S07°37'15"W	55.26'
L7	N89°25'13"E	96.80'
L8	S89°25'13"W	7.31'
L9	N89°25'13"E	30.00'
L10	N00°34'47"W	5.00'
L11	N00°34'54"W	55.00'
L12	N89°25'13"E	70.24'
L13	S00°00'00"E	10.91'
L14	S89°25'13"W	50.55'
L15	S89°45'39"E	12.46'
L16	S00°14'21"W	84.33'
L17	S85°09'21"E	52.95'
L18	N89°25'13"E	28.98'
L19	S00°34'47"E	23.06'
L20	N89°25'13"E	8.50'

LINE TABLE		
LINE	BEARING	LENGTH
L21	N89°25'13"E	8.50'
L22	S00°34'47"E	20.00'
L23	S89°25'13"W	8.50'
L24	N89°25'13"E	8.00'
L25	N00°34'47"W	20.00'
L26	S89°25'13"W	8.00'
L27	N00°00'00"E	8.58'
L28	S00°34'58"E	9.06'
L29	N89°25'13"E	24.00'
L30	N89°25'13"E	6.00'
L31	N00°34'47"W	20.00'
L32	S89°25'13"W	6.00'
L33	N89°25'12"E	41.00'
L34	N00°34'47"W	15.00'
L35	S89°25'13"W	23.25'
L36	N00°06'27"W	29.41'
L37	N89°53'36"E	13.44'
L38	N00°34'47"W	9.22'
L39	N90°00'00"E	16.34'



LEGEND

---	EASEMENT LINE
---	CENTERLINE
---	SECTION LINE
---	RIGHT OF WAY LINE
---	BOUNDARY LINE
■	FOUND ALIQUOT CORNER AS DESCRIBED
■	FOUND MONUMENT AS DESCRIBED
□	FOUND #6 REBAR WITH 3 1/4" ALUMINUM CAP LS 22103
●	SET 24" OF #4 REBAR WITH A BLUE PLASTIC CAP STAMPED KS, LS 38209
○	CALCULATED POSITION
A&UE	ACCESS & UTILITY EASEMENT
DE	DRAINAGE EASEMENT
D,A&UE	DRAINAGE, ACCESS & UTILITY EASEMENT

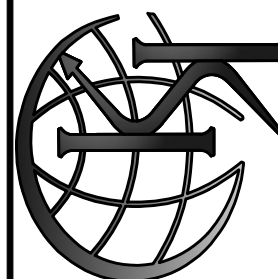


PRELIMINARY

Paul B. Groves — On Behalf Of King Surveyors
Colorado Licensed Professional
Land Surveyor #38209

DATE:	12/13/2022
FILE NAME:	20220491A-SUB
SCALE:	1"=30'
DRAWN BY:	CSK
CHECKED BY:	PG

KING SURVEYORS
650 E. Garden Drive | Windsor, Colorado 80550
phone: (970) 686-5011 | email: contact@KingSurveyors.com



REVISED:	DATE:	BY:
REVISED ESMIT & LOTS	5/1/23	CSK
REVISED ESMIT & LOTS	7/6/23	CSK

WESTSIDE CROSSING REPLAT #2
FOR
BERTHOUD GATEWAY LLC
8340 LOUDEN CIRCLE
WINDSOR, CO 80528

PROJECT #:
20220491-A

2

SHEET 2 OF 2

DISCLAIMER: Drawing represents an illustrative masterplan, identifying proposed uses, buildings, parking and site circulation. This drawing is subject to change at time of final plat and site plan submittal.



Scale: 1" = 60'





ALDRIDGE TRANSPORTATION CONSULTANTS, LLC

Advanced Transportation Planning and Traffic Engineering

John M.W. Aldridge, PE
Colorado Licensed Professional Engineer

1082 Chimney Rock Road
Highlands Ranch, CO 80126
303-703-9112
Mobile: 303-594-4132
Email: john@atceng.com

January 2, 2023

Mr. Jay D. Stoner
President
Land Developers, Inc.
1035 37th Avenue Court
Greeley, CO 80634

Re: Transportation Impact Study with Comprehensive Signal Warrant Analysis
Westside Crossing - Berthoud, CO

Dear Mr. Stoner:

Aldridge Transportation Consultants (ATC) is pleased to present this Traffic Impact Study regarding the proposed development of Westside Crossing in Berthoud.

ATC is professional service firm specializing in traffic engineering and transportation planning. ATC's principal, John M.W. Aldridge, is a Colorado licensed professional engineer. In the past 20 years, ATC has prepared over 1,000 traffic impact studies, designed over 100 traffic signals, and has provided expert witness testimony on engineering design and access issues on multi-million dollar interchange and highway projects in Kansas and Colorado.

ATC appreciates the opportunity to be of service. Please call if you have any questions. We can be reached at 303-703-9112.



Respectfully submitted,

Aldridge Transportation Consultants, LLC

John M.W. Aldridge, P.E.
Principal



1. PROJECT DESCRIPTION

Land Developers, Inc. is proposing to construct a mixed-use development on the northeast corner of CO-287 and CO-56 in Berthoud, Colorado. The development includes a residential component, retail shops, restaurants, grocery store, and a gas station with a convenience store. Figure 1 shows the location of the site, site plan, and the adjacent streets and intersections. Note that the site plan is subject to changes.



Figure 1



2. GENERAL EXISTING CONDITIONS

CO-287 is a state highway categorized as F-W (Freeway) in this section. It currently carries 23,000 per CDOT OTIS data. The speed limit is 65 mph. SH-56 is a two-lane Arterial. Currently it carries 8,000 ADT and is posted at 45 mph in this section. Meadowlark Dr. is two-lane Collector that currently carries approximately 1,200 ADT. It is posted at 35 mph. The traffic signal at CO-287 and CO-56 is fully actuated and features protected/permitted left turn phasing on the north/south approaches and protected only on the east/west approaches. The intersection of CO-56 and Meadowlark Dr. is two-way stop sign controlled.

The AM and PM peak hours at intersections of CO-287/CO-56 and CO-56/Meadowlark were counted on October 15, 2019, by All Traffic Data. The counts are attached.

Both sides will be accessible from CO-56 at two locations. A full movement access at Meadowlark Dr. and a right in/right out access approximately 300 feet west of Meadowlark Dr. No access is allowed on CO-287.

3. DEVELOPMENT SITE CHARACTERISTICS

The trip generation for the residential development is defined in Table 1. It is based on the rates and values found in the ITE Trip Generation Manual, 11th Edition. Shown are the Average Daily Traffic and the AM and PM peak hours.

Table 1

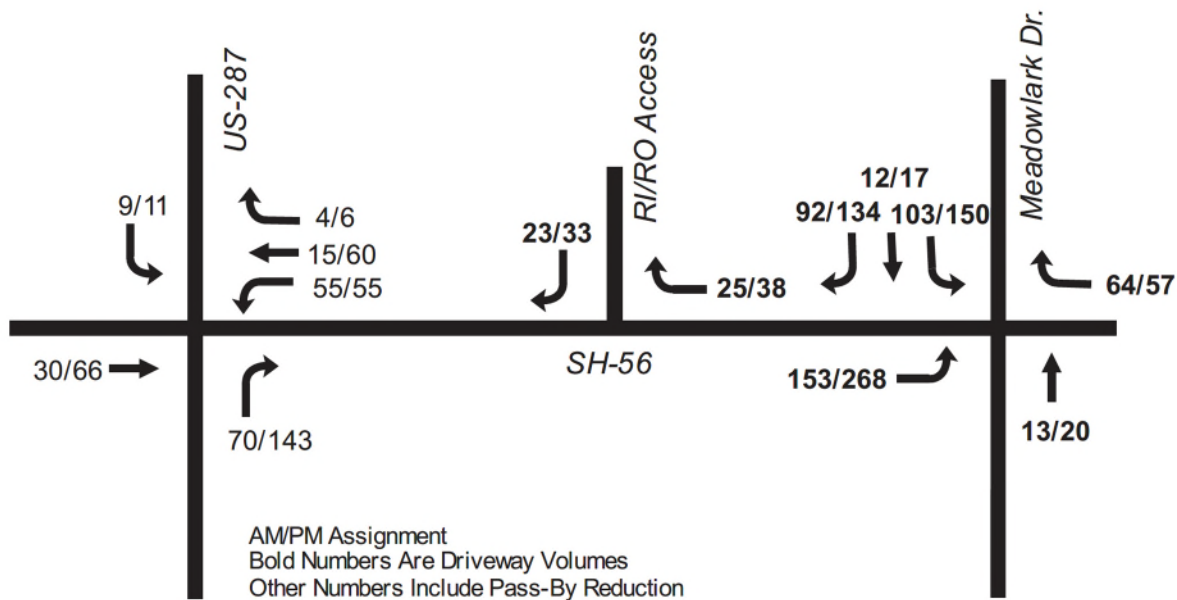
Trip Generation Tabulation								
ITE CODE	LAND USE	UNIT	QUANTITY	ADT	AM		PM	
					IN	OUT	IN	OUT
945	Gas Station w/ Convenience	Fueling	12	265.12	8.03	8.03	9.21	9.21
		Positions		3181	96	96	111	111
210	Single Family Detached	DU	56	9.43	0.18	0.52	0.59	0.35
				528	10	29	33	20
822	Strip Retail Plaza	KSF	29.7	54.45	1.42	0.94	3.30	3.30
				1617	42	28	98	98
850	Grocery Store	KSF	25.0	93.84	1.69	1.17	4.48	4.48
				2346	42	29	112	112
848	Tire Store	KSF	11.9	27.69	1.67	0.94	1.61	2.14
				330	20	11	19	25
932	Restaurants	KSF	16.0	107.20	5.26	4.31	5.52	3.53
				1715	84	69	88	56
Internal Trip Capture Reduction (13% AM) (19% PM)					38	34	88	80
Total Trips				9717	257	229	373	342



The average pass-by trip percentage is 56 percent per the ITE Trip Generation Manual, 11th Edition. The pass-by trips were taken at the intersections and on the mainline. Shown in Table 1 is the internal trip capture. These are trips that stay inside the development i.e., a trip from the residential area to the grocery store. The internal trip capture was determined by using the NCHRP 684 Internal Trip Capture Estimation Tool. It is attached for reference.

The PM peak hour is the heaviest time of traffic on the highway and the development. It is considered the design hour volume (DHV) for operations and geometric design purposes.

The distribution and assignment of the site generated trips is shown in the following graphic. The distribution is based on the current percent movement splits at CO-56/Meadowlark Dr. and CO-287/CO-56.



4. FUTURE CONDITIONS

The CDOT OTIS 20-year growth factor for US-287 is 1.44 and for SH-56 it is 1.13. The 5-year growth factor is 1.10 for US-287 and 1.03 for SH-56. Although likely inclusive of this development, the growth factors were applied as background growth and the site generated traffic was added on for the total growth conditions.



5. PROJECT IMPACTS

ATC uses Synchro v.11 for operations analyses. The Synchro v.11 methodologies are based on the **Highway Capacity Manual, 6th Edition** (HCM). The Synchro HCM reports in the appendix are for reference. LOS is letter rating from A to F. LOS A indicates free-flow traffic conditions and no delay at intersections. LOS F is heavy traffic congestion with significant delay. LOS is provided for the overall operations at signalized intersections. LOS D is generally the benchmark for acceptable signalized intersection operations during the weekday peak hours. The critical movement, not the overall, provides the LOS rating for unsignalized intersections. The critical movement is generally a left turn from the minor approach. Caution is advised when evaluating the LOS at unsignalized intersections particularly when LOS F shows. In cases of a LOS F, the HCM suggests that other evaluation measures should be considered such as the volume over capacity ratio and the 95th percentile queue length to make the most effective traffic control decision. LOS F at unsignalized intersections is considered normal for the weekday peak hour particularly when the v/c ratio and the 95th percentile queue length are acceptable.

The Synchro operations analysis revealed that the intersection at US-287 would operate at no worse than LOS D with little to no delay or queuing in the left turn storage bays. The 20-year growth factor of 1.44 when applied to the mainline volumes shows that the intersection will continue to operate at LOS B again with little to no delay or queuing in the left turn storage bays.

The intersection at Meadowlark Dr. and SH-56 currently operates at LOS C and would continue to do so in the background 2025 and 2040 AM and PM peak hour. The additional site generated traffic will cause significant delay and LOS F operations.

The right turn only entrance will operate at LOS B in all conditions. The Synchro graphics and reports are attached.

Traffic Signal Warrant Analysis

To determine the need for a traffic signal at CO-56/Meadowlark Dr. we have prepared a warrant analysis based on the procedures and methodology promulgated by the Manual on Uniform Traffic Control Devices (MUTCD) that has been adopted as Colorado Law. The analysis worksheets and an explanation summary are provided in the appendix.

Three scenarios were prepared. 1) Existing Conditions, 2) Future Conditions with Residential Only, and 3) Future Conditions with Residential and 50% Build Out of the Commercial Development. The Traffic Signal Analysis reports are provided in the appendix. In summary, the results show in Scenario 1 Existing Conditions that a traffic signal is not warranted. In Scenario 2 Future Conditions with Residential Only a traffic signal is not warranted but it is very close to meeting Warrant #2 - Four-Hour Warrant. As it is very close additional traffic generated by the commercial area will probably push it over the top. Thus, the reason for Scenario 3 Future Conditions with Residential and 50% Build Out of the Commercial Development. In fact, with Scenario 3 the three volume warrants Warrant 1 – Eight-Hour Warrant, Warrant, 2 – Four Hour Warrant and Warrant 3 – Peak Hour Warrant are met. Note that Warrant 8 – Roadway Network permits signal installation up to five years from a projected warrant. A more comprehensive analysis including warrant worksheets is provided in the appendix.



Street Traffic Volumes

Table 2 provides a summary of the ACF traffic volume requirements for the primary roadway, SH-56.

Table 2

Street Traffic Volume Summary Table								
Street Segment	Existing Volume	Date of Existing Volume	Regional Traffic Growth	Traffic from Other Development	Site Generated Traffic	Total Traffic	ACF Traffic Threshold	ACF Compliance
1 SH-56 e/o US-287	447	10/15/2019	505	unk	115	620	920	YES

Peak Hour Link Volumes

Table 3 summarizes the ACF compliance for the individual roadway links in the peak hour.

Table 3

Peak Hour Link Volume Summary Table									
	Existing		AFC	2025		AFC	2040		AFC
Link	VPHPL	ACF Base	Compliant	VPHPL	ACF Base	Compliant	VPHPL	ACF Base	Compliant
SH-56 e/o B. Pkwy. (east link)	323	920	YES	490	920	YES	537	920	YES
SH-56 e/o B. Pkwy. (west link)	447	920	YES	537	920	YES	589	920	YES
ACF Base VPHPL adjusted per Attachments E & F									

Intersection Delay

The intersection operations were analyzed for the existing weekday AM and PM peak hour and the 2025 and 2040 scenarios with and without the site generated traffic. The signalized intersection analyses were performed with the current left turn phasing in the existing and 2025/2040 scenarios. The Synchro graphics and reports for each condition are attached for reference.

Table 4 provides a summary of the Peak Hour intersection Level of Service characteristics. The major intersection threshold for any movement at a signalized intersection is LOS E. LOS F is recorded on the EB leg/movements and WB left on US-287 in 2040. This can be mitigated with opening the dual left turn lanes that are currently striped in and signal timing improvements. Note that the Synchro program is for fixed cycle times. The signal is fully actuated, and each movement is optimized.

The traffic signal at SH-56/Meadowlark Dr. is ACF compliant in all conditions.

LOS F on the critical movement at an unsignalized intersection acceptable in urban conditions. The right in/right out access will operate at a high LOS B in all scenarios.



Table 4

Peak Hour Intersection Level of Service Summary												
Intersection	Traffic Control	Existing		2025 Background		2025 Total		2040 Background		2040 Total		ACF Compliant?
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	
US-287/SH-56	Signalized											
EBL		E	E	E	E	E	E	E	E	E	F	NO
EBT		E	D	E	D	E	E	E	D	E	F	NO
WBL		E	D	E	D	E	E	E	E	F	F	NO
WBT		D	D	D	D	D	E	D	D	D	E	YES
NBL		B	A	B	A	B	B	C	A	C	B	YES
NBT		B	B	B	B	B	B	B	F	B	C	YES
SBL		A	B	B	B	B	B	B	B	B	C	YES
SBT		B	B	B	B	C	B	C	B	C	B	YES
Overall Intersection Delay		27.3	21.8	27.8	22.4	32.8	28.8	32.8	32.1	39.8	38.6	
Overall Intersection LOS		C	C	C	B	C	C	C	D	D	C	YES
SH-56/Meadowlark	TWSC											
NBLTR		C	C	C	C			C	D			YES
EBL		A	A	A	A			A	A			YES
WBL		A	A	A	A			A	A			YES
SBLTR		C	C	C	C			C	C			YES
Overall Intersection Delay		3.5	3.2	3.6	3.3			4.2	3.8	2.8	5.0	
SH-56/Meadowlark	Signalized											
EBL						D	D			D	E	YES
EBT						A	A			A	A	YES
EBR						D	D			D	D	YES
WBL						C	C			C	C	YES
WBT						A	A			A	A	YES
WBR						D	E			D	E	YES
NBL						C	C			C	C	YES
NBT						A	A			A	A	YES
NBR						C	C			C	C	YES
SBL						B	C			B	C	YES
SBT						B	B			B	C	YES
SBR						B	C			B	C	YES
Overall Intersection Delay						37.4	42.3			38.2	44.5	YES
Overall Intersection LOS						D	D			D	D	YES
SH-56/RIRO	TWSC											
SBR						B	B			B	B	YES
Overall Intersection Delay						0.3	0.3			0.3	0.3	



PEDESTRIAN and BICYCLE IMPACT EVALUATIONS

Presently there are no sidewalks or bike lanes on either side of SH-56 or US-287. Detached sidewalks are planned for frontage on US-287, SH-56, and Meadowlark Dr.

MITIGATION MEASURES

Based on the analysis herein, the primary improvement will be the reconstruction and signalization of the SH-56/Meadowlark intersection. The southbound approach should include exclusive left, through and right turn lanes. A right turn lane is needed for the right turn only access and this should be continuous to Meadowlark Dr. An acceleration lane is not required.

The non-compliance at the US-287/SH-56 intersection is on the eastbound leg/movement and the westbound left turn movement in the 2040 condition. The intersection, however, includes striped out areas for dual left turns on the eastbound, northbound, and southbound approaches which will improve the LOS and delay when put in use. Moreover, with real time adaptive signal control, the cycle time and phase splits will become considerably flexible. Note though that the current and future (with the current fixed timing) overall operation is acceptable.

CONCLUSIONS and RECOMMENDED IMPROVEMENTS SUMMARY

The study and operations analyses contained herein provides evidence that the recommended access locations and type will function within acceptable traffic engineering parameters promulgated by FHWA, AASHTO, MUTCD, CDOT, and LCUASS. The access locations and type are essential for safe and smooth transitions on and off the highway and to reduce to the greatest extent unnecessary on-site circulation.

ADEQUACY STATEMENT

In my professional opinion, the transportation facilities will be adequate and available to serve the proposed development within one year of the full build out of the project and that it meets or exceeds the applicable adopted level of service provided in Section 4.5 of the LCUASS standards.



APPENDIX



Traffic Signal Warrant Analysis

The need for a traffic signal can be projected using standard methodology and procedures recommended by the MUTCD, FHWA, and ITE. Of the nine warrants established in the MUTCD, three are what are known as volume warrants. Warrant 1 requires eight hours of traffic volume exceeding the threshold which is a combination of the intersection approaches on the major street and the approach volume on the minor street. Warrant 2 is the same combination but it is for four hours with a higher threshold requirement. Warrant 3 is the peak hour warrant where the same combination exceeds a threshold in just one hour during the peak hour. The peak hour warrant is designed to serve commercial developments that have a high discharge during a one-hour period. Warrants 1 and 2 are generally for residential applications and/or mixed-use developments. While it's easy to project the peak hour warrant, projecting the eight- and four-hour warrants requires an estimated daily volume (ADT) and time of day percentage of the ADT for the total of the major street approaches and the in and out movements of the minor street approach.

The warrant analysis herein is broken down into three scenarios; 1) Existing to test whether the current traffic entering the intersection satisfies a warrant. 2) Existing plus an increase in the background traffic and development of the residential section only. 3) Existing plus an increase in the background traffic, residential development and 50% of the commercial development. Note that the 50% commercial development was selected as the volume in the second scenario was close to meeting the four-hour warrant.

The ADT on the major street approaches is broken down into hourly volumes using Time of Day percentages published by the ITE Trip Generation Manual, 11th Edition. The ADT on the minor street approach likewise is determined using the same procedure. Note that on the minor street approach the right turn volume is typically reduced by 50% to account for right turn on red and ease of entering the major street stream particularly if an acceleration lane is present.

For the Existing scenario, the current volume of 8,000 ADT on CO-56 was input. The Meadowlark Dr. approach volume of 1,200 ADT was input. In this case, no warrant threshold was reached.

For the Existing plus the background and residential section only the volume on CO-56 was raised to 9,000 ADT and the Meadowlark Dr. ADT was raised to 2,000 ADT. In this case, three of the four hours needed to satisfy Warrant 2 were reached, but still fell short. Warrants 1 and 3 were not satisfied.

For the Existing plus the background, residential, and 50% of the commercial the volume on CO-56 was raised to 10,000 ADT, and the ADT on Meadowlark Dr. approach was raised to 5,000 ADT which included a 50% reduction of the right turn volume. In this case, all three volume warrants were satisfied.

Should 50% or more of the commercial development be anticipated within five years, then Warrant 8 - Roadway Network could warrant the traffic signal prior to meeting a warrant with actual traffic volumes. Note that CDOT generally requires actual traffic volumes to warrant a signal.

The following worksheets were developed by the Wisconsin DOT and conform to the MUTCD warrant analysis methodology and procedures. We use them as they are comprehensive and easy to use.

Wisconsin Department of Transportation Traffic Signal Warrant

Summary Worksheet

70%

The Worksheet(s) attached are provided as an attachment to the Engineering Investigation Study for:

Intersection: CO-56 and Meadowlark

County: Larimer

Town: Berthoud

Major Street: CO-56

Critical Approach Speed: 45 mph

Lanes: 1 lane

Minor Street: Meadowlark

Critical Approach Speed: 25 mph

Lanes: 1 lane

% Right Turns Included

From North (SB) 0%

From East (WB) 100%

From South (NB) 100%

From West (EB) 100%

In built-up area of isolated community of < 10,000 population? No

Total number of approaches at intersection? 4 or more

If it is a "T" intersection, inflate minor threshold to 150%? No

Manually set volume level? 70%

Analysis based on PROJECTED volume data.

Forecast Year	Within 5 Years of Construction?	Time (HH:MM)			
		From	AM / PM	To	AM / PM
2040	No	6	AM	10	PM

Warrant Evaluation Summary	Warrant Met:
Warrant 1: Eight - Hour Vehicular Volume	No
Condition A: Minimum Vehicular Volume	No
Condition B: Interruption of Continuous Traffic	No
Condition C: Combination: 80% of A and B	No
Warrant 2: Four-Hour Volume	No
Warrant 3: Peak Hour Volume	No
Warrant 4: Pedestrian Volume	N/A
Criterion A: Four-Hour	
Criterion B: Peak-Hour	
Warrant 5: School Crossing	N/A
Warrant 6: Coordinated Signal System	N/A
Warrant 7: Crash Experience	N/A
Warrant 8: Roadway Network	No
Warrant 9: Intersection Near a Grade Crossing	N/A

Warrant Analysis Conducted By:

Name: John Aldridge

Agency: Aldridge Transportation Consultants

Date: 12/30/2022

Warrant 1: Eight - Hour Vehicular Volume

70%

Warrant Evaluated? Yes

Warrant Satisfied? No

Manually Set To: No

Condition A : Min. Veh. Volume		
Volume Level	70%	56%
Major Rd. Req	350	280
Minor Rd. Req	105	84
Number of Hours	0	1

Satisfied? No

Condition B: Interruption of Continuous Traffic		
Volume Level	70%	56%
Major Rd. Req	525	420
Minor Rd. Req	53	42
Number of Hours	2	7

Satisfied? No

Condition C: Combination of A & B at 56%		
---	--	--

Satisfied? No

6:00 AM		Enter Start Time (Military Time) (HH:MM)			Total
Time Period	From	To	Major Road: Both App. (VPH)	Minor Road: High App. (VPH)	
1	6:00	7:00	254	40	294
2	7:00	8:00	525	82	607
3	8:00	9:00	618	87	705
4	9:00	10:00	436	53	489
5	10:00	11:00	373	38	411
6	11:00	12:00	449	48	497
7	12:00	13:00	482	37	519
8	13:00	14:00	387	33	420
9	14:00	15:00	449	41	490
10	15:00	16:00	436	32	468
11	16:00	17:00	595	44	639
12	17:00	18:00	757	42	799
13	18:00	19:00	707	48	755
14	19:00	20:00	436	24	460
15	20:00	21:00	347	24	371
16	21:00	22:00	235	10	245

Warrant 2: Four-Hour Volume

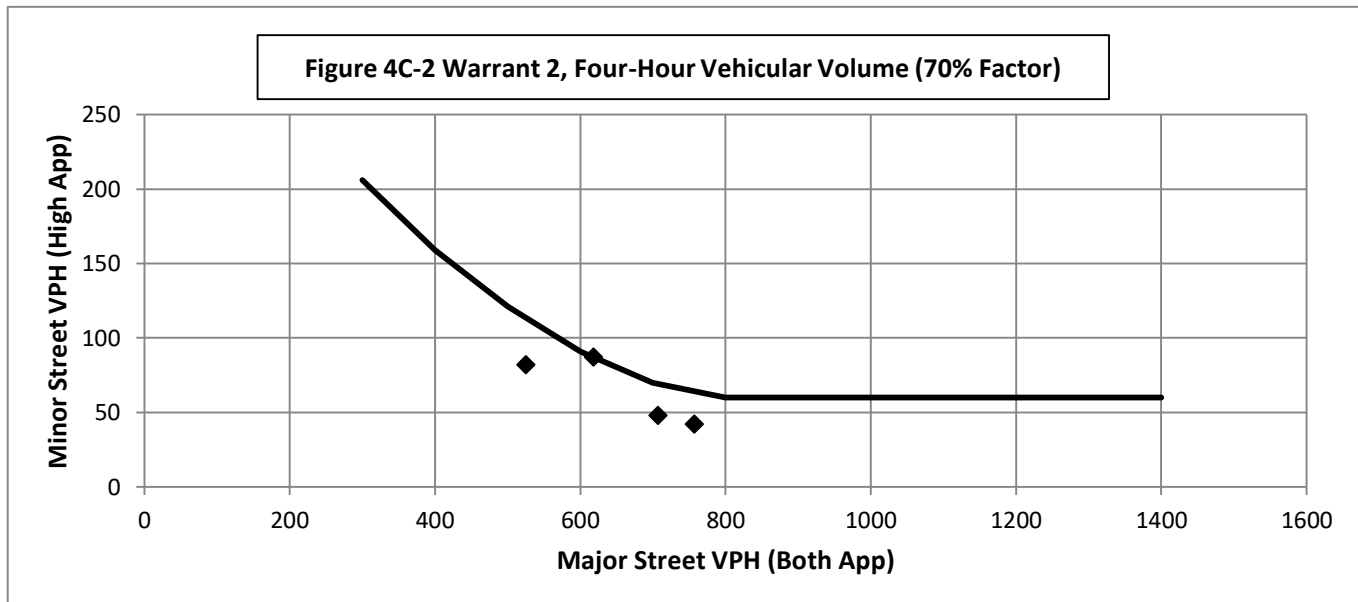
70%

Warrant Evaluated? Yes

Warrant Satisfied? No

Manually Set To: No

Hour Start	8:00	17:00	18:00	7:00
Major Road Vol.	618	757	707	525
Minor Road Vol.	87	42	48	82



Warrant 3: Peak Hour Volume

70%

Warrant Evaluated? Yes

Warrant Satisfied? No

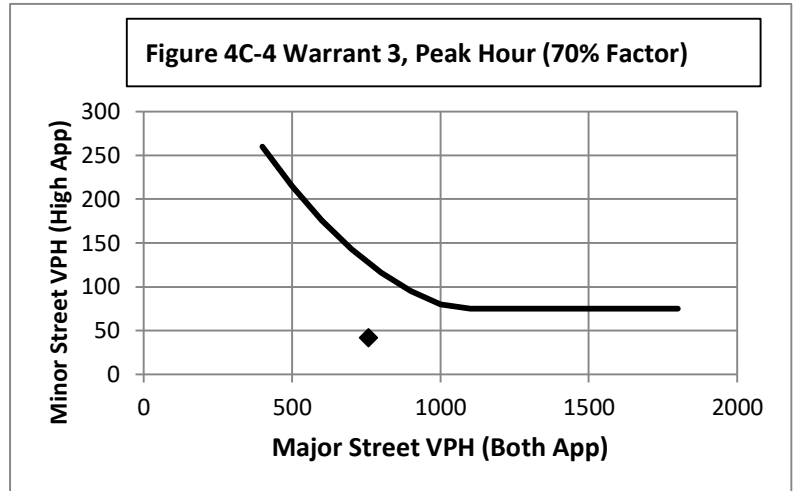
Manually Set To: No

Condition justifying use of warrant:

Criteria		Met?
Delay on Minor Approach	4	No
Volume on Minor Approach	100	
Total Entering Volume (veh/h)	800	

Manually Set Peak Hour? No

Peak Hour	Major Road Vol. (Both App.)	Minor Road Vol. (High App.)
17:00	757	42



Warrant 4: Pedestrian Volume

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criterion A: Four Hour

Hour (Start)	Pedestrian Volume	Major Road Vol.
0:00	0	#N/A
0:00	0	#N/A
0:00	0	#N/A
0:00	0	#N/A

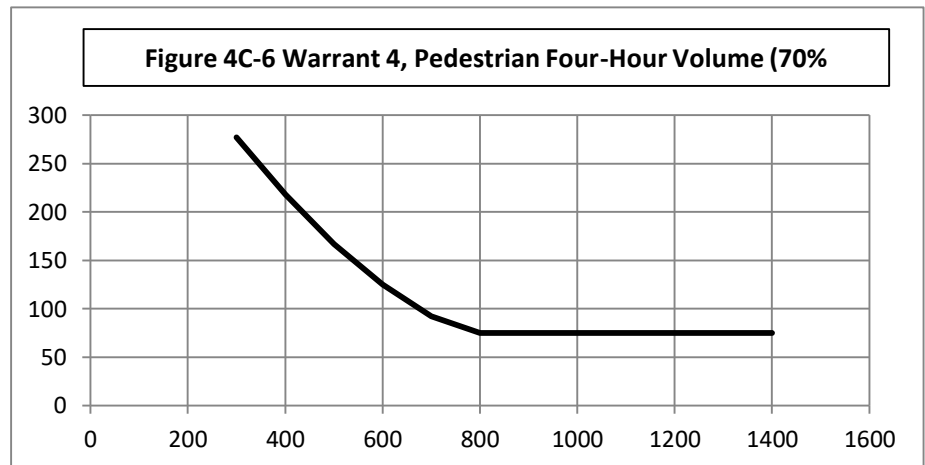
Manually Set Major Rd Vol?

Avg. walk speed less than 3.5 ft/s?

No

No

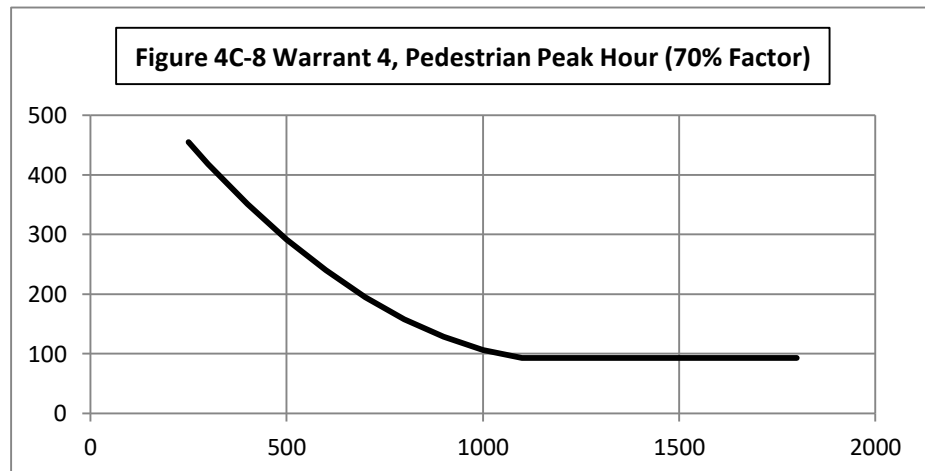
Criterion A Satisfied?



Criterion B: Peak Hour

Peak Hour	Pedestrian Vol.	Major Road Vol.
#N/A	#N/A	#N/A

Criterion B Satisfied?



Warrant 5: School Crossing

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criteria

Fulfilled?

1	There are a MINIMUM of 20 school children during the highest crossing hour.	
2	There are fewer adequate gaps in the major road traffic stream during the period when the school children are using the crossing than the number of minutes in the same period.	
3	The nearest traffic signal along the major road is located more than 300 ft away. Or, the nearest traffic signal is within 300 ft but the proposed traffic signal will not restrict the progressive movement of traffic.	

Warrant 6: Coordinated Signal System

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criteria

Fulfilled?

1	Signal spacing > 1000 ft	
2	On a one-way road or a road that has traffic predominantly in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicle platooning.	
3	On a two-way road, adjacent signals do not provide the necessary degree of platooning and the proposed and the adjacent signals will collectively provide a progressive operation.	

Warrant 7: Crash Experience

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criteria

Met?

Fulfilled?

1	Adequate trial of other remedial measures has failed to reduce crash frequency.			
	Measures Tried:			
2	Five or more reported crashes, of types susceptible to correction by signal, have occurred within a 12 month period.		# of crashes per 12 months	
3	Warrant 1, Condition A (80%)			No
	Warrant 1, Condition B (80%)			No
	Warrant 4, Criterion A (80%)			#N/A
	Warrant 4, Criterion B (80%)			#N/A

Warrant 8: Roadway Network

70%

Warrant Evaluated? Yes

Warrant Satisfied? No

Manually Set To:

Criteria

Met?

Fulfilled?

1	Total entering volume of at least 1,000 veh/h during typical weekday peak hour		799	No	No
	Five-year projected volumes that satisfy one or more of Warrants 1, 2, or 3.		2	Yes	
2	Total entering vol. of at least 1,000 veh/h for each of any 5 hrs of non-normal business day (Sat. or Sun.)				
	Hour				
	Volume				

Characteristics of Major Routes - Select yes if all intersecting routes have characteristic

Fulfilled?

1	Part of the road or highway system that serves as the principal roadway network for through traffic flow	Yes
2	Rural or suburban highway outside of, entering, or traversing a city	Yes
3	Appears as a major route on an official plan	Yes

Warrant 9: Intersection Near a Grade Crossing

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Adjustment Factors			Manually Set Peak Hour?				
Rail Traffic per Day	% High Occupancy Buses on Minor Road	% Tractor-Trailer Trucks on Minor Road	D	Peak Hour	Major Road Vol.	Minor Road Vol.	Adjusted Minor Vol.
1	0	0% to 2.5%	660	17:00	757	42	14.07

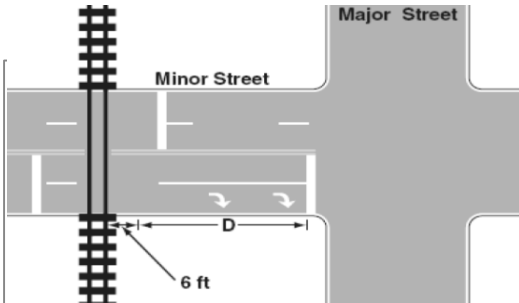
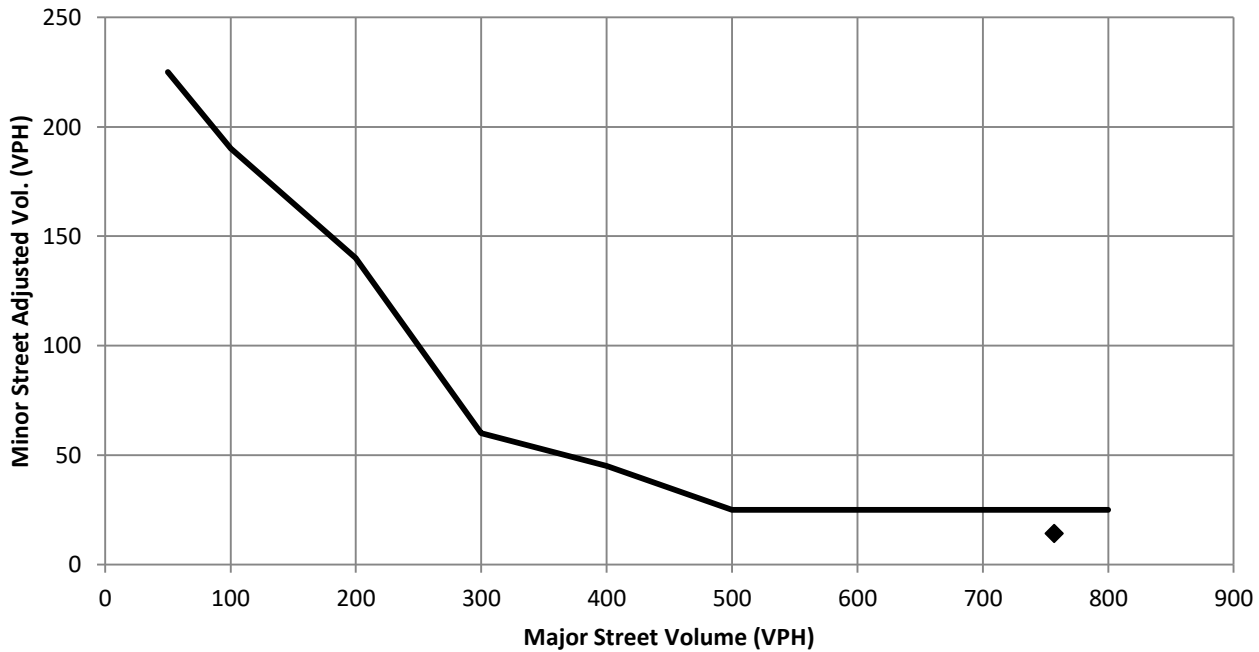


Figure 4C-9 Warrant9, Intersection Near a grade Crossing (One Approach Lane at the Track Crossing)



Conclusions/Comments:

Updated: 12/6/2017

Wisconsin Department of Transportation Traffic Signal Warrant

Summary Worksheet

70%

The Worksheet(s) attached are provided as an attachment to the Engineering Investigation Study for:

Intersection: CO-56 and Meadowlark

County: Larimer

Town: Berthoud

Major Street: CO-56

Critical Approach Speed: 45 mph

Lanes: 1 lane

Minor Street: Meadowlark

Critical Approach Speed: 25 mph

Lanes: 1 lane

% Right Turns Included

From North (SB) 0%

From East (WB) 100%

From South (NB) 100%

From West (EB) 100%

In built-up area of isolated community of < 10,000 population? No

Total number of approaches at intersection? 4 or more

If it is a "T" intersection, inflate minor threshold to 150%? No

Manually set volume level? 70%

Analysis based on PROJECTED volume data.

Forecast Year	Within 5 Years of Construction?	Time (HH:MM)			
		From	AM / PM	To	AM / PM
2040	No	6	AM	10	PM

Warrant Evaluation Summary	Warrant Met:
Warrant 1: Eight - Hour Vehicular Volume	No
Condition A: Minimum Vehicular Volume	No
Condition B: Interruption of Continuous Traffic	No
Condition C: Combination: 80% of A and B	No
Warrant 2: Four-Hour Volume	No
Warrant 3: Peak Hour Volume	No
Warrant 4: Pedestrian Volume	N/A
Criterion A: Four-Hour	
Criterion B: Peak-Hour	
Warrant 5: School Crossing	N/A
Warrant 6: Coordinated Signal System	N/A
Warrant 7: Crash Experience	N/A
Warrant 8: Roadway Network	No
Warrant 9: Intersection Near a Grade Crossing	N/A

Warrant Analysis Conducted By:

Name: John Aldridge

Agency: Aldridge Transportation Consultants

Date: 12/30/2022

Warrant 1: Eight - Hour Vehicular Volume

70%

Warrant Evaluated? Yes

Warrant Satisfied? No

Manually Set To: No

Condition A :		
Min. Veh. Volume		
Volume Level	70%	56%
Major Rd. Req	350	280
Minor Rd. Req	105	84
Number of Hours	2	2

Satisfied? No

Condition B:		
Interruption of Continuous Traffic		
Volume Level	70%	56%
Major Rd. Req	525	420
Minor Rd. Req	53	42
Number of Hours	5	12

Satisfied? No

Condition C:		
Combination of A & B at 56%		

Satisfied? No

6:00 AM		Enter Start Time (Military Time) (HH:MM)			Total
Time Period	From	To	Major Road: Both App. (VPH)	Minor Road: High App. (VPH)	
1	6:00	7:00	286	54	340
2	7:00	8:00	591	109	700
3	8:00	9:00	695	116	811
4	9:00	10:00	491	71	562
5	10:00	11:00	420	51	471
6	11:00	12:00	506	64	570
7	12:00	13:00	543	50	593
8	13:00	14:00	435	45	480
9	14:00	15:00	506	55	561
10	15:00	16:00	491	42	533
11	16:00	17:00	669	59	728
12	17:00	18:00	851	55	906
13	18:00	19:00	796	64	860
14	19:00	20:00	491	32	523
15	20:00	21:00	390	32	422
16	21:00	22:00	264	13	277

Warrant 2: Four-Hour Volume

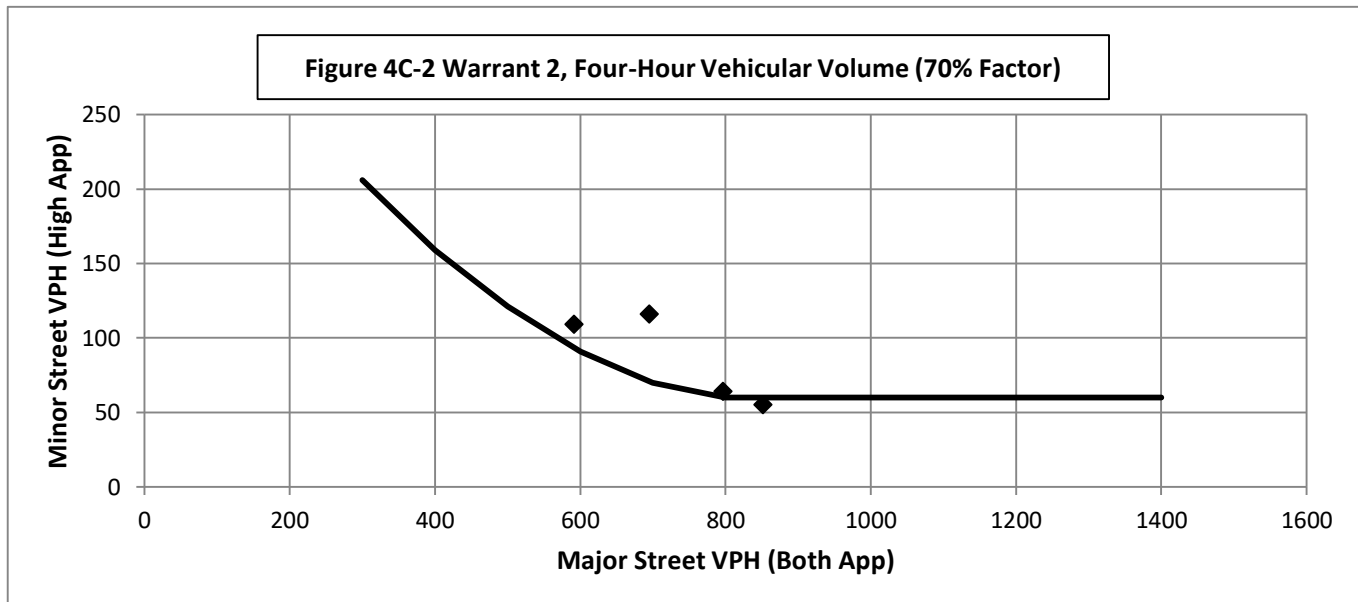
70%

Warrant Evaluated? Yes

Warrant Satisfied? No

Manually Set To: No

Hour Start	18:00	8:00	7:00	17:00
Major Road Vol.	796	695	591	851
Minor Road Vol.	64	116	109	55



Warrant 3: Peak Hour Volume

70%

Warrant Evaluated? Yes

Warrant Satisfied? No

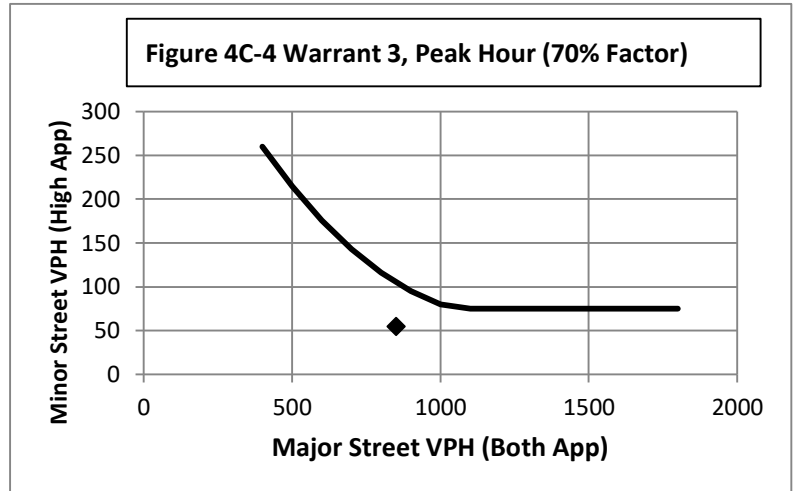
Manually Set To: No

Condition justifying use of warrant:

Criteria		Met?
Delay on Minor Approach	4	Yes
Volume on Minor Approach	100	
Total Entering Volume (veh/h)	800	

Manually Set Peak Hour? No

Peak Hour	Major Road Vol. (Both App.)	Minor Road Vol. (High App.)
17:00	851	55



Warrant 4: Pedestrian Volume

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criterion A: Four Hour

Hour (Start)	Pedestrian Volume	Major Road Vol.
0:00	0	#N/A
0:00	0	#N/A
0:00	0	#N/A
0:00	0	#N/A

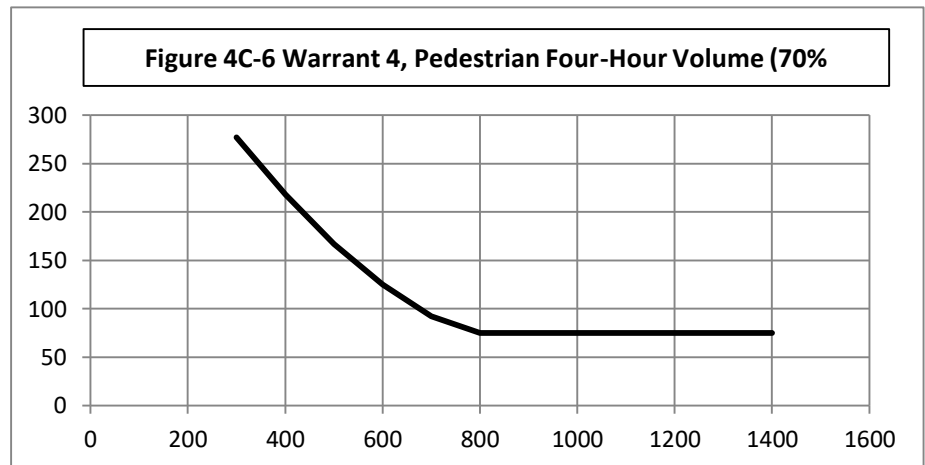
Manually Set Major Rd Vol?

Avg. walk speed less than 3.5 ft/s?

No

No

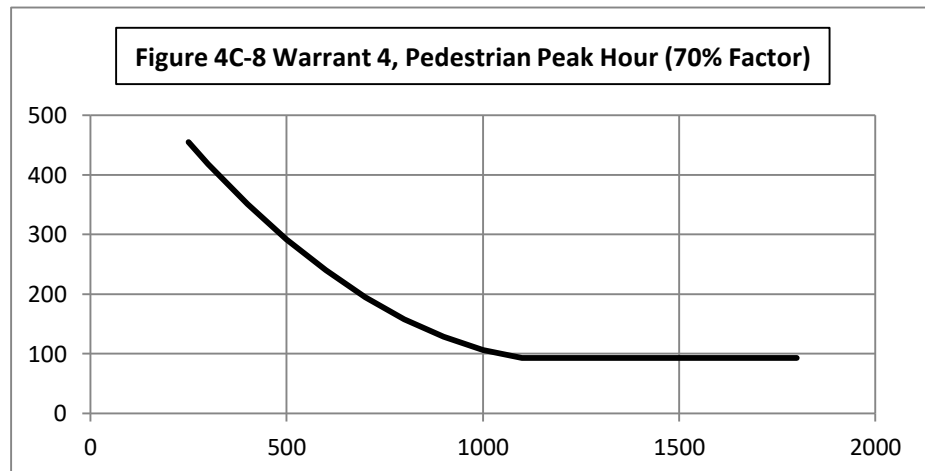
Criterion A Satisfied?



Criterion B: Peak Hour

Peak Hour	Pedestrian Vol.	Major Road Vol.
#N/A	#N/A	#N/A

Criterion B Satisfied?



Warrant 5: School Crossing

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criteria

Fulfilled?

1	There are a MINIMUM of 20 school children during the highest crossing hour.	
2	There are fewer adequate gaps in the major road traffic stream during the period when the school children are using the crossing than the number of minutes in the same period.	
3	The nearest traffic signal along the major road is located more than 300 ft away. Or, the nearest traffic signal is within 300 ft but the proposed traffic signal will not restrict the progressive movement of traffic.	

Warrant 6: Coordinated Signal System

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criteria

Fulfilled?

1	Signal spacing > 1000 ft	
2	On a one-way road or a road that has traffic predominantly in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicle platooning.	
3	On a two-way road, adjacent signals do not provide the necessary degree of platooning and the proposed and the adjacent signals will collectively provide a progressive operation.	

Warrant 7: Crash Experience

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criteria

Met?

Fulfilled?

1	Adequate trial of other remedial measures has failed to reduce crash frequency.	
	Measures Tried:	
2	Five or more reported crashes, of types susceptible to correction by signal, have occurred within a 12 month period.	# of crashes per 12 months
3	Warrant 1, Condition A (80%)	No
	Warrant 1, Condition B (80%)	Yes
	Warrant 4, Criterion A (80%)	#N/A
	Warrant 4, Criterion B (80%)	#N/A

Warrant 8: Roadway Network

70%

Warrant Evaluated? Yes

Warrant Satisfied? No

Manually Set To:

Criteria

Met?

Fulfilled?

1	Total entering volume of at least 1,000 veh/h during typical weekday peak hour	906	No	No
	Five-year projected volumes that satisfy one or more of Warrants 1, 2, or 3.	2	Yes	
2	Total entering vol. of at least 1,000 veh/h for each of any 5 hrs of non-normal business day (Sat. or Sun.)			
	Hour			
	Volume			

Characteristics of Major Routes - Select yes if all intersecting routes have characteristic

Fulfilled?

1	Part of the road or highway system that serves as the principal roadway network for through traffic flow	Yes
2	Rural or suburban highway outside of, entering, or traversing a city	Yes
3	Appears as a major route on an official plan	Yes

Warrant 9: Intersection Near a Grade Crossing

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Adjustment Factors			Manually Set Peak Hour?				
Rail Traffic per Day	% High Occupancy Buses on Minor Road	% Tractor-Trailer Trucks on Minor Road	D	Peak Hour	Major Road Vol.	Minor Road Vol.	Adjusted Minor Vol.
1	0	0% to 2.5%	660	17:00	851	55	18.425

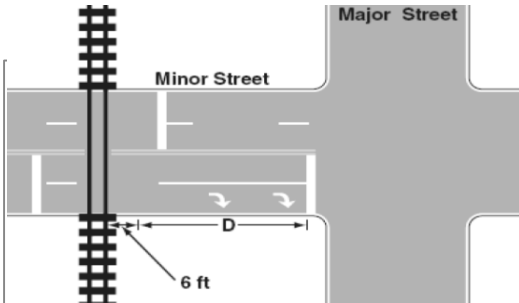
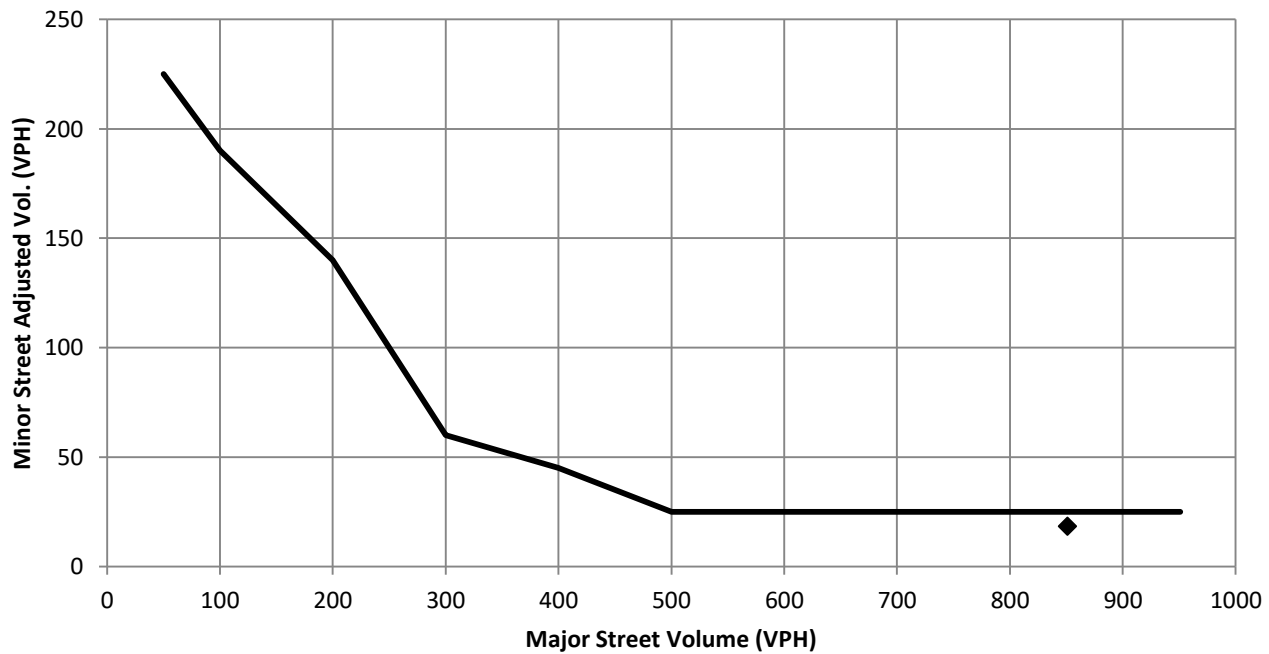


Figure 4C-9 Warrant9, Intersection Near a grade Crossing (One Approach Lane at the Track Crossing)



Conclusions/Comments:

Updated: 12/6/2017

Wisconsin Department of Transportation Traffic Signal Warrant

Summary Worksheet

70%

The Worksheet(s) attached are provided as an attachment to the Engineering Investigation Study for:

Intersection: CO-56 and Meadowlark

County: Larimer

Town: Berthoud

Major Street: CO-56

Critical Approach Speed: 45 mph

Lanes: 1 lane

Minor Street: Meadowlark

Critical Approach Speed: 25 mph

Lanes: 2 or more lanes

% Right Turns Included

From North (SB) 0%

From East (WB) 100%

From South (NB) 50%

From West (EB) 100%

In built-up area of isolated community of < 10,000 population? No

Total number of approaches at intersection? 4 or more

If it is a "T" intersection, inflate minor threshold to 150%? No

Manually set volume level? 70%

Analysis based on PROJECTED volume data.

Forecast Year	Within 5 Years of Construction?	Time (HH:MM)			
		From	AM / PM	To	AM / PM
2040	No	6	AM	10	PM

Warrant Evaluation Summary	Warrant Met:
Warrant 1: Eight - Hour Vehicular Volume	Yes
Condition A: Minimum Vehicular Volume	No
Condition B: Interruption of Continuous Traffic	Yes
Condition C: Combination: 80% of A and B	Yes
Warrant 2: Four-Hour Volume	Yes
Warrant 3: Peak Hour Volume	Yes
Warrant 4: Pedestrian Volume	N/A
Criterion A: Four-Hour	
Criterion B: Peak-Hour	
Warrant 5: School Crossing	N/A
Warrant 6: Coordinated Signal System	N/A
Warrant 7: Crash Experience	N/A
Warrant 8: Roadway Network	Yes
Warrant 9: Intersection Near a Grade Crossing	N/A

Warrant Analysis Conducted By:

Name: John Aldridge

Agency: Aldridge Transportation Consultants

Date: 12/30/2022

Warrant 1: Eight - Hour Vehicular Volume

70%

Warrant Evaluated? Yes

Warrant Satisfied? Yes

Manually Set To: Yes

Condition A : Min. Veh. Volume		
Volume Level	70%	56%
Major Rd. Req	350	280
Minor Rd. Req	140	112
Number of Hours	6	12

Satisfied? No

Condition B: Interruption of Continuous Traffic		
Volume Level	70%	56%
Major Rd. Req	525	420
Minor Rd. Req	70	56
Number of Hours	11	14

Satisfied? Yes

Condition C: Combination of A & B at 56%		
---	--	--

Satisfied? Yes

6:00 AM		Enter Start Time (Military Time) (HH:MM)			Total
Time Period	From	To	Major Road: Both App. (VPH)	Minor Road: High App. (VPH)	
1	6:00	7:00	318	134	452
2	7:00	8:00	657	273	930
3	8:00	9:00	772	291	1063
4	9:00	10:00	545	178	723
5	10:00	11:00	467	128	595
6	11:00	12:00	562	161	723
7	12:00	13:00	603	124	727
8	13:00	14:00	483	112	595
9	14:00	15:00	562	136	698
10	15:00	16:00	545	105	650
11	16:00	17:00	743	147	890
12	17:00	18:00	946	138	1084
13	18:00	19:00	884	161	1045
14	19:00	20:00	545	81	626
15	20:00	21:00	434	81	515
16	21:00	22:00	293	33	326

Warrant 2: Four-Hour Volume

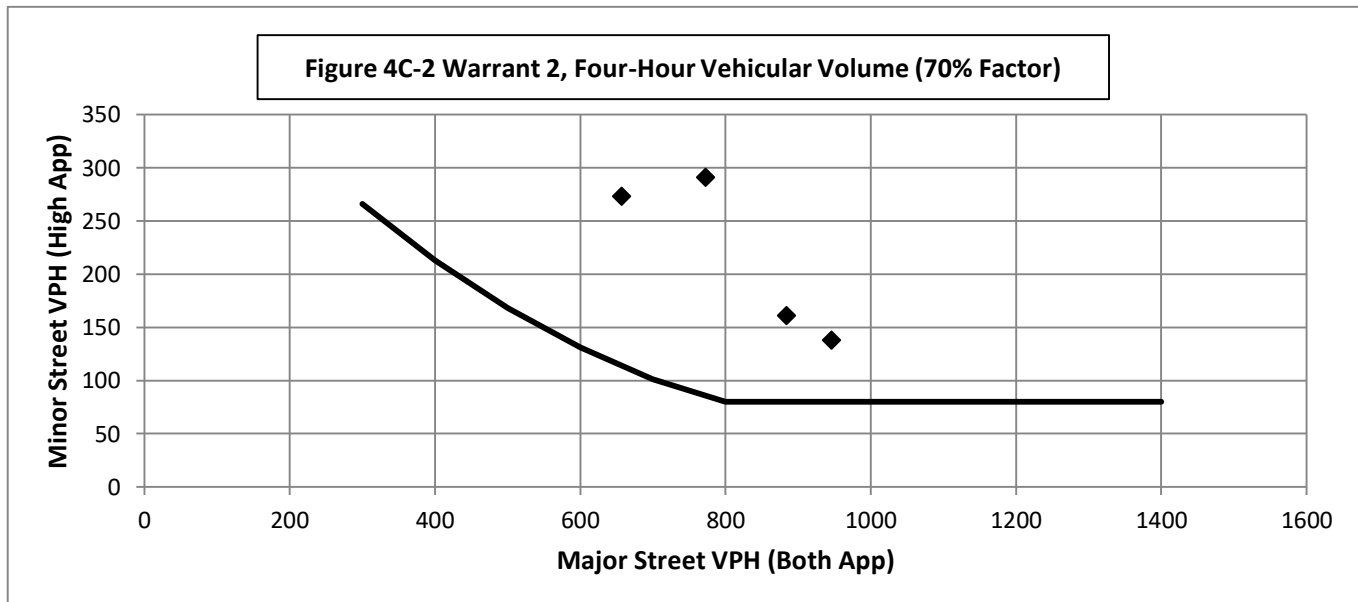
70%

Warrant Evaluated? Yes

Warrant Satisfied? Yes

Manually Set To: Yes

Hour Start	17:00	8:00	18:00	7:00
Major Road Vol.	946	772	884	657
Minor Road Vol.	138	291	161	273



Warrant 3: Peak Hour Volume

70%

Warrant Evaluated? Yes

Warrant Satisfied? Yes

Manually Set To: Yes

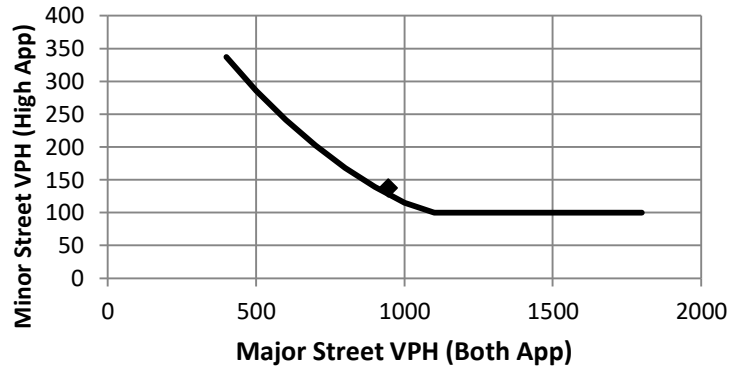
Condition justifying use of warrant:

Criteria		Met?
Delay on Minor Approach	5	Yes
Volume on Minor Approach	150	
Total Entering Volume (veh/h)	800	

Manually Set Peak Hour? No

Peak Hour	Major Road Vol. (Both App.)	Minor Road Vol. (High App.)
17:00	946	138

Figure 4C-4 Warrant 3, Peak Hour (70% Factor)



Warrant 4: Pedestrian Volume

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criterion A: Four Hour

Hour (Start)	Pedestrian Volume	Major Road Vol.
0:00	0	#N/A
0:00	0	#N/A
0:00	0	#N/A
0:00	0	#N/A

Manually Set Major Rd Vol?

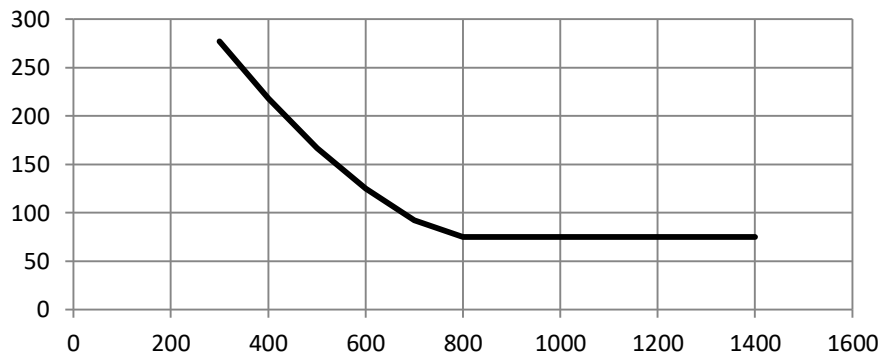
Avg. walk speed less than 3.5 ft/s?

No

No

Criterion A Satisfied?

Figure 4C-6 Warrant 4, Pedestrian Four-Hour Volume (70%)

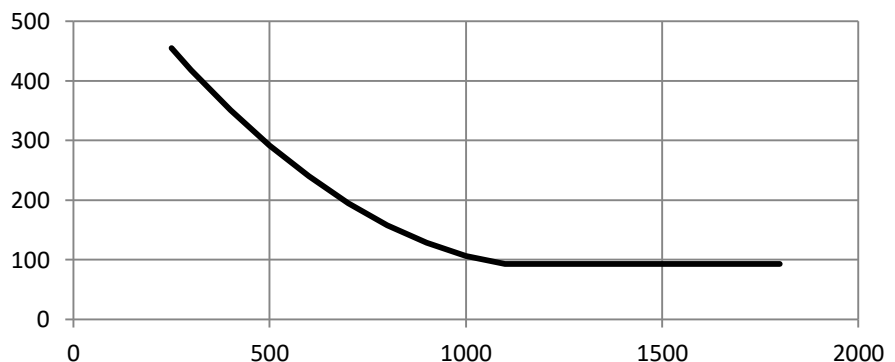


Criterion B: Peak Hour

Peak Hour	Pedestrian Vol.	Major Road Vol.
#N/A	#N/A	#N/A

Criterion B Satisfied?

Figure 4C-8 Warrant 4, Pedestrian Peak Hour (70% Factor)



Warrant 5: School Crossing

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criteria

Fulfilled?

1	There are a MINIMUM of 20 school children during the highest crossing hour.	
2	There are fewer adequate gaps in the major road traffic stream during the period when the school children are using the crossing than the number of minutes in the same period.	
3	The nearest traffic signal along the major road is located more than 300 ft away. Or, the nearest traffic signal is within 300 ft but the proposed traffic signal will not restrict the progressive movement of traffic.	

Warrant 6: Coordinated Signal System

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criteria

Fulfilled?

1	Signal spacing > 1000 ft	
2	On a one-way road or a road that has traffic predominantly in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicle platooning.	
3	On a two-way road, adjacent signals do not provide the necessary degree of platooning and the proposed and the adjacent signals will collectively provide a progressive operation.	

Warrant 7: Crash Experience

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Criteria

Met?

Fulfilled?

1	Adequate trial of other remedial measures has failed to reduce crash frequency.			
	Measures Tried:			
2	Five or more reported crashes, of types susceptible to correction by signal, have occurred within a 12 month period.		# of crashes per 12 months	
3	Warrant 1, Condition A (80%)		Yes	#N/A
	Warrant 1, Condition B (80%)		Yes	
	Warrant 4, Criterion A (80%)		#N/A	
	Warrant 4, Criterion B (80%)		#N/A	

Warrant 8: Roadway Network

70%

Warrant Evaluated? Yes

Warrant Satisfied? Yes

Manually Set To: Yes

Criteria

Met?

Fulfilled?

1	Total entering volume of at least 1,000 veh/h during typical weekday peak hour		1084	Yes	Yes
	Five-year projected volumes that satisfy one or more of Warrants 1, 2, or 3.		2	Yes	
2	Total entering vol. of at least 1,000 veh/h for each of any 5 hrs of non-normal business day (Sat. or Sun.)				
	Hour				
	Volume				

Characteristics of Major Routes - Select yes if all intersecting routes have characteristic

Fulfilled?

1	Part of the road or highway system that serves as the principal roadway network for through traffic flow	Yes
2	Rural or suburban highway outside of, entering, or traversing a city	Yes
3	Appears as a major route on an official plan	Yes

Warrant 9: Intersection Near a Grade Crossing

70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Adjustment Factors			Manually Set Peak Hour?				
Rail Traffic per Day	% High Occupancy Buses on Minor Road	% Tractor-Trailer Trucks on Minor Road	D	Peak Hour	Major Road Vol.	Minor Road Vol.	Adjusted Minor Vol.
1	0	0% to 2.5%	660	17:00	946	138	46.23

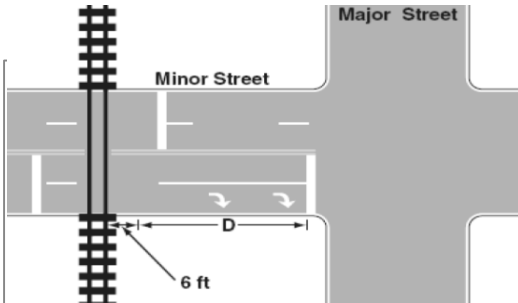
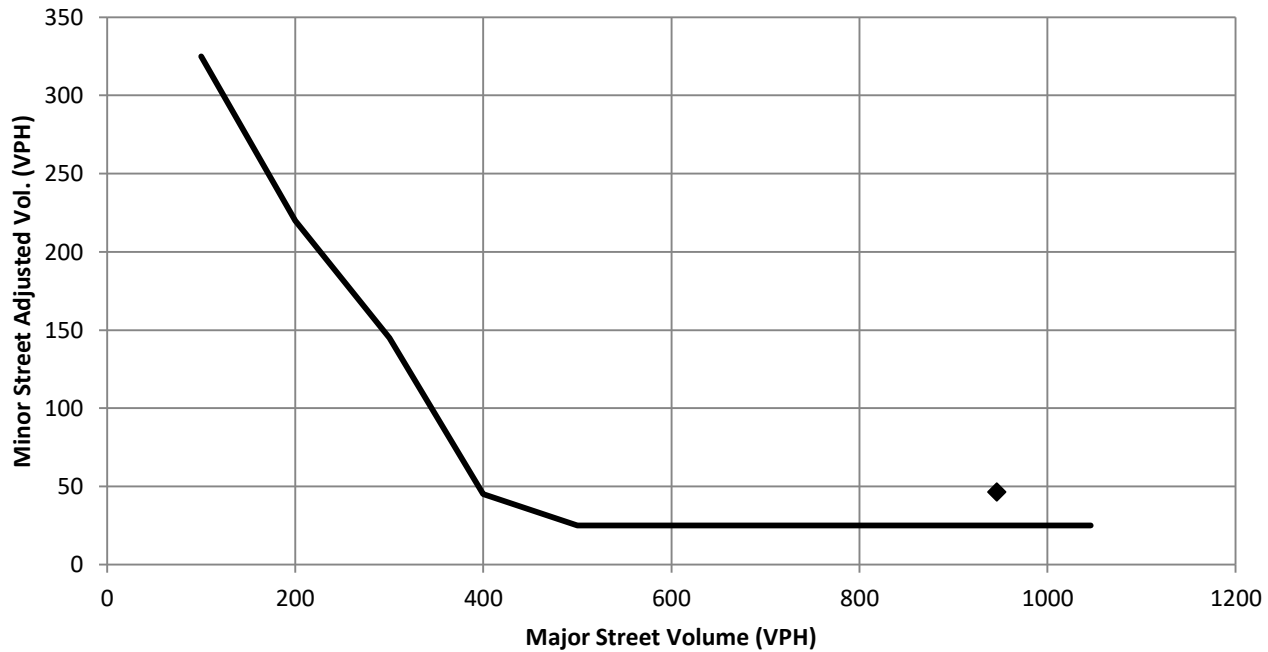


Figure 4C-10 Warrant 9, Intersection Near a grade Crossing
(Two or More Approach Lanes at the Track Crossing)



Conclusions/Comments:

Updated: 12/6/2017



Aldridge Transportation Consultants, LLC

Advanced Transportation Planning and Traffic Engineering

John M.W. Aldridge, P.E.
Colorado Licensed Professional Engineer

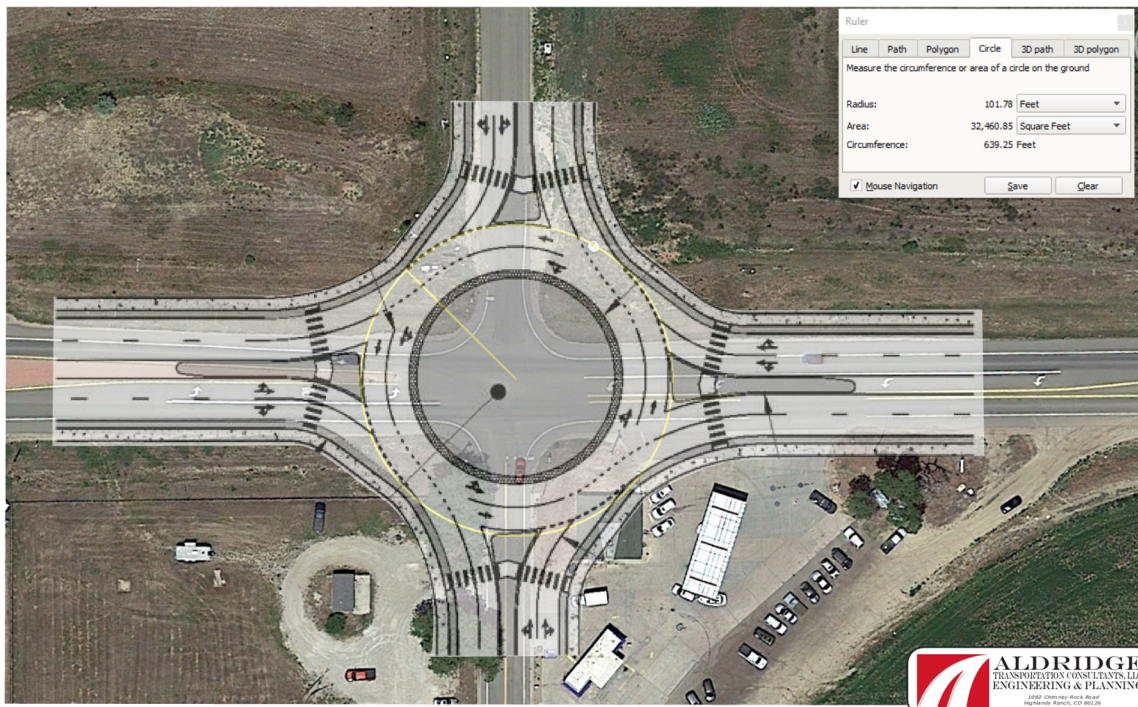
1082 Chimney Rock Road
Highlands Ranch, CO 80126
303-703-9112
Mobile: 303-594-4132

August 1, 2021

Technical Memorandum

Proposed Roundabout Alternative SH-56/Meadowlark Dr.

At the behest of the Town of Berthoud this technical memorandum provides an engineering review of a roundabout in lieu of a traffic signal-controlled intersection at SH-56 and Meadowlark Dr. which is about 1,000 feet west of US-287. The traffic impact study (revised July 25, 2021) prepared for the Westside Crossing mixed-use development projected that traffic signal warrants would be met with build out or before of the project. The Town prefers a roundabout instead of a traffic signal and while there are many advantages to roundabouts including safety, less vehicle delay and queuing, signal progression, environmental factors, traffic calming, and aesthetics there are however some disadvantages primarily spatial requirements.



Conceptual Dual Lane Roundabout

CDOT will require a 200' diameter inscribed circle (the yellow circle in the background) to manage the turning radius of a WB-67 design vehicle.



The graphic shows a CDOT standard 200-foot diameter roundabout (the yellow circle shows the 200-foot inscribed circle) which is necessary to manage a WB-67 design vehicle. The center of the roundabout is shown on center of the intersection. Note though center placement is not required and can be offset but the entering roadways would have to be offset as well. The roundabout shown has a two-lane circulating ring. The entry/exit roads on SH-56 are two-lane as well assuming that SH-56 will be improved to four-lanes in the future. The Meadowlark Dr. entry/exit lanes will remain as single lanes. The graphic includes bike lanes, sidewalks, and pedestrian crossings with raised refuge islands.

The inscribed circle is approximately 75 percent of an acre. Adding the other features such as bike lanes, sidewalks, and traffic channelizing islands raises the total property needed easily over an acre. As shown, all four corners of the intersection would be impacted with right of way taking. The southeast corner currently developed with a gas station and convenience store would be taken in its entirety.

Roundabouts are generally more expensive to construct than a traffic signal. A ballpark estimate for a multi-lane roundabout is about \$1.5 to \$2 million dollars. A traffic signal is around \$3-400,000.

We trust that this technical memorandum provides the Town with the information required to make an enlightened decision on the choice of a traffic signal vs. a roundabout.

ATC appreciates the opportunity to be of service. Please call if you have any questions. We can be reached at 303-703-9112.

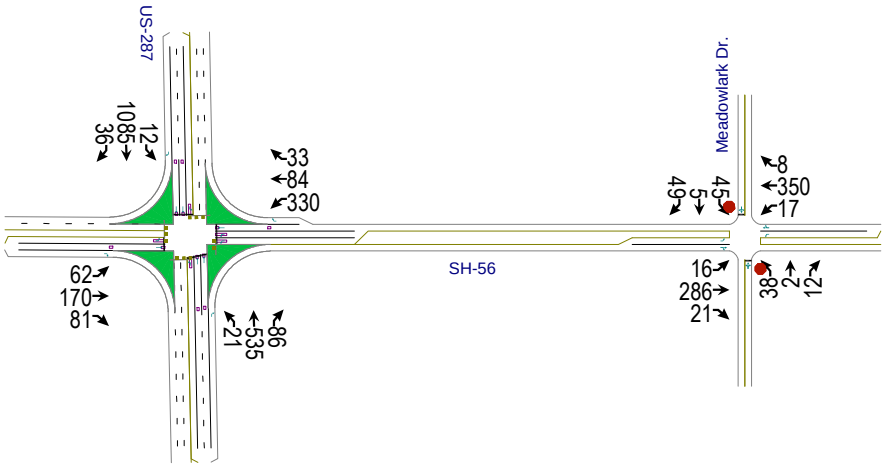
Respectfully submitted,

Aldridge Transportation Consultants, LLC

John M.W. Aldridge, P.E.
Principal

ATC is professional service firm specializing in traffic engineering and transportation planning. ATC's principal, John M.W. Aldridge, is a Colorado licensed professional engineer. In the past 20 years, ATC has prepared over 1,000 traffic impact studies, designed over 100 traffic signals, and has provided expert witness testimony on engineering design and access issues on multi-million-dollar interchange and highway projects in Kansas and Colorado.





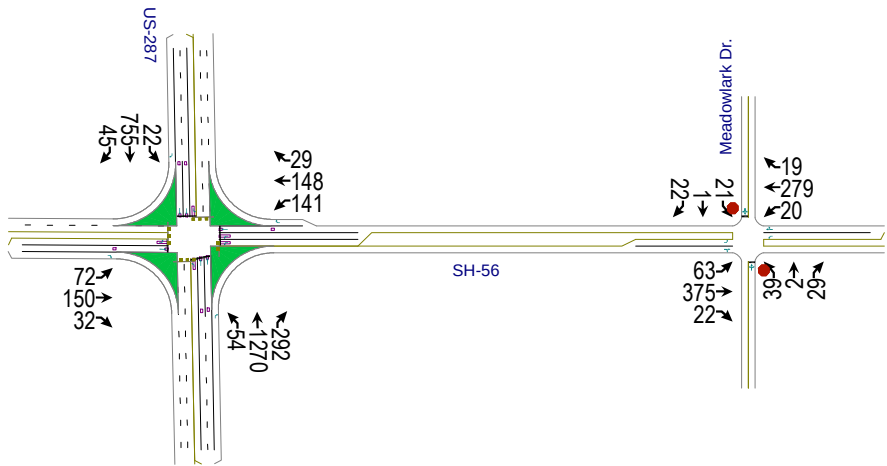
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	62	170	81	330	84	33	21	535	86	12	1085	36
Future Volume (veh/h)	62	170	81	330	84	33	21	535	86	12	1085	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	67	185	0	359	91	0	23	582	0	13	1179	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	86	220		428	361		281	2111		514	2084	
Arrive On Green	0.05	0.12	0.00	0.12	0.19	0.00	0.02	0.59	0.00	0.01	0.59	0.00
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	67	185	0	359	91	0	23	582	0	13	1179	0
Grp Sat Flow(s), veh/h/ln	1781	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	4.5	11.6	0.0	12.2	5.0	0.0	0.6	9.5	0.0	0.4	24.6	0.0
Cycle Q Clear(g_c), s	4.5	11.6	0.0	12.2	5.0	0.0	0.6	9.5	0.0	0.4	24.6	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	86	220		428	361		281	2111		514	2084	
V/C Ratio(X)	0.78	0.84		0.84	0.25		0.08	0.28		0.03	0.57	
Avail Cap(c_a), veh/h	156	335		590	491		315	2111		563	2084	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	56.5	51.9	0.0	51.4	41.1	0.0	12.0	11.8	0.0	9.9	15.4	0.0
Incr Delay (d2), s/veh	13.9	11.2	0.0	7.6	0.4	0.0	0.1	0.3	0.0	0.0	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	6.0	0.0	5.6	2.3	0.0	0.2	3.4	0.0	0.1	9.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.3	63.0	0.0	59.0	41.4	0.0	12.1	12.2	0.0	10.0	16.5	0.0
LnGrp LOS	E	E		E	D		B	B		A	B	
Approach Vol, veh/h		252	A		450	A		605	A		1192	A
Approach Delay, s/veh		65.0			55.5			12.2			16.4	
Approach LOS		E			E			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.3	75.8	19.4	18.6	7.2	74.9	10.3	27.7				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	55.0	20.5	21.5	5.0	55.0	10.5	31.5				
Max Q Clear Time (g_c+l1), s	2.4	11.5	14.2	13.6	2.6	26.6	6.5	7.0				
Green Ext Time (p_c), s	0.0	3.7	0.7	0.5	0.0	8.5	0.0	0.4				
Intersection Summary												
HCM 6th Ctrl Delay			27.3									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Intersection												
Int Delay, s/veh	3.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	286	21	17	350	8	38	2	12	45	5	49
Future Vol, veh/h	16	286	21	17	350	8	38	2	12	45	5	49
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	175	-	-	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	311	23	18	380	9	41	2	13	49	5	53

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	389	0	0	334	0	0	807	782	323	785	789	385
Stage 1	-	-	-	-	-	-	357	357	-	421	421	-
Stage 2	-	-	-	-	-	-	450	425	-	364	368	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1170	-	-	1225	-	-	300	326	718	310	323	663
Stage 1	-	-	-	-	-	-	661	628	-	610	589	-
Stage 2	-	-	-	-	-	-	589	586	-	655	621	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1170	-	-	1225	-	-	266	316	718	296	313	663
Mov Cap-2 Maneuver	-	-	-	-	-	-	266	316	-	296	313	-
Stage 1	-	-	-	-	-	-	651	619	-	601	580	-
Stage 2	-	-	-	-	-	-	529	577	-	632	612	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.4			19			16.9		
HCM LOS							C			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	313	1170	-	-	1225	-	-	409
HCM Lane V/C Ratio	0.181	0.015	-	-	0.015	-	-	0.263
HCM Control Delay (s)	19	8.1	-	-	8	-	-	16.9
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	1



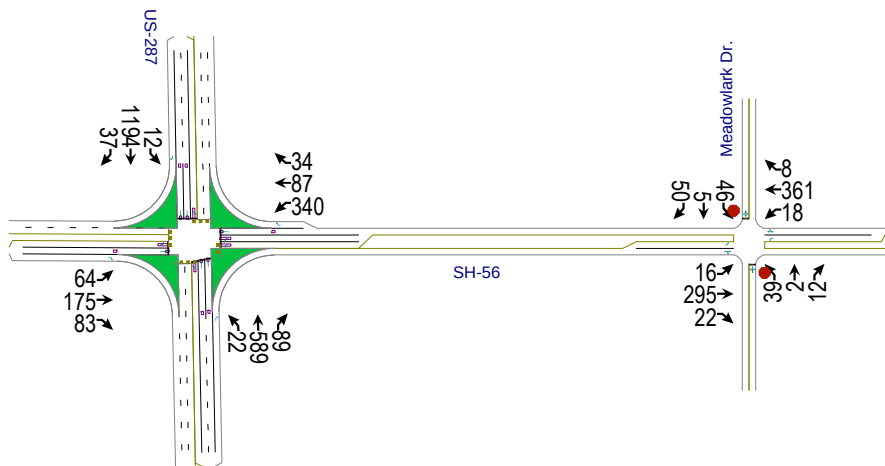
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	150	32	141	148	29	54	1270	292	22	755	45
Future Volume (veh/h)	72	150	32	141	148	29	54	1270	292	22	755	45
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	78	163	0	153	161	0	59	1380	0	24	821	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	100	198		210	207		485	2347		276	2301	
Arrive On Green	0.06	0.11	0.00	0.06	0.11	0.00	0.04	0.66	0.00	0.02	0.65	0.00
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	78	163	0	153	161	0	59	1380	0	24	821	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	5.2	10.2	0.0	5.2	10.1	0.0	1.3	25.9	0.0	0.5	12.7	0.0
Cycle Q Clear(g_c), s	5.2	10.2	0.0	5.2	10.1	0.0	1.3	25.9	0.0	0.5	12.7	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	100	198		210	207		485	2347		276	2301	
V/C Ratio(X)	0.78	0.82		0.73	0.78		0.12	0.59		0.09	0.36	
Avail Cap(c_a), veh/h	186	335		302	304		503	2347		316	2301	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	55.9	52.6	0.0	55.4	51.9	0.0	7.0	11.3	0.0	9.2	9.7	0.0
Incr Delay (d2), s/veh	12.5	8.3	0.0	5.0	7.4	0.0	0.1	1.1	0.0	0.1	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	5.1	0.0	2.4	5.0	0.0	0.4	8.6	0.0	0.2	4.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.5	60.9	0.0	60.3	59.3	0.0	7.1	12.4	0.0	9.4	10.1	0.0
LnGrp LOS	E	E		E	E		A	B		A	B	
Approach Vol, veh/h		241	A		314	A		1439	A		845	A
Approach Delay, s/veh		63.3			59.8			12.2			10.1	
Approach LOS		E			E			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.3	83.8	11.8	17.2	8.8	82.2	11.2	17.8				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.5	64.5	10.5	21.5	5.5	64.5	12.5	19.5				
Max Q Clear Time (g_c+I1), s	2.5	27.9	7.2	12.2	3.3	14.7	7.2	12.1				
Green Ext Time (p_c), s	0.0	11.5	0.1	0.5	0.0	5.6	0.1	0.4				
Intersection Summary												
HCM 6th Ctrl Delay			21.2									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	63	375	22	20	279	19	39	2	29	21	1	22
Future Vol, veh/h	63	375	22	20	279	19	39	2	29	21	1	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	175	-	-	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	68	408	24	22	303	21	42	2	32	23	1	24

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	324	0	0	432	0	0	926	924	420	931	926	314
Stage 1	-	-	-	-	-	-	556	556	-	358	358	-
Stage 2	-	-	-	-	-	-	370	368	-	573	568	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1236	-	-	1128	-	-	249	269	633	247	269	726
Stage 1	-	-	-	-	-	-	515	513	-	660	628	-
Stage 2	-	-	-	-	-	-	650	621	-	505	506	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1236	-	-	1128	-	-	227	249	633	220	249	726
Mov Cap-2 Maneuver	-	-	-	-	-	-	227	249	-	220	249	-
Stage 1	-	-	-	-	-	-	487	485	-	624	615	-
Stage 2	-	-	-	-	-	-	615	609	-	451	478	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.1			0.5			20.3			17.4		
HCM LOS							C			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	310	1236	-	-	1128	-	-	339
HCM Lane V/C Ratio	0.245	0.055	-	-	0.019	-	-	0.141
HCM Control Delay (s)	20.3	8.1	-	-	8.3	-	-	17.4
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.9	0.2	-	-	0.1	-	-	0.5



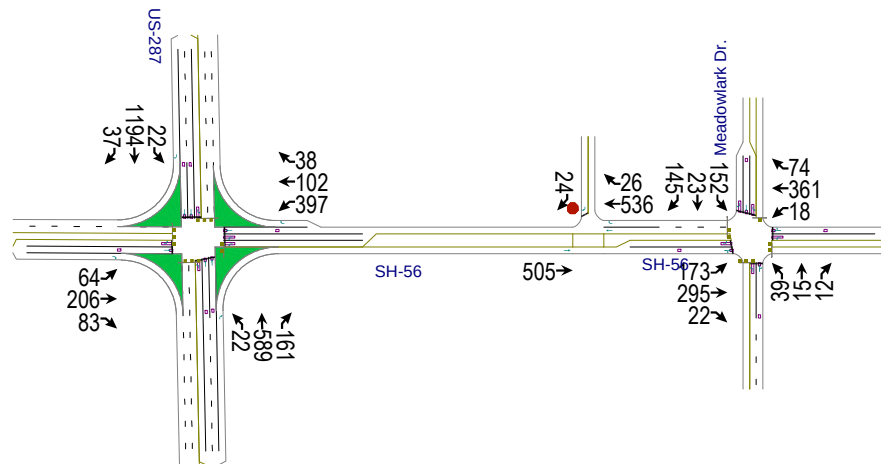
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	62	170	81	330	84	33	21	535	86	12	1085	36
Future Volume (veh/h)	62	170	81	330	84	33	21	535	86	12	1085	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	69	190	0	369	94	0	24	640	0	13	1297	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	89	225		438	369		245	2091		479	2062	
Arrive On Green	0.05	0.12	0.00	0.13	0.20	0.00	0.02	0.59	0.00	0.01	0.58	0.00
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	69	190	0	369	94	0	24	640	0	13	1297	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	4.6	11.9	0.0	12.5	5.1	0.0	0.7	10.8	0.0	0.4	29.0	0.0
Cycle Q Clear(g_c), s	4.6	11.9	0.0	12.5	5.1	0.0	0.7	10.8	0.0	0.4	29.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	89	225		438	369		245	2091		479	2062	
V/C Ratio(X)	0.78	0.85		0.84	0.25		0.10	0.31		0.03	0.63	
Avail Cap(c_a), veh/h	156	335		590	491		278	2091		527	2062	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	56.4	51.7	0.0	51.2	40.7	0.0	13.3	12.4	0.0	10.3	16.6	0.0
Incr Delay (d2), s/veh	13.6	12.0	0.0	8.2	0.4	0.0	0.2	0.4	0.0	0.0	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	6.2	0.0	5.8	2.3	0.0	0.2	3.9	0.0	0.1	10.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.0	63.7	0.0	59.4	41.1	0.0	13.5	12.8	0.0	10.4	18.1	0.0
LnGrp LOS	E	E		E	D		B	B		B	B	
Approach Vol, veh/h		259	A		463	A		664	A		1310	A
Approach Delay, s/veh		65.4			55.7			12.8			18.0	
Approach LOS		E			E			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.3	75.1	19.7	18.9	7.3	74.1	10.5	28.2				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	55.0	20.5	21.5	5.0	55.0	10.5	31.5				
Max Q Clear Time (g_c+I1), s	2.4	12.8	14.5	13.9	2.7	31.0	6.6	7.1				
Green Ext Time (p_c), s	0.0	4.1	0.7	0.5	0.0	9.2	0.0	0.4				
Intersection Summary												
HCM 6th Ctrl Delay			27.8									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	286	21	17	350	8	38	2	12	45	5	49
Future Vol, veh/h	16	286	21	17	350	8	38	2	12	45	5	49
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	175	-	-	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	320	24	19	392	9	43	2	13	50	6	55

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	401	0	0	344	0	0	833	807	332	811	815	397
Stage 1	-	-	-	-	-	-	368	368	-	435	435	-
Stage 2	-	-	-	-	-	-	465	439	-	376	380	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1158	-	-	1215	-	-	288	315	710	298	312	652
Stage 1	-	-	-	-	-	-	652	621	-	600	580	-
Stage 2	-	-	-	-	-	-	578	578	-	645	614	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1158	-	-	1215	-	-	254	305	710	284	302	652
Mov Cap-2 Maneuver	-	-	-	-	-	-	254	305	-	284	302	-
Stage 1	-	-	-	-	-	-	642	611	-	590	571	-
Stage 2	-	-	-	-	-	-	516	569	-	621	604	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.4			19.9			17.6		
HCM LOS							C			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	300	1158	-	-	1215	-	-	396
HCM Lane V/C Ratio	0.194	0.015	-	-	0.016	-	-	0.28
HCM Control Delay (s)	19.9	8.2	-	-	8	-	-	17.6
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.7	0	-	-	0	-	-	1.1



												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	62	200	81	385	99	37	21	535	156	21	1085	36
Future Volume (veh/h)	62	200	81	385	99	37	21	535	156	21	1085	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	69	224	0	431	111	0	24	640	0	24	1297	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	89	258		502	437		221	1933		451	1933	
Arrive On Green	0.05	0.14	0.00	0.05	0.08	0.00	0.02	0.54	0.00	0.02	0.54	0.00
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	69	224	0	431	111	0	24	640	0	24	1297	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	4.6	14.1	0.0	14.9	6.7	0.0	0.7	12.0	0.0	0.7	31.5	0.0
Cycle Q Clear(g_c), s	4.6	14.1	0.0	14.9	6.7	0.0	0.7	12.0	0.0	0.7	31.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	89	258		502	437		221	1933		451	1933	
V/C Ratio(X)	0.78	0.87		0.86	0.25		0.11	0.33		0.05	0.67	
Avail Cap(c_a), veh/h	151	335		590	496		254	1933		484	1933	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	56.4	50.7	0.0	55.9	45.5	0.0	15.8	15.2	0.0	12.0	19.7	0.0
Incr Delay (d2), s/veh	13.6	17.2	0.0	10.8	0.3	0.0	0.2	0.5	0.0	0.0	1.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	7.6	0.0	7.6	3.2	0.0	0.3	4.5	0.0	0.3	11.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.0	67.8	0.0	66.7	45.8	0.0	16.0	15.7	0.0	12.1	21.5	0.0
LnGrp LOS	E	E		E	D		B	B		B	C	
Approach Vol, veh/h		293	A		542	A		664	A		1321	A
Approach Delay, s/veh		68.3			62.4			15.7			21.4	
Approach LOS		E			E			B			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.3	69.8	21.9	21.0	7.3	69.8	10.5	32.5				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	55.0	20.5	21.5	5.0	55.0	10.2	31.8				
Max Q Clear Time (g_c+I1), s	2.7	14.0	16.9	16.1	2.7	33.5	6.6	8.7				
Green Ext Time (p_c), s	0.0	4.1	0.6	0.5	0.0	8.7	0.0	0.5				

Intersection Summary

HCM 6th Ctrl Delay	32.8
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

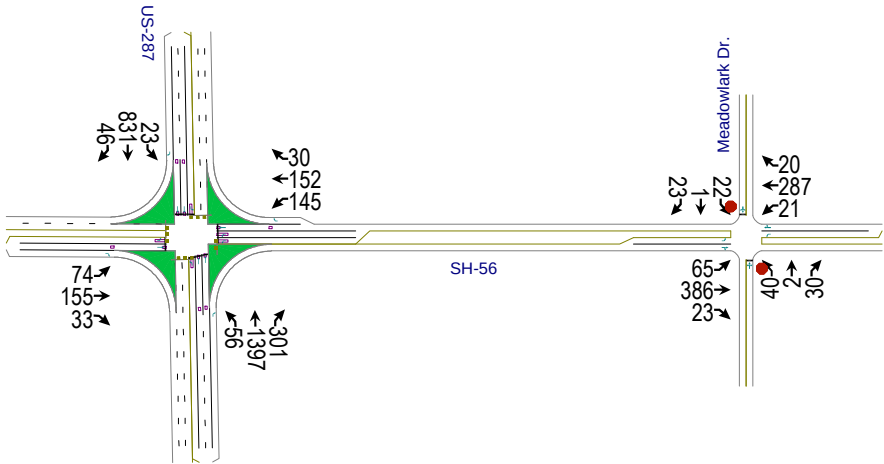
Gateway
6: SH-56 & Meadowlark Dr.

2025 AM Total
10/23/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	168	286	21	17	350	72	38	15	12	148	22	141
Future Volume (veh/h)	168	286	21	17	350	72	38	15	12	148	22	141
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	188	320	24	19	392	81	43	17	13	166	25	158
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	256	619	46	287	438	90	540	393	300	722	949	805
Arrive On Green	0.03	0.12	0.12	0.02	0.29	0.29	0.40	0.40	0.40	0.07	0.51	0.51
Sat Flow, veh/h	1781	1718	129	1781	1504	311	1201	983	752	1781	1870	1585
Grp Volume(v), veh/h	188	0	344	19	0	473	43	0	30	166	25	158
Grp Sat Flow(s), veh/h/ln	1781	0	1847	1781	0	1814	1201	0	1735	1781	1870	1585
Q Serve(g_s), s	8.4	0.0	21.0	0.9	0.0	30.0	2.7	0.0	1.3	6.3	0.8	6.5
Cycle Q Clear(g_c), s	8.4	0.0	21.0	0.9	0.0	30.0	2.7	0.0	1.3	6.3	0.8	6.5
Prop In Lane	1.00		0.07	1.00		0.17	1.00		0.43	1.00		1.00
Lane Grp Cap(c), veh/h	256	0	666	287	0	528	540	0	693	722	949	805
V/C Ratio(X)	0.73	0.00	0.52	0.07	0.00	0.90	0.08	0.00	0.04	0.23	0.03	0.20
Avail Cap(c_a), veh/h	343	0	947	334	0	764	540	0	693	782	949	805
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.5	0.0	43.1	29.5	0.0	40.8	22.4	0.0	22.0	17.5	14.7	16.2
Incr Delay (d2), s/veh	5.4	0.0	0.6	0.1	0.0	9.8	0.3	0.0	0.1	0.2	0.1	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	0.0	10.5	0.4	0.0	14.7	0.8	0.0	0.5	2.6	0.4	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.0	0.0	43.7	29.6	0.0	50.6	22.7	0.0	22.1	17.6	14.8	16.7
LnGrp LOS	D	A	D	C	A	D	C	A	C	B	B	B
Approach Vol, veh/h	532			492			73			349		
Approach Delay, s/veh	41.3			49.7			22.5			17.0		
Approach LOS	D			D			C			B		
Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	3.0	52.5	6.8	47.7		65.4	15.2	39.4				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s	12.5	22.5	5.5	61.5		39.5	16.5	50.5				
Max Q Clear Time (g_c+I), s	10.3	4.7	2.9	23.0		8.5	10.4	32.0				
Green Ext Time (p_c), s	0.2	0.2	0.0	2.3		0.6	0.3	2.9				
Intersection Summary												
HCM 6th Ctrl Delay				37.4								
HCM 6th LOS				D								

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Traffic Vol, veh/h	0	490	520	25	0	23
Future Vol, veh/h	0	490	520	25	0	23
Conflicting Peds, #/hr	0	0	0	25	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	549	582	28	0	26
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	607
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	496
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	484
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		12.9		
HCM LOS				B		
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	484		
HCM Lane V/C Ratio	-	-	-	0.053		
HCM Control Delay (s)	-	-	-	12.9		
HCM Lane LOS	-	-	-	B		
HCM 95th %tile Q(veh)	-	-	-	0.2		



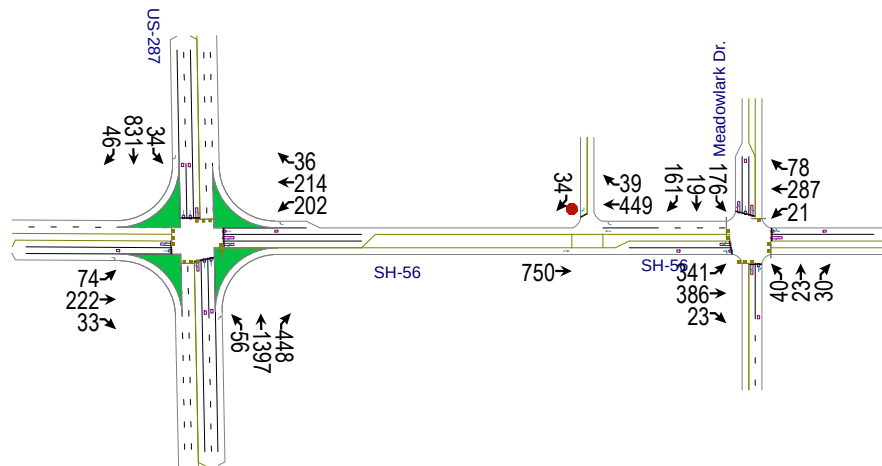
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	150	32	141	148	29	54	1270	292	22	755	45
Future Volume (veh/h)	72	150	32	141	148	29	54	1270	292	22	755	45
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	81	168	0	158	166	0	60	1518	0	25	903	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	103	203		215	211		446	2331		239	2286	
Arrive On Green	0.06	0.11	0.00	0.06	0.11	0.00	0.04	0.66	0.00	0.02	0.64	0.00
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	81	168	0	158	166	0	60	1518	0	25	903	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	5.4	10.6	0.0	5.4	10.4	0.0	1.3	30.8	0.0	0.6	14.6	0.0
Cycle Q Clear(g_c), s	5.4	10.6	0.0	5.4	10.4	0.0	1.3	30.8	0.0	0.6	14.6	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	103	203		215	211		446	2331		239	2286	
V/C Ratio(X)	0.79	0.83		0.73	0.79		0.13	0.65		0.10	0.39	
Avail Cap(c_a), veh/h	180	327		294	298		458	2331		272	2286	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	55.8	52.4	0.0	55.3	51.8	0.0	7.4	12.4	0.0	10.6	10.2	0.0
Incr Delay (d2), s/veh	12.3	9.1	0.0	6.1	8.9	0.0	0.1	1.4	0.0	0.2	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	5.3	0.0	2.5	5.3	0.0	0.4	10.4	0.0	0.2	4.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.1	61.5	0.0	61.4	60.7	0.0	7.5	13.8	0.0	10.8	10.7	0.0
LnGrp LOS	E	E		E	E		A	B		B	B	
Approach Vol, veh/h		249	A		324	A		1578	A		928	A
Approach Delay, s/veh		63.7			61.0			13.6			10.7	
Approach LOS		E			E			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.3	83.2	12.0	17.5	8.8	81.7	11.4	18.0				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	65.8	10.2	21.0	5.1	65.7	12.1	19.1				
Max Q Clear Time (g_c+I1), s	2.6	32.8	7.4	12.6	3.3	16.6	7.4	12.4				
Green Ext Time (p_c), s	0.0	12.9	0.1	0.4	0.0	6.4	0.1	0.4				
Intersection Summary												
HCM 6th Ctrl Delay			21.8									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	63	375	22	20	279	19	39	2	29	21	1	22
Future Vol, veh/h	63	375	22	20	279	19	39	2	29	21	1	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	175	-	-	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	71	420	25	22	312	21	44	2	32	24	1	25

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	333	0	0	445	0	0	955	952	433	959	954	323
Stage 1	-	-	-	-	-	-	575	575	-	367	367	-
Stage 2	-	-	-	-	-	-	380	377	-	592	587	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1226	-	-	1115	-	-	238	259	623	237	259	718
Stage 1	-	-	-	-	-	-	503	503	-	653	622	-
Stage 2	-	-	-	-	-	-	642	616	-	493	497	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1226	-	-	1115	-	-	216	239	623	210	239	718
Mov Cap-2 Maneuver	-	-	-	-	-	-	216	239	-	210	239	-
Stage 1	-	-	-	-	-	-	474	474	-	615	610	-
Stage 2	-	-	-	-	-	-	607	604	-	438	468	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.1			0.5			21.4			18		
HCM LOS							C			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	297	1226	-	-	1115	-	-	326
HCM Lane V/C Ratio	0.264	0.058	-	-	0.02	-	-	0.151
HCM Control Delay (s)	21.4	8.1	-	-	8.3	-	-	18
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1	0.2	-	-	0.1	-	-	0.5



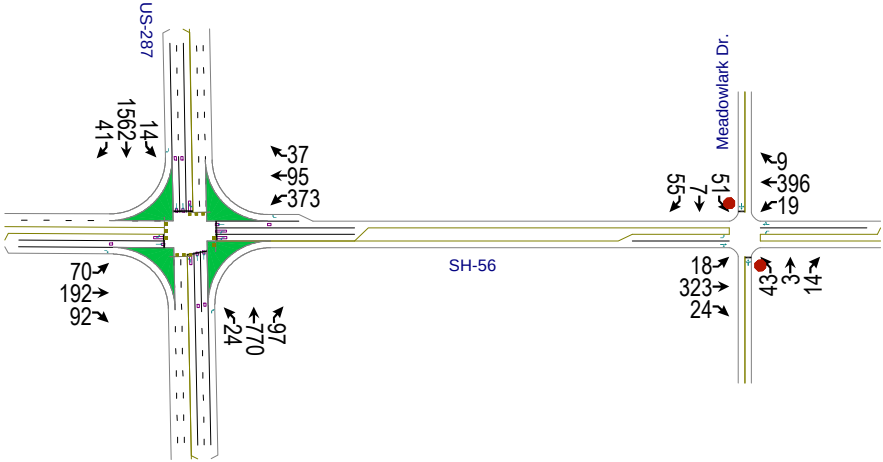
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	216	32	196	208	35	54	1270	435	33	755	45
Future Volume (veh/h)	72	216	32	196	208	35	54	1270	435	33	755	45
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	81	242	0	219	233	0	60	1518	0	37	903	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	103	276		279	319		398	2104		212	2081	
Arrive On Green	0.06	0.15	0.00	0.03	0.06	0.00	0.04	0.59	0.00	0.03	0.59	0.00
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	81	242	0	219	233	0	60	1518	0	37	903	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	5.4	15.2	0.0	7.6	14.7	0.0	1.6	36.5	0.0	1.0	16.9	0.0
Cycle Q Clear(g_c), s	5.4	15.2	0.0	7.6	14.7	0.0	1.6	36.5	0.0	1.0	16.9	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	103	276		279	319		398	2104		212	2081	
V/C Ratio(X)	0.79	0.88		0.79	0.73		0.15	0.72		0.17	0.43	
Avail Cap(c_a), veh/h	156	351		331	366		414	2104		233	2081	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	55.8	50.1	0.0	57.4	53.9	0.0	10.2	17.4	0.0	15.0	13.8	0.0
Incr Delay (d2), s/veh	14.0	18.0	0.0	10.0	6.2	0.0	0.2	2.2	0.0	0.4	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	8.3	0.0	3.8	7.9	0.0	0.6	13.4	0.0	0.4	6.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	69.8	68.0	0.0	67.4	60.1	0.0	10.4	19.6	0.0	15.4	14.5	0.0
LnGrp LOS	E	E		E	E		B	B		B	B	
Approach Vol, veh/h		323	A		452	A		1578	A		940	A
Approach Delay, s/veh		68.5			63.6			19.3			14.5	
Approach LOS		E			E			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.0	75.6	14.2	22.2	8.8	74.8	11.4	25.0				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	63.0	11.5	22.5	5.4	62.6	10.5	23.5				
Max Q Clear Time (g_c+I1), s	3.0	38.5	9.6	17.2	3.6	18.9	7.4	16.7				
Green Ext Time (p_c), s	0.0	11.4	0.1	0.5	0.0	6.4	0.0	0.6				
Intersection Summary												
HCM 6th Ctrl Delay			28.8									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Gateway
6: SH-56 & Meadowlark Dr.

2025 PM Total
10/23/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	331	375	22	20	279	76	39	22	29	171	18	156
Future Volume (veh/h)	331	375	22	20	279	76	39	22	29	171	18	156
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	371	420	25	22	312	85	44	25	32	191	20	175
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	410	704	42	265	347	95	465	254	325	639	866	734
Arrive On Green	0.06	0.13	0.13	0.02	0.25	0.25	0.34	0.34	0.34	0.08	0.46	0.46
Sat Flow, veh/h	1781	1748	104	1781	1415	386	1188	745	954	1781	1870	1585
Grp Volume(v), veh/h	371	0	445	22	0	397	44	0	57	191	20	175
Grp Sat Flow(s),veh/h/ln	1781	0	1852	1781	0	1801	1188	0	1699	1781	1870	1585
Q Serve(g_s), s	18.6	0.0	27.2	1.1	0.0	25.6	3.0	0.0	2.7	8.0	0.7	8.0
Cycle Q Clear(g_c), s	18.6	0.0	27.2	1.1	0.0	25.6	3.0	0.0	2.7	8.0	0.7	8.0
Prop In Lane	1.00		0.06	1.00		0.21	1.00		0.56	1.00		1.00
Lane Grp Cap(c), veh/h	410	0	746	265	0	442	465	0	579	639	866	734
V/C Ratio(X)	0.90	0.00	0.60	0.08	0.00	0.90	0.09	0.00	0.10	0.30	0.02	0.24
Avail Cap(c_a), veh/h	544	0	986	302	0	578	465	0	579	681	866	734
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.1	0.0	42.9	32.9	0.0	43.8	27.1	0.0	27.0	21.0	17.5	19.4
Incr Delay (d2), s/veh	15.3	0.0	0.8	0.1	0.0	14.0	0.4	0.0	0.3	0.3	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.6	0.0	13.7	0.5	0.0	13.1	0.9	0.0	1.2	3.4	0.3	3.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	51.4	0.0	43.6	33.1	0.0	57.9	27.5	0.0	27.3	21.3	17.5	20.2
LnGrp LOS	D	A	D	C	A	E	C	A	C	C	B	C
Approach Vol, veh/h		816			419			101			386	
Approach Delay, s/veh		47.1			56.6			27.4			20.6	
Approach LOS		D			E			C			C	
Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	14.7	45.4	7.1	52.8		60.1	26.0	33.9				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s	13.0	20.0	5.1	63.9		37.5	30.5	38.5				
Max Q Clear Time (g_c+I1), s	10.0	5.0	3.1	29.2		10.0	20.6	27.6				
Green Ext Time (p_c), s	0.1	0.3	0.0	3.1		0.7	0.9	1.8				
Intersection Summary												
HCM 6th Ctrl Delay			42.3									
HCM 6th LOS			D									

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Traffic Vol, veh/h	0	728	436	38	0	33
Future Vol, veh/h	0	728	436	38	0	33
Conflicting Peds, #/hr	0	0	0	25	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	815	488	43	0	37
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	513
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	561
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	548
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		12		
HCM LOS				B		
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	548		
HCM Lane V/C Ratio	-	-	-	0.067		
HCM Control Delay (s)	-	-	-	12		
HCM Lane LOS	-	-	-	B		
HCM 95th %tile Q(veh)	-	-	-	0.2		



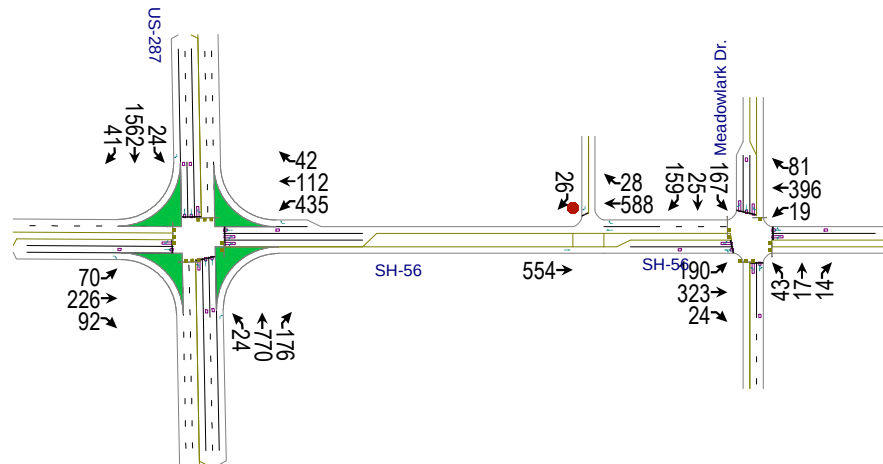
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	62	170	81	330	84	33	21	535	86	12	1085	36
Future Volume (veh/h)	62	170	81	330	84	33	21	535	86	12	1085	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	76	209	0	405	103	0	26	837	0	15	1698	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	97	240		459	387		151	2034		379	2007	
Arrive On Green	0.05	0.13	0.00	0.13	0.21	0.00	0.02	0.57	0.00	0.02	0.56	0.00
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	76	209	0	405	103	0	26	837	0	15	1698	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	5.1	13.2	0.0	13.8	5.5	0.0	0.7	15.8	0.0	0.4	47.8	0.0
Cycle Q Clear(g_c), s	5.1	13.2	0.0	13.8	5.5	0.0	0.7	15.8	0.0	0.4	47.8	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	97	240		459	387		151	2034		379	2007	
V/C Ratio(X)	0.78	0.87		0.88	0.27		0.17	0.41		0.04	0.85	
Avail Cap(c_a), veh/h	174	281		475	387		182	2034		424	2007	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	56.0	51.3	0.0	51.1	40.0	0.0	20.8	14.3	0.0	11.6	21.8	0.0
Incr Delay (d2), s/veh	12.8	21.9	0.0	17.1	0.4	0.0	0.5	0.6	0.0	0.0	4.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	7.5	0.0	6.9	2.5	0.0	0.3	5.8	0.0	0.2	18.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.8	73.3	0.0	68.2	40.3	0.0	21.3	15.0	0.0	11.6	26.4	0.0
LnGrp LOS	E	E		E	D		C	B		B	C	
Approach Vol, veh/h		285	A		508	A		863	A		1713	A
Approach Delay, s/veh		72.1			62.6			15.2			26.3	
Approach LOS		E			E			B			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.5	73.2	20.4	19.9	7.4	72.3	11.0	29.3				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	62.5	16.5	18.0	5.0	62.5	11.7	22.8				
Max Q Clear Time (g_c+I1), s	2.4	17.8	15.8	15.2	2.7	49.8	7.1	7.5				
Green Ext Time (p_c), s	0.0	5.8	0.1	0.2	0.0	8.5	0.0	0.3				
Intersection Summary												
HCM 6th Ctrl Delay			32.8									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Intersection												
Int Delay, s/veh	4.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	286	21	17	350	8	38	2	12	45	5	49
Future Vol, veh/h	16	286	21	17	350	8	38	2	12	45	5	49
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	175	-	-	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	351	26	21	430	10	47	3	15	55	8	60

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	440	0	0	377	0	0	915	886	364	890	894	435
Stage 1	-	-	-	-	-	-	404	404	-	477	477	-
Stage 2	-	-	-	-	-	-	511	482	-	413	417	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1120	-	-	1181	-	-	253	284	681	264	280	621
Stage 1	-	-	-	-	-	-	623	599	-	569	556	-
Stage 2	-	-	-	-	-	-	545	553	-	616	591	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1120	-	-	1181	-	-	217	274	681	249	270	621
Mov Cap-2 Maneuver	-	-	-	-	-	-	217	274	-	249	270	-
Stage 1	-	-	-	-	-	-	612	588	-	559	546	-
Stage 2	-	-	-	-	-	-	476	543	-	589	580	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.4			23.4			20.5		
HCM LOS							C			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	260	1120	-	-	1181	-	-	354
HCM Lane V/C Ratio	0.248	0.018	-	-	0.018	-	-	0.348
HCM Control Delay (s)	23.4	8.3	-	-	8.1	-	-	20.5
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1	0.1	-	-	0.1	-	-	1.5



Gateway
3: SH-56 & US-287

2040 AM Total
10/23/2019

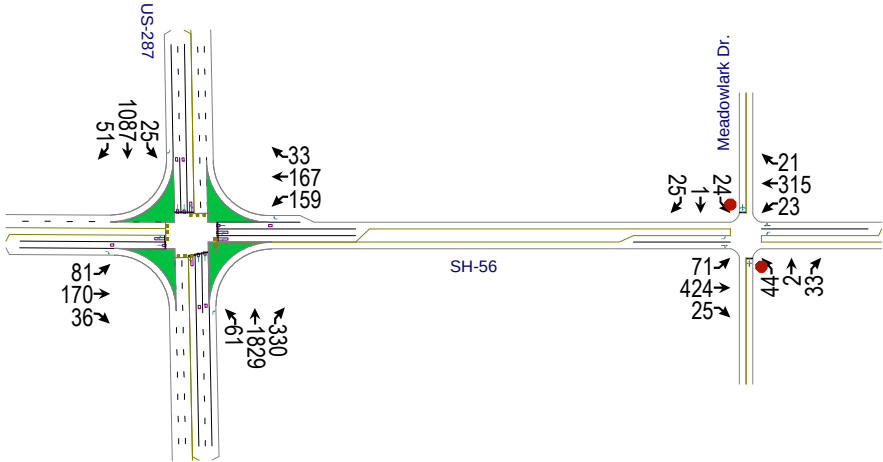
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	62	200	81	385	99	37	21	535	156	21	1085	36
Future Volume (veh/h)	62	200	81	385	99	37	21	535	156	21	1085	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	76	246	0	473	122	0	26	837	0	26	1698	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	97	275		504	445		134	1895		359	1895	
Arrive On Green	0.05	0.15	0.00	0.05	0.08	0.00	0.02	0.53	0.00	0.02	0.53	0.00
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	76	246	0	473	122	0	26	837	0	26	1698	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	5.1	15.5	0.0	16.4	7.4	0.0	0.8	17.3	0.0	0.8	51.3	0.0
Cycle Q Clear(g_c), s	5.1	15.5	0.0	16.4	7.4	0.0	0.8	17.3	0.0	0.8	51.3	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	97	275		504	445		134	1895		359	1895	
V/C Ratio(X)	0.78	0.90		0.94	0.27		0.19	0.44		0.07	0.90	
Avail Cap(c_a), veh/h	174	288		504	445		165	1895		390	1895	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	56.0	50.3	0.0	56.6	45.5	0.0	24.0	17.1	0.0	13.2	25.0	0.0
Incr Delay (d2), s/veh	12.8	27.3	0.0	25.6	0.3	0.0	0.7	0.7	0.0	0.1	7.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	9.1	0.0	9.4	3.5	0.0	0.3	6.5	0.0	0.3	20.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.8	77.6	0.0	82.2	45.8	0.0	24.7	17.9	0.0	13.3	32.2	0.0
LnGrp LOS	E	E		F	D		C	B		B	C	
Approach Vol, veh/h		322	A		595	A		863	A		1724	A
Approach Delay, s/veh		75.5			74.7			18.1			31.9	
Approach LOS		E			E			B			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.4	68.5	22.0	22.1	7.4	68.5	11.0	33.1				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	61.0	17.5	18.5	5.0	61.0	11.7	24.3				
Max Q Clear Time (g_c+l1), s	2.8	19.3	18.4	17.5	2.8	53.3	7.1	9.4				
Green Ext Time (p_c), s	0.0	5.7	0.0	0.1	0.0	5.7	0.0	0.4				
Intersection Summary												
HCM 6th Ctrl Delay			39.8									
HCM 6th LOS			D									
Notes												
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Gateway
6: SH-56 & Meadowlark Dr.

2040 AM Total
10/23/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	168	286	21	17	350	72	38	15	12	148	22	141
Future Volume (veh/h)	168	286	21	17	350	72	38	15	12	148	22	141
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	206	351	26	21	430	88	47	18	15	182	27	173
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	262	666	49	295	476	97	488	342	285	683	896	760
Arrive On Green	0.03	0.13	0.13	0.02	0.32	0.32	0.36	0.36	0.36	0.08	0.48	0.48
Sat Flow, veh/h	1781	1720	127	1781	1507	308	1182	943	786	1781	1870	1585
Grp Volume(v), veh/h	206	0	377	21	0	518	47	0	33	182	27	173
Grp Sat Flow(s),veh/h/ln	1781	0	1847	1781	0	1815	1182	0	1729	1781	1870	1585
Q Serve(g_s), s	8.9	0.0	22.9	0.9	0.0	32.8	3.2	0.0	1.5	7.4	0.9	7.7
Cycle Q Clear(g_c), s	8.9	0.0	22.9	0.9	0.0	32.8	3.2	0.0	1.5	7.4	0.9	7.7
Prop In Lane	1.00		0.07	1.00		0.17	1.00		0.45	1.00		1.00
Lane Grp Cap(c), veh/h	262	0	716	295	0	573	488	0	626	683	896	760
V/C Ratio(X)	0.78	0.00	0.53	0.07	0.00	0.90	0.10	0.00	0.05	0.27	0.03	0.23
Avail Cap(c_a), veh/h	342	0	947	339	0	764	488	0	626	731	896	760
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.5	0.0	42.0	27.6	0.0	39.3	25.4	0.0	24.9	19.7	16.5	18.3
Incr Delay (d2), s/veh	8.6	0.0	0.6	0.1	0.0	11.6	0.4	0.0	0.2	0.2	0.1	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	0.0	11.5	0.4	0.0	16.3	1.0	0.0	0.6	3.1	0.4	3.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.2	0.0	42.6	27.7	0.0	50.9	25.8	0.0	25.0	19.9	16.6	19.0
LnGrp LOS	D	A	D	C	A	D	C	A	C	B	B	B
Approach Vol, veh/h		583			539			80			382	
Approach Delay, s/veh		41.4			50.0			25.5			19.2	
Approach LOS		D			D			C			B	
Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	14.0	48.0	7.0	51.0		62.0	15.6	42.4				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s	12.8	22.2	5.5	61.5		39.5	16.5	50.5				
Max Q Clear Time (g_c+I1), s	9.4	5.2	2.9	24.9		9.7	10.9	34.8				
Green Ext Time (p_c), s	0.2	0.2	0.0	2.6		0.7	0.3	3.1				
Intersection Summary												
HCM 6th Ctrl Delay			38.2									
HCM 6th LOS			D									

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Traffic Vol, veh/h	0	490	520	25	0	23
Future Vol, veh/h	0	490	520	25	0	23
Conflicting Peds, #/hr	0	0	0	25	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	602	639	31	0	28
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	664
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	461
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	450
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		13.5		
HCM LOS	B					
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	450		
HCM Lane V/C Ratio	-	-	-	0.063		
HCM Control Delay (s)	-	-	-	13.5		
HCM Lane LOS	-	-	-	B		
HCM 95th %tile Q(veh)	-	-	-	0.2		



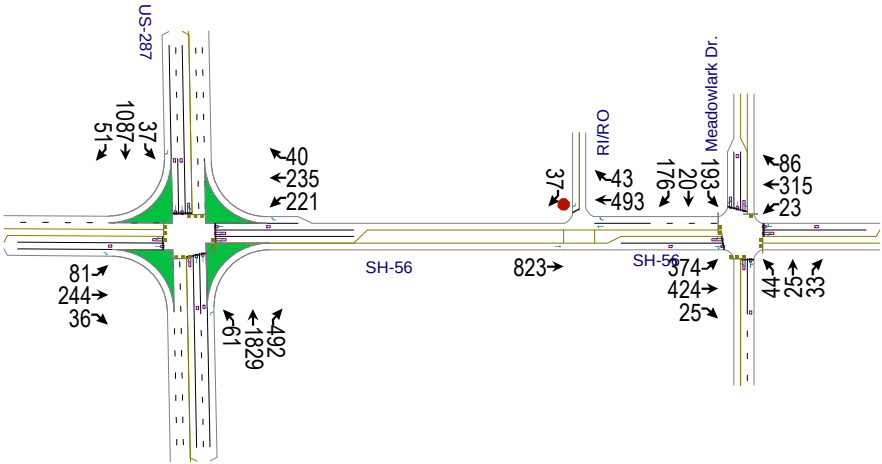
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	150	32	141	148	29	54	1270	292	22	755	45
Future Volume (veh/h)	72	150	32	141	148	29	54	1270	292	22	755	45
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	88	184	0	173	182	0	66	1988	0	27	1182	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	111	237		216	237		322	1982		140	1912	
Arrive On Green	0.06	0.13	0.00	0.06	0.13	0.00	0.05	0.56	0.00	0.03	0.54	0.00
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	88	184	0	173	182	0	66	1988	0	27	1182	0
Grp Sat Flow(s), veh/h/ln	1781	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	3.9	7.6	0.0	4.0	7.5	0.0	1.3	44.6	0.0	0.5	18.4	0.0
Cycle Q Clear(g_c), s	3.9	7.6	0.0	4.0	7.5	0.0	1.3	44.6	0.0	0.5	18.4	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	111	237		216	237		322	1982		140	1912	
V/C Ratio(X)	0.79	0.78		0.80	0.77		0.21	1.00		0.19	0.62	
Avail Cap(c_a), veh/h	111	421		216	421		347	1982		201	1912	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	37.0	33.8	0.0	37.0	33.8	0.0	9.6	17.7	0.0	19.2	12.8	0.0
Incr Delay (d2), s/veh	30.9	5.5	0.0	19.0	5.2	0.0	0.3	20.9	0.0	0.7	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	3.6	0.0	2.1	3.5	0.0	0.4	18.8	0.0	0.2	5.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.8	39.3	0.0	56.0	39.0	0.0	9.9	38.6	0.0	19.9	14.3	0.0
LnGrp LOS	E	D		E	D		A	F		B	B	
Approach Vol, veh/h		272	A		355	A		2054	A		1209	A
Approach Delay, s/veh		48.5			47.3			37.7			14.4	
Approach LOS		D			D			D			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.8	49.1	9.5	14.6	8.3	47.5	9.5	14.6				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	34.0	5.0	18.0	5.0	34.0	5.0	18.0				
Max Q Clear Time (g_c+I1), s	2.5	46.6	6.0	9.6	3.3	20.4	5.9	9.5				
Green Ext Time (p_c), s	0.0	0.0	0.0	0.5	0.0	6.2	0.0	0.5				
Intersection Summary												
HCM 6th Ctrl Delay			32.1									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	63	375	22	20	279	19	39	2	29	21	1	22
Future Vol, veh/h	63	375	22	20	279	19	39	2	29	21	1	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	175	-	-	300	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	77	461	27	25	343	23	48	2	36	26	1	27

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	366	0	0	488	0	0	1048	1045	475	1053	1047	355
Stage 1	-	-	-	-	-	-	629	629	-	405	405	-
Stage 2	-	-	-	-	-	-	419	416	-	648	642	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1193	-	-	1075	-	-	206	229	590	204	228	689
Stage 1	-	-	-	-	-	-	470	475	-	622	598	-
Stage 2	-	-	-	-	-	-	612	592	-	459	469	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1193	-	-	1075	-	-	184	209	590	177	208	689
Mov Cap-2 Maneuver	-	-	-	-	-	-	184	209	-	177	208	-
Stage 1	-	-	-	-	-	-	439	444	-	582	584	-
Stage 2	-	-	-	-	-	-	573	578	-	401	439	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.1			0.5			25.7			20.7		
HCM LOS							D			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	259	1193	-	-	1075	-	-	283
HCM Lane V/C Ratio	0.332	0.065	-	-	0.023	-	-	0.191
HCM Control Delay (s)	25.7	8.2	-	-	8.4	-	-	20.7
HCM Lane LOS	D	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1.4	0.2	-	-	0.1	-	-	0.7



												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	216	32	196	208	35	54	1270	435	33	755	45
Future Volume (veh/h)	72	216	32	196	208	35	54	1270	435	33	755	45
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	88	265	0	241	255	0	66	1988	0	41	1182	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	104	282		274	321		304	2093		130	2072	
Arrive On Green	0.06	0.15	0.00	0.03	0.06	0.00	0.04	0.59	0.00	0.03	0.58	0.00
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	88	265	0	241	255	0	66	1988	0	41	1182	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	5.9	16.8	0.0	8.3	16.2	0.0	1.8	62.6	0.0	1.1	24.9	0.0
Cycle Q Clear(g_c), s	5.9	16.8	0.0	8.3	16.2	0.0	1.8	62.6	0.0	1.1	24.9	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	104	282		274	321		304	2093		130	2072	
V/C Ratio(X)	0.85	0.94		0.88	0.79		0.22	0.95		0.32	0.57	
Avail Cap(c_a), veh/h	104	282		274	321		324	2093		149	2072	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	56.0	50.4	0.0	57.9	54.5	0.0	12.0	23.0	0.0	28.1	15.6	0.0
Incr Delay (d2), s/veh	44.3	37.6	0.0	26.5	12.9	0.0	0.4	11.0	0.0	1.4	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	10.6	0.0	4.7	9.2	0.0	0.6	25.1	0.0	0.7	9.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	100.3	88.0	0.0	84.4	67.4	0.0	12.4	34.0	0.0	29.5	16.8	0.0
LnGrp LOS	F	F		F	E		B	C		C	B	
Approach Vol, veh/h		353	A		496	A		2054	A		1223	A
Approach Delay, s/veh		91.1			75.6			33.3			17.2	
Approach LOS		F			E			C			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.2	75.2	14.0	22.6	8.9	74.5	11.5	25.1				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	69.4	9.5	18.1	5.8	68.6	7.0	20.6				
Max Q Clear Time (g_c+l1), s	3.1	64.6	10.3	18.8	3.8	26.9	7.9	18.2				
Green Ext Time (p_c), s	0.0	4.1	0.0	0.0	0.0	9.3	0.0	0.3				
Intersection Summary												
HCM 6th Ctrl Delay			38.6									
HCM 6th LOS			D									
Notes												
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	331	375	22	20	279	76	39	22	29	171	18	156
Future Volume (veh/h)	331	375	22	20	279	76	39	22	29	171	18	156
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	407	461	27	25	343	93	48	27	36	210	22	192
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	446	774	45	280	375	102	397	210	280	580	789	669
Arrive On Green	0.07	0.15	0.15	0.02	0.26	0.26	0.29	0.29	0.29	0.10	0.42	0.42
Sat Flow, veh/h	1781	1749	102	1781	1417	384	1167	727	969	1781	1870	1585
Grp Volume(v), veh/h	407	0	488	25	0	436	48	0	63	210	22	192
Grp Sat Flow(s), veh/h/ln	1781	0	1852	1781	0	1801	1167	0	1696	1781	1870	1585
Q Serve(g_s), s	21.2	0.0	29.6	1.2	0.0	28.2	3.7	0.0	3.3	9.6	0.8	9.6
Cycle Q Clear(g_c), s	21.2	0.0	29.6	1.2	0.0	28.2	3.7	0.0	3.3	9.6	0.8	9.6
Prop In Lane	1.00		0.06	1.00		0.21	1.00		0.57	1.00		1.00
Lane Grp Cap(c), veh/h	446	0	819	280	0	477	397	0	489	580	789	669
V/C Ratio(X)	0.91	0.00	0.60	0.09	0.00	0.91	0.12	0.00	0.13	0.36	0.03	0.29
Avail Cap(c_a), veh/h	556	0	986	313	0	563	397	0	489	580	789	669
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.7	0.0	41.2	31.1	0.0	42.8	31.7	0.0	31.5	24.5	20.3	22.8
Incr Delay (d2), s/veh	16.9	0.0	0.7	0.1	0.0	17.8	0.6	0.0	0.5	0.4	0.1	1.1
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ft	5.1	0.0	14.9	0.5	0.0	14.8	1.1	0.0	1.4	4.1	0.4	3.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	55.6	0.0	41.9	31.2	0.0	60.6	32.3	0.0	32.1	24.9	20.4	23.9
LnGrp LOS	E	A	D	C	A	E	C	A	C	C	C	C
Approach Vol, veh/h	895			461			111			424		
Approach Delay, s/veh	48.2			59.0			32.2			24.2		
Approach LOS	D			E			C			C		
Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	6.0	39.1	7.3	57.6		55.1	28.6	36.3				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s	1.5	21.5	5.1	63.9		37.5	31.5	37.5				
Max Q Clear Time (g_c+I1), s	1.6	5.7	3.2	31.6		11.6	23.2	30.2				
Green Ext Time (p_c), s	0.0	0.4	0.0	3.5		0.7	0.9	1.6				
Intersection Summary												
HCM 6th Ctrl Delay				44.5								
HCM 6th LOS				D								

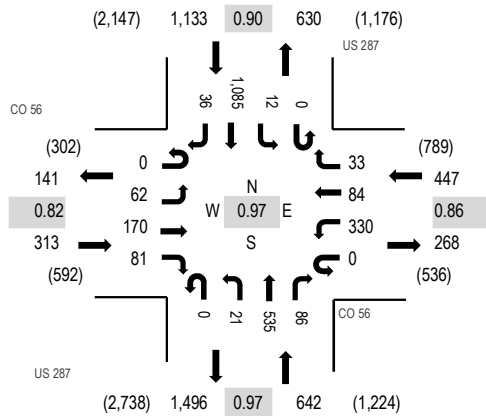
Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Traffic Vol, veh/h	0	728	436	38	0	33
Future Vol, veh/h	0	728	436	38	0	33
Conflicting Peds, #/hr	0	0	0	25	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	894	536	47	0	41
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	561
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	527
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	514
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		12.6		
HCM LOS				B		
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	514		
HCM Lane V/C Ratio	-	-	-	0.079		
HCM Control Delay (s)	-	-	-	12.6		
HCM Lane LOS	-	-	-	B		
HCM 95th %tile Q(veh)	-	-	-	0.3		



(303) 216-2439
www.alltrafficdata.net

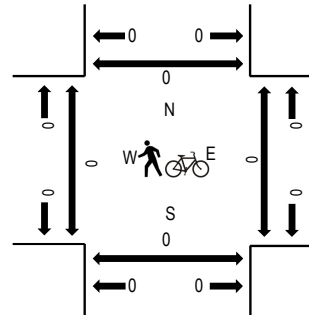
Location: 1 US 287 & CO 56 AM
Date: Tuesday, October 15, 2019
Peak Hour: 07:15 AM - 08:15 AM
Peak 15-Minutes: 08:00 AM - 08:15 AM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



Traffic Counts

Interval Start Time	CO 56 Eastbound				CO 56 Westbound				US 287 Northbound				US 287 Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	11	24	11	0	64	8	5	0	5	102	11	0	1	297	5	544	2,424	0	0	0	0
7:15 AM	0	16	36	25	0	80	13	8	0	3	139	15	0	4	303	10	652	2,535	0	0	0	0
7:30 AM	0	21	36	19	0	84	11	10	0	7	133	16	0	1	269	6	613	2,505	0	0	0	0
7:45 AM	0	12	51	21	0	80	23	8	0	6	133	30	0	2	241	8	615	2,435	0	0	0	0
8:00 AM	0	13	47	16	0	86	37	7	0	5	130	25	0	5	272	12	655	2,328	0	0	0	0
8:15 AM	0	18	69	16	0	58	26	7	0	4	129	35	0	4	241	15	622		0	0	0	0
8:30 AM	0	15	20	19	0	61	38	6	0	8	119	22	1	5	216	13	543		0	0	0	0
8:45 AM	0	20	43	13	0	43	22	4	0	7	109	31	0	3	203	10	508		0	0	0	0
Count Total	0	126	326	140	0	556	178	55	0	45	994	185	1	25	2,042	79	4,752		0	0	0	0
Peak Hour	0	62	170	81	0	330	84	33	0	21	535	86	0	12	1,085	36	2,535		0	0	0	0



(303) 216-2439
www.alltrafficdata.net

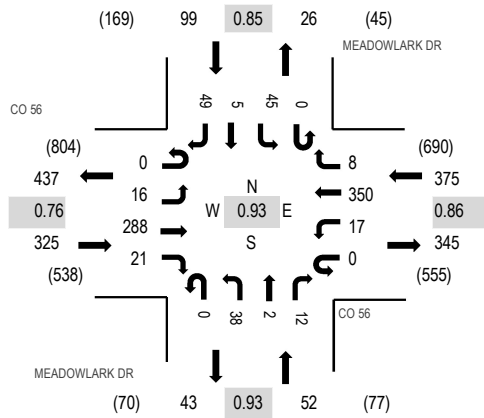
Location: 2 MEADOWLARK DR & CO 56 AM

Date: Tuesday, October 15, 2019

Peak Hour: 07:30 AM - 08:30 AM

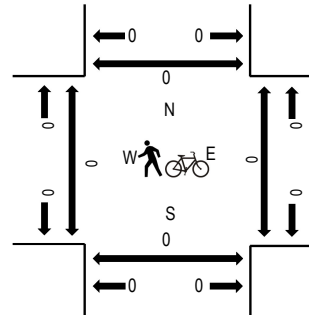
Peak 15-Minutes: 08:15 AM - 08:30 AM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



Traffic Counts

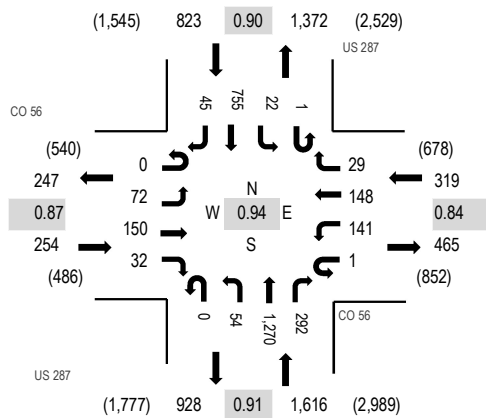
Interval Start Time	CO 56 Eastbound				CO 56 Westbound				MEADOWLARK DR Northbound				MEADOWLARK DR Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	0	34	1	0	1	67	1	0	3	0	1	0	4	1	11	124	697	0	0	0	0
7:15 AM	0	7	45	4	0	2	83	1	0	8	0	2	0	3	0	19	174	797	0	0	0	0
7:30 AM	0	3	48	4	0	5	73	1	0	10	0	2	0	7	1	21	175	851	0	0	0	0
7:45 AM	0	3	76	5	0	1	99	1	0	11	0	3	0	13	1	11	224	846	0	0	0	0
8:00 AM	0	8	67	4	0	5	107	3	0	8	2	3	0	7	2	8	224	777	0	0	0	0
8:15 AM	0	2	97	8	0	6	71	3	0	9	0	4	0	18	1	9	228		0	0	0	0
8:30 AM	0	2	43	3	1	5	88	5	0	6	0	1	0	5	0	11	170		0	0	0	0
8:45 AM	0	1	67	6	0	4	55	2	0	4	0	0	0	4	0	12	155		0	0	0	0
Count Total	0	26	477	35	1	29	643	17	0	59	2	16	0	61	6	102	1,474		0	0	0	0
Peak Hour	0	16	288	21	0	17	350	8	0	38	2	12	0	45	5	49	851		0	0	0	0



(303) 216-2439
www.alltrafficdata.net

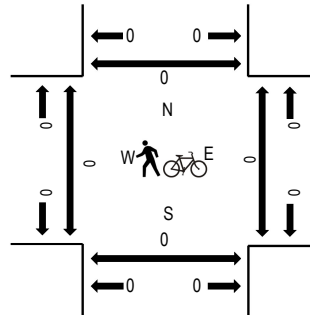
Location: 1 US 287 & CO 56 PM
Date: Tuesday, October 15, 2019
Peak Hour: 04:45 PM - 05:45 PM
Peak 15-Minutes: 05:15 PM - 05:30 PM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



Traffic Counts

Interval Start Time	CO 56 Eastbound				CO 56 Westbound				US 287 Northbound				US 287 Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	11	33	5	0	44	56	8	0	18	262	54	0	5	140	8	644	2,709	0	0	0	0
4:15 PM	0	21	40	8	0	43	35	5	0	18	272	47	0	6	152	14	661	2,793	0	0	0	0
4:30 PM	0	12	26	8	0	47	44	5	0	17	274	59	0	4	187	13	696	2,930	0	0	0	0
4:45 PM	0	23	37	13	0	34	38	5	0	16	280	81	0	3	166	12	708	3,012	0	0	0	0
5:00 PM	0	15	42	7	0	33	36	9	0	13	295	65	0	11	190	12	728	2,989	0	0	0	0
5:15 PM	0	15	43	7	0	46	39	6	0	11	358	75	0	4	184	10	798		0	0	0	0
5:30 PM	0	19	28	5	1	28	35	9	0	14	337	71	1	4	215	11	778		0	0	0	0
5:45 PM	0	20	36	12	0	29	36	7	0	20	260	72	0	5	174	14	685		0	0	0	0
Count Total	0	136	285	65	1	304	319	54	0	127	2,338	524	1	42	1,408	94	5,698		0	0	0	0
Peak Hour	0	72	150	32	1	141	148	29	0	54	1,270	292	1	22	755	45	3,012		0	0	0	0



(303) 216-2439
www.alltrafficdata.net

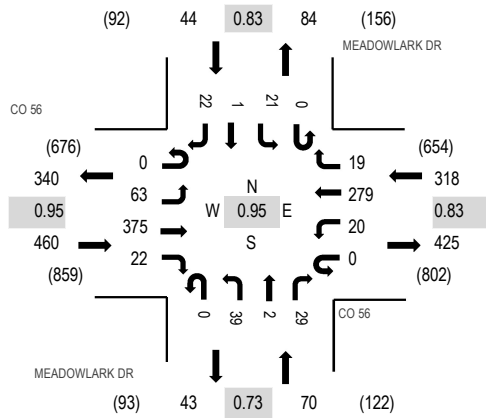
Location: 2 MEADOWLARK DR & CO 56 PM

Date: Tuesday, October 15, 2019

Peak Hour: 04:30 PM - 05:30 PM

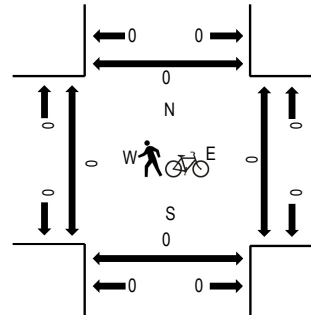
Peak 15-Minutes: 05:00 PM - 05:15 PM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



Traffic Counts

Interval Start Time	CO 56 Eastbound				CO 56 Westbound				MEADOWLARK DR Northbound				MEADOWLARK DR Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	1	10	77	6	0	4	94	6	0	5	0	7	0	10	0	4	224	847	0	0	0	0
4:15 PM	0	9	76	5	0	7	70	5	0	5	0	7	0	4	0	6	194	858	0	0	0	0
4:30 PM	0	10	78	4	0	5	83	4	0	9	0	5	0	5	0	4	207	892	0	0	0	0
4:45 PM	0	17	98	8	0	7	59	1	0	9	0	8	0	8	1	6	222	892	0	0	0	0
5:00 PM	0	20	97	6	0	5	67	8	0	15	0	9	0	3	0	5	235	880	0	0	0	0
5:15 PM	0	16	102	4	0	3	70	6	0	6	2	7	0	5	0	7	228		0	0	0	0
5:30 PM	0	9	83	7	0	6	70	4	0	4	4	5	0	6	1	8	207		0	0	0	0
5:45 PM	0	16	93	7	0	5	57	8	0	8	1	6	0	3	2	4	210		0	0	0	0
Count Total	1	107	704	47	0	42	570	42	0	61	7	54	0	44	4	44	1,727		0	0	0	0
Peak Hour	0	63	375	22	0	20	279	19	0	39	2	29	0	21	1	22	892		0	0	0	0

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Gateway		Organization:	ATC	
Project Location:	Berthoud		Performed By:	jmwa	
Scenario Description:			Date:	10/14/2019	
Analysis Year:	2024		Checked By:		
Analysis Period:	AM Peak Hour		Date:		

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (<i>For Information Only</i>)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				337	190	148
Restaurant				159	87	72
Cinema/Entertainment				0	0	0
Residential				59	14	45
Hotel				0		
All Other Land Uses ²				0	0	0
				555	291	265

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office	1.00	0%	5%	1.00	0%	5%
Retail	1.50	0%	5%	1.50	0%	5%
Restaurant	1.50	0%	5%	1.50	0%	5%
Cinema/Entertainment	1.50	0%	5%	1.50	0%	5%
Residential						
Hotel						
All Other Land Uses ²	1.00			1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		29	0	0	0
Restaurant	0	15		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	9	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	805	430	375
Internal Capture Percentage	13%	13%	14%
External Vehicle-Trips ⁵	459	243	216
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	34	19	15

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	5%	13%
Restaurant	29%	15%
Cinema/Entertainment	N/A	N/A
Residential	7%	20%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

³Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

⁴Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

⁵Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

⁶Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	Gateway
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.50	190	285	1.50	148	222
Restaurant	1.50	87	131	1.50	72	108
Cinema/Entertainment	1.50	0	0	1.50	0	0
Residential	1.00	14	14	1.00	45	45
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office	0	0	0	0	0	0
Retail	64	0	29	0	31	0
Restaurant	33	15	0	0	4	3
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	0	9	0	0	0
Hotel	0	0	0	0	0	0

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office	0	91	30	0	0	0
Retail	0	0	66	0	0	0
Restaurant	0	23	0	0	1	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	48	26	0	0	0
Hotel	0	11	8	0	0	0

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	15	270	285	171	0	14
Restaurant	38	93	131	59	0	5
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	13	14	13	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	29	193	222	122	0	10
Restaurant	16	92	108	58	0	5
Cinema/Entertainment	0	0	0	0	0	0
Residential	9	36	45	36	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Gateway			Organization:	ATC
Project Location:	Berthoud			Performed By:	JMWA
Scenario Description:				Date:	10/14/2019
Analysis Year:	2024			Checked By:	
Analysis Period:	PM Street Peak Hour			Date:	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				658	332	327
Restaurant				156	97	59
Cinema/Entertainment				0	0	0
Residential				72	45	27
Hotel				0		
All Other Land Uses ²				0	0	0
				886	474	413

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office	1.00	0%	5%	1.00	0%	5%
Retail	1.50	0%	5%	1.50	0%	5%
Restaurant	1.50	0%	5%	1.50	0%	5%
Cinema/Entertainment	1.50	0%	0%	1.50	0%	0%
Residential						
Hotel						
All Other Land Uses ²	1.00	1%	0%	1.00	1%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		300	300		500	
Retail					500	
Restaurant					500	
Cinema/Entertainment					500	
Residential		500	500			
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		42	0	21	0
Restaurant	0	36		0	7	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	10	5	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,296	689	607
Internal Capture Percentage	19%	18%	20%
External Vehicle-Trips ⁵	678	366	312
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	51	28	23

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	9%	13%
Restaurant	32%	48%
Cinema/Entertainment	N/A	N/A
Residential	62%	56%
Hotel	N/A	N/A

¹ Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
³ Enter trips assuming no transit or non-motorized trips (as assumed in ITE <i>Trip Generation Manual</i>).
⁴ Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be
⁵ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.
⁶ Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	Gateway
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.50	332	498	1.50	327	491
Restaurant	1.50	97	146	1.50	59	89
Cinema/Entertainment	1.50	0	0	1.50	0	0
Residential	1.00	45	45	1.00	27	27
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office	0	0	0	0	0	0
Retail	10	0	142	20	128	25
Restaurant	3	36	0	7	16	6
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	10	5	0	0	1
Hotel	0	0	0	0	0	0

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office	0	39	3	0	2	0
Retail	0	0	42	0	21	0
Restaurant	0	249	0	0	7	0
Cinema/Entertainment	0	20	4	0	2	0
Residential	0	45	19	0	0	0
Hotel	0	10	7	0	0	0

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	46	452	498	286	0	23
Restaurant	47	99	146	63	0	5
Cinema/Entertainment	0	0	0	0	0	0
Residential	28	17	45	17	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	63	428	491	271	0	21
Restaurant	43	46	89	29	0	2
Cinema/Entertainment	0	0	0	0	0	0
Residential	15	12	27	12	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

Table 7.1a Adjusted Internal Trip Capture Rates for Trip Origins within a Multi-Use Development

Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
From OFFICE	To Office	0.0%	0.0%
	To Retail	28.0%	19.4%
	To Restaurant	63.0%	3.9%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	1.0%	2.0%
	To Hotel	0.0%	0.0%
From RETAIL	To Office	29.0%	2.0%
	To Retail	0.0%	0.0%
	To Restaurant	13.0%	29.0%
	To Cinema/Entertainment	0.0%	4.0%
	To Residential	14.0%	26.0%
	To Hotel	0.0%	5.0%
From RESTAURANT	To Office	31.0%	3.0%
	To Retail	14.0%	41.0%
	To Restaurant	0.0%	0.0%
	To Cinema/Entertainment	0.0%	8.0%
	To Residential	4.0%	18.0%
	To Hotel	3.0%	7.0%
From CINEMA/ENTERTAINMENT	To Office	0.0%	2.0%
	To Retail	0.0%	21.0%
	To Restaurant	0.0%	31.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	8.0%
	To Hotel	0.0%	2.0%
From RESIDENTIAL	To Office	2.0%	4.0%
	To Retail	1.0%	38.2%
	To Restaurant	20.0%	19.1%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	0.0%
	To Hotel	0.0%	3.0%
From HOTEL	To Office	75.0%	0.0%
	To Retail	14.0%	16.0%
	To Restaurant	9.0%	68.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	2.0%
	To Hotel	0.0%	0.0%

Table 7.2a Adjusted Internal Trip Capture Rates for Trip Destinations within a Multi-Use Development

Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
To OFFICE	From Office	0.0%	0.0%
	From Retail	4.0%	31.0%
	From Restaurant	14.0%	30.0%
	From Cinema/Entertainment	0.0%	6.0%
	From Residential	3.0%	57.0%
	From Hotel	3.0%	0.0%
To RETAIL	From Office	32.0%	7.8%
	From Retail	0.0%	0.0%
	From Restaurant	8.0%	50.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	17.0%	9.1%
	From Hotel	4.0%	2.0%
To RESTAURANT	From Office	23.0%	1.9%
	From Retail	50.0%	29.0%
	From Restaurant	0.0%	0.0%
	From Cinema/Entertainment	0.0%	3.0%
	From Residential	20.0%	12.7%
	From Hotel	6.0%	5.0%
To CINEMA/ENTERTAINMENT	From Office	0.0%	1.0%
	From Retail	0.0%	26.0%
	From Restaurant	0.0%	32.0%
	From Cinema/Entertainment	0.0%	0.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To RESIDENTIAL	From Office	0.0%	4.0%
	From Retail	2.0%	46.0%
	From Restaurant	5.0%	16.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To HOTEL	From Office	0.0%	0.0%
	From Retail	0.0%	17.0%
	From Restaurant	4.0%	71.0%
	From Cinema/Entertainment	0.0%	1.0%
	From Residential	0.0%	12.0%
	From Hotel	0.0%	0.0%

**Preliminary Drainage Report Amendment
Westside Crossing
Berthoud, Colorado**

Prepared for:
Berthoud Gateway, LLC
8040 Loudon Circle, Windsor, CO 80528
Phone Number: (970) 222-7268

Prepared by:



Kiowa
Engineering Corporation

7175 West Jefferson Avenue, Suite 2200
Lakewood, Colorado 80235
Ph: (303)692-0369

Kiowa Project No. 19043

July 7, 2023

TABLE OF CONTENTS

Table of Contents.....	i
Signature Page.....	ii
I. General Description.....	1
II. Soils Conditions	1
III. Drainage Criteria.....	1
IV. Existing Drainage Conditions	2
V. Proposed Drainage Conditions	3
VI. Water Quality and Detention Design	4
VII. Floodplain Statement.....	5
VIII. Summary.....	5
IX. References.....	5
Appendix Table of Contents	7

SIGNATURE PAGE

ENGINEER'S STATEMENT:

Kiowa Engineering Corporation hereby certifies that the drainage facilities for Westside Crossing Replat #2 will be constructed according to the design presented in this report. I understand that the Town of Berthoud does not and shall not assume liability for the drainage facilities designed and/or certified by me engineer. I understand that the Town of Berthoud reviews drainage plans but cannot, on behalf of Westside Crossing Replat #2 and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the Plat and/or Development Permit does not imply approval of my engineer's drainage design.

Matthew W. Erichsen, PE, CFM (PE #36713)
Kiowa Engineering Corp.

I. GENERAL DESCRIPTION

The purpose of this Preliminary Drainage Report is to describe and discuss the drainage patterns and impacts associated with the proposed development. The Westside Crossing project is located on an undeveloped parcel at the northwest corner of State Highway 56 and Meadowlark Drive. The proposed development will consist of approximately 7.75 acres of residential multi-family use and 13.19 acres of commercial use. The total area of the site is 20.94 acres (ac). The residential use to the north consists of Lot 1, Block 2, Westside Crossing, and the commercial use on the southern portion of the site is comprised of Lots 1 thru 6, Block 1, Westside Crossing. The properties are situated in the South Half of the Southwest Quarter of Section 15, Township 4 North, Range 69 West of the 6th Principal Meridian, City of Berthoud, County of Larimer, State of Colorado. The property is bounded on the east by Meadowlark Drive, on the south by Highway 56, on the west by U.S. Highway 287 by-pass, and on the north by Village at Matthews Farm residential development. The location of the site is shown on the Vicinity Map (Figure 1).

The site is currently covered with native prairie grasses and sparse trees located on the southern boundary of the site along Highway 56.

The proposed development is planned to occur in two phases with the South commercial Lots being developed first and the North residential Lot(s) developed in the future. The development of the South Lot will include construction of the previously mentioned commercial buildings, parking lots, paved drives, landscaping, and associated stormwater quality and detention facilities. The development of the North Lot will include construction of multifamily residences, paved drives, landscaping and associated stormwater quality and detention facility.

II. SOILS CONDITIONS

The majority of soils within the property are classified to be within Hydrologic Soils Group C based on the NRCS Soil Survey for the Berthoud area. Soils on the site are predominantly Nunn Clay Loam (Soil Group C). For the site drainage calculations, the soils were assumed to be Hydrologic Soil Group C. The existing vegetative cover within the development is in fair condition with mostly grasses and scattered trees throughout the site. The existing ground slopes for the majority of the property range from 0.5 to 1.5 percent with the steepest slopes occurring near the southeast corner of the site at an existing soil mound. Steep slopes also parallel the northern and eastern property boundaries where existing drainage swales convey stormwater and irrigation water from the west side of Highway 287 and from northern residential development's detention facility release as well as minor undetained runoff.

III. DRAINAGE CRITERIA

Hydrologic Criteria

The hydrology for the site was performed using the methods outlined in the *Larimer County Stormwater Design Standards*, which is an addendum to the Mile High Flood District (MHFD) Criteria Manuals as well as Town of Berthoud Engineering and Infrastructure Design Standards and Construction Specifications. Existing topography for the site was surveyed and compiled using one-foot contour intervals and is presented on the Existing Conditions Drainage Plan (Exhibit A). The hydrological calculations were made for the proposed site conditions, which are depicted on the Proposed Conditions Drainage Plan (Exhibit B). Peak Flow Rates for the sub-basins were estimated using the Rational Method. The 10-Year (Minor Storm) and 100-Year (Major Storm) recurrence intervals were determined.

Rainfall intensity was determined using NOAA Atlas 14, Volume 8, Version 2 point-based precipitation frequency estimates. Per Town of Berthoud, Runoff Coefficients for the existing and proposed sub basins were determined by Table 600-2 of the Town of Berthoud Design and Construction Specifications.

Hydraulic Criteria

The preliminary design of the drainage system for this site has been designed in conformance with the Larimer County Stormwater Design Standards. Hydraulic calculations are provided for the proposed drainage facilities. MHFD spreadsheets were used to design the proposed inlet within Meadowlark Drive as well as determine the street capacity of Meadowlark Drive and design all on-site full spectrum detention facilities. The MHFD-Inlet spreadsheet was used for inlet and street capacity calculations and MHFD-Detention spreadsheet was used for water quality and detention design. UD-Sewer software has been used to analyze the outfall trunkline that parallels Meadowlark Drive and transfers all offsite stormwater and irrigation flows as well as developed site runoff. Due to excessively flat topography for the area, the outfall trunkline has been sized as large as possible and conveys the Minor Storm Runoff.

IV. EXISTING DRAINAGE CONDITIONS

Existing drainage conditions for the site are inclusive of both onsite sheet flow across the site in a southeasterly direction as well offsite pass thru flows. The pass thru flows as well as adjacent flows that bypass the project site have been identified by the *U.S Highway 287 Berthoud Bypass Segment #2, Final Hydrology & Hydraulics Report Prepared by URS Corporation, dated January 2002, Revised October 2002*, hereafter referred to as the 287 Report. Per the 287 Report, the construction of the U.S. Highway 287 bypass resulted in several changes in the nature of existing runoff conditions from sheet flow generally west-to-east across the project site to what are now concentrated flows directed under U.S. Highway 287 via culverts in order to maintain ultimate downstream uses of irrigation ditch water and transference of stormwater.

Two culverts located at the northwest corner of the site comprise the majority of pass thru flows and transfer both irrigation and stormwater flows from the west side of U.S. Highway 287, into an existing swale that parallels the northern property boundary (see Design Point 6 and I-6 located on the *Berthoud Bypass Segment #2 Drainage Map* extracted from the 287 Report located in the appendix). The 30-inch RCP storm water culvert transfers flows from the western portion of the Estate at Matthews Farms residential development along with remaining flows from Basin 2-U per the 287 Report (the western portion of the Estate at Matthews Farm residential development is inclusive of Basin 2-U and a max capacity of 31 cfs is assumed from this area during a 100-Year Event). The 24-inch irrigation culvert flows were originally designed to service the agricultural needs of the subject site and the property to the east (Gateway Park Subdivision). It is believed that this ditch has been abandoned as it does not appear that there are any downstream users receiving flows, however, this report accounts for the original flow as pass-thru and has been accounted for in the design calculations. These flows combine with flows identified by the *Final Drainage Report, The Village at Matthews Farms, Prepared by Gorton Scott Engineering, LLC* hereafter referred to as the Matthews Report at existing Design Point EX1 (see Existing Conditions Drainage Plan, Exhibit A, located in the appendix). Combined flows travel south within the roadside ditch that parallels the eastern site boundary adjacent to Meadowlark Drive until they reach Design Point EX2. Flows are then directed east under Meadowlark Drive via an existing 30-inch RCP culvert into a roadside ditch along the north side of Highway 56. Per the *Final Drainage Report, Gateway Park Prepared by Drexel, Barrel & Co.*, developed flows have been accounted for and have been used to size the culvert crossing under the intersection of Highway 56 and County Road 17 (Berthoud Pkwy). The ultimate outfall for these flows is the Little Thompson River located approximately 2.25 miles southeast of the project site.

A high point is located approximately one-quarter mile north of the intersection of U.S. Highway 287 and Highway 56. Flows north of the high point continue north and eventually outfall in the Loveland Reservoir. The majority of flows south of the highpoint and west of U.S. Highway 287 (Offsite Basin 2-OS-A and Basin 2-A per the 287 Report) are directed to a 60-inch culvert which directs flows east under U.S. Highway 287 at the intersection with Highway 56. Runoff from the eastern half of U.S. Highway 287 and west of the project site concentrate within a roadside ditch and are also transferred to the 60-inch culvert via existing storm inlet located at the northeast intersection of U.S. Highway 287 and Highway 56. The culvert turns south and crosses Highway 56 to outfall in a roadside swale that parallels the east side of U.S. Highway 287. The ultimate outfall for these flows is Dry Creek approximately 4,500 feet south of the project site.

The 30-inch RCP culvert under Meadowlark Drive does not have sufficient capacity to transfer 100-Year Event flows from the subject site to the drainage swale on the north side of Highway 56. Flows in excess of the 30-inch culvert capacity currently pond up near Design Point EX2 until overtopping Meadowlark Drive at a low point approximately 200-feet north of the intersection with Highway 56. Once flows have overtopped the low point within Meadowlark Drive, they continue eastward and eventually enter the existing drainage swale on the north side of Highway 56.

Following is a description of the existing drainage sub-basins.

Basins E1 & E2: These basins generally slope toward the southeast at approximately one percent. The existing runoff pattern is sheet flow to the east until entering the existing roadside swale along Meadowlark Drive as shown in Exhibit A. Once within the Meadowlark Drive roadside swale, concentrated flows are directed south to Design Point EX2.

Basins EOS3 & EOS4: Per the Matthews Report, these flows are released undetained from the southern extents of the eastern portion of the Estates at Matthews Farm residential development and are captured within the existing ditch that parallels the site's northern property boundary. Once collected within the swale, concentrated flows are directed eastward where they combine with existing Matthews Farm detention pond release flows at Design Point EX1. Flows combined at Design Point EX1 then travel south within the Meadowlark Drive roadside swale. The two off-site basins along with the Matthews Farm detention pond release generate a 10-Year and 100-Year Runoff of 10.2 and 20.3 cfs, respectively. (Note: 10-Year Runoff from Basins EOS3 & EOS4 were not identified in the Matthews Report so Rational Method Calculations were performed using impervious values and areas identified within the Matthews Report. Additionally, the 10-Year release from the Matthews Farm detention pond was not included in the Matthews Report so a conservative estimate was used).

Basin EOS1: Basin EOS1 is made up of the western half of Meadowlark Drive and sheet flows west into the Meadowlark Drive roadside swale. Once within the swale, concentrated flows are directed south to Design Point EX2.

All existing site sub-basins, as well as the aforementioned pass-thru flows (24-inch irrigation culvert and 30-inch storm water culvert located at the northwestern property corner) eventually reach Design Point EX2 and cross under Meadowlark Drive via 30-inch RCP culvert.

V. PROPOSED DRAINAGE CONDITIONS

The proposed drainage plan will follow the existing site drainage patterns and direct flows toward the southeast corner of the site. Runoff from the development will generally be conveyed as sheet flow through paved areas to curb and gutter that will direct flows either to inlets with storm sewer or directly to the detention basins along the eastern boundary of the site. All on-site drainage structures are designed for developed 100-Year flow capacity. Due to site design limitations, the detention basin at the southeast corner of the site has been designed to allow flows to back up into

grassed areas located to the north as well as underground detention located to the west. A storm culvert under the drive separating the two above ground detention areas will connect the basins. The underground detention will be connected to the rest of the detention areas via storm pipe penetration through the detention basin retaining walls. The three areas will function as one detention facility and collect runoff from all 'A' Basins and will hereafter be referred to as Detention Basin 'A'. Detention Basin B is located along the middle of the eastern property boundary and will collect storm runoff from all 'B' Basins. Detention Basin 'C' has been shown as the collection point for future Basin C developed residential runoff for the purposes of sizing the public trunkline outfall. The developed flows generated from all A, B and C Basins will be routed and detained to historic levels in the three Full Spectrum Detention Basins prior to being released to the proposed outfall trunkline. Pass-thru flows that previously travelled south along the Meadowlark Drive roadside swale will be collected and conveyed via the outfall trunkline as well, following historic patterns. Once collected within the Outfall Trunkline, flows will be conveyed directly to the existing 30-inch culvert at Meadowlark and Highway 56.

Basin OS10 is resultant from an existing low point along the north side of Highway 56, near the intersection with U.S. Highway 287. A drain pan with curb cut has been proposed at the low point in order to direct tributary flows out of the road section and into the existing storm inlet located just northwest of the end of the drain pan. In the existing condition, curb and gutter does not exist along the north side of Highway 56 and runoff from Basin OS10 enters this inlet via overland flow. The proposed condition will maintain historic drainage patterns for this area.

The storm sewer facilities to be constructed as part of this site will be both public and private facilities. Easements will be provided for the public facilities. Outlots will be created to encompass the proposed detention basins.

VI. WATER QUALITY AND DETENTION DESIGN

The development of the property will include storm water quality and detention measures meeting the requirements of the Town's Drainage Criteria. The water quality and detention measures to be instituted for the site will include:

All Full Spectrum Detention (FSD) Basins will include concrete low flow channels, FSD outlet structures with micropools, forebays, emergency spillways, outlet pipes and maintenance access trails. The outlet structures have been designed to release the WQCV, EURV and 100-Year flow at the allowable release rates as outlined by MHFD. All basins will include the water quality capture volume within the 100-Year detention volume. The emergency spillways will be constructed along the eastern edge of the detention basins to release flows in excess of the 100-Year Event and in an emergency situation to Meadowlark Drive. The MHFD-Detention workbook along with MHFD equations have been used to design each facility. Refer to the Appendix for associated calculations. The WQ/EURV orifice plate will be designed as a 3-hole plate sized to drain the WQCV in approximately 40 hours and to drain the EURV in approximately 72 hours. The detention basins have been designed to account for the development of all 'A' and 'B' Basins as well as the future development of Basin 'C', using MHFD standard Impervious and Runoff Coefficients. Due to depth constraints presented by the subject site, retaining walls have been proposed on slightly more than 50% of the perimeter of the southern portion of Detention Basin A in order to meet storage volume requirements dictated by current MHFD criteria. The walls are planned to extend above the exterior finished grade to maximize the volume and minimize the footprint.

Usable detention is planned for at least two of the detention basins to meet the Town requirements. Access to the bottom of the detention basins is planned for Detention Basin C and Detention Basin B.

VII. FLOODPLAIN STATEMENT

The site is located approximately three quarters of a mile North of Dry Creek and is well outside the floodplain shown on the Flood Insurance Rate Map No. 08069C1386H, revised January 15, 2021.

VIII. VARIANCES

A variance to Section 602.4.B.4.c regarding HGLs is being requested as part of this development. Section 602.4.B.4.c states that "The hydraulic grade line (HGL) for the routed design flow (Q) shall be at or below the final finished elevation of the manhole rims." This variance is being requested due to the following conditions:

- The subject site lies within the path of existing passthrough flows from multiple locations including (1) the existing West Detention Basin as reported in "The Estates at Matthews Farm Drainage Report", (2) an existing culvert designed as part of the "US HWY 287 Berthoud Bypass Segment 2 Final Hydrology and Hydraulics" report, and (3) existing detention basin release rates as reported within "The Village at Matthews Farm Drainage Report". The outfall for these flows are all currently passing through the subject site via roadside swale adjacent to Meadowlark Drive until entering an existing 30" RCP culvert at the southeast corner of the subject property which conveys these flows offsite.
- Both upstream and downstream elevations mentioned above are set and control the allowable slope through the subject property.
- The largest storm pipe possible has been proposed given site constraints, i.e., detention pond retaining walls are located immediately west of the storm outfall pipe along it's alignment through the subject property.

IX. SUMMARY

This Preliminary Drainage Report has been prepared in general conformance with the *Larimer County Stormwater Design Standards (Addendum to the Mile High Flood District Criteria Manual, Volumes 1, 2 and 3)* and the Town of Berthoud Engineering and Infrastructure Standards. The proposed Full Spectrum Detention facilities have been designed in accordance with the criteria set forth in the MHFD Manuals to provide detention and water quality for the WQCV, EURV, and 100-Year Storm Event. As previously mentioned, the Outfall Trunkline has been designed to convey the Minor Storm Event (10-Year), but due to site constraints the Trunkline does not have the capacity to convey the 100-Year Event. During a Major Storm Event, flows not able to enter the Outfall Trunkline will enter Meadowlark Drive and overtop the street crown at the low point within Meadowlark Drive and continue eastward to enter the drainage swale on the north side of Highway 56, following historic patterns. Meadowlark Drive has been analyzed for a half-street section to ensure that the 100-Year Event flows conform to Section 602.4.C of the Town of Berthoud Engineering and Infrastructure Standards. The proposed public drainage improvements associated with Westside Crossing have been designed with the intent to not cause adverse impacts to the downstream and surrounding developments while improving the existing drainage condition for the Minor Storm Event by releasing developed flows at a lower rate than that of the predeveloped condition. Major Storm Event Flows will follow historic patterns during the peak period of the Storm Event hydrograph.

X. REFERENCES

- 1) Final Drainage Report for The Village and Matthews Farms, Berthoud, Colorado, Gorton Scott Engineering, LLC July 14, 2002.

- 2) Final Drainage Report for The Estate and Matthews Farms, Berthoud, Colorado, Gorton Scott Engineering, LLC June 23, 2003.
- 3) Final Drainage Report for Collings Park P.U.D., Town of Berthoud, Colorado, Park Engineering, July, 2004.
- 4) Final Drainage Report for Gateway Park, Berthoud, Colorado, Drexel, Barrel & Co., January 2002.
- 5) Final Drainage and Erosion Control Study for Gateway Park 1st Filing Phase 2, North Star Design January 2006.
- 6) Town of Berthoud Engineering and Infrastructure Design Standards and Construction Specifications, October 2021.
- 7) Flood Insurance Rate Map No. 08069C1386H, Federal Emergency Management Administration, revised January 15, 2021.
- 8) Larimer County Stormwater Design Standards (Addendum to Urban Storm Drainage Criteria Manual volume 1-3), Larimer County, Colorado. June 20, 2005.
- 9) Mile High Flood District Criteria Manual - Volumes 1 and 2, Urban Drainage and Flood Control District, Denver, Colorado, June 2001 (with current revisions).
- 10) Mile High Flood District - Volume 3, Urban Drainage and Flood Control District, Denver, Colorado, June 2002 (with current revisions).
- 11) U.S. Highway 287 Berthoud Bypass Segment #2; Final Hydrology and Hydraulics Report, Colorado Department of Transportation October 2002

APPENDIX TABLE OF CONTENTS

APPENDIX A

Figure 1: Vicinity Map

Soils Map

FEMA Flood Insurance Rate Map

APPENDIX B

Hydrologic Calculations

Runoff Coefficient and Percent Impervious Calculations

Time of Concentration and Drainage Basin Runoff Calculations

APPENDIX B.1

Supporting Hydrologic Tables and Figures

APPENDIX C

Water Quality and Detention Calcs – Detention Basins A, B, & C

APPENDIX C.1

Hydraulic Calculations

Inlet and Street Capacity Calculations

UD-Sewer Results Summaries for Outfall Trunkline (10-Year & 100-Year)

APPENDIX D

Relevant Pages from other Drainage Studies

APPENDIX E

Exhibit A: Existing Conditions Drainage Plan

Exhibit B: Proposed Conditions Drainage Plan

APPENDIX A
Figure 1: Vicinity Map
Soils Map
FEMA Flood Insurance Rate Map



SCALE: NTS

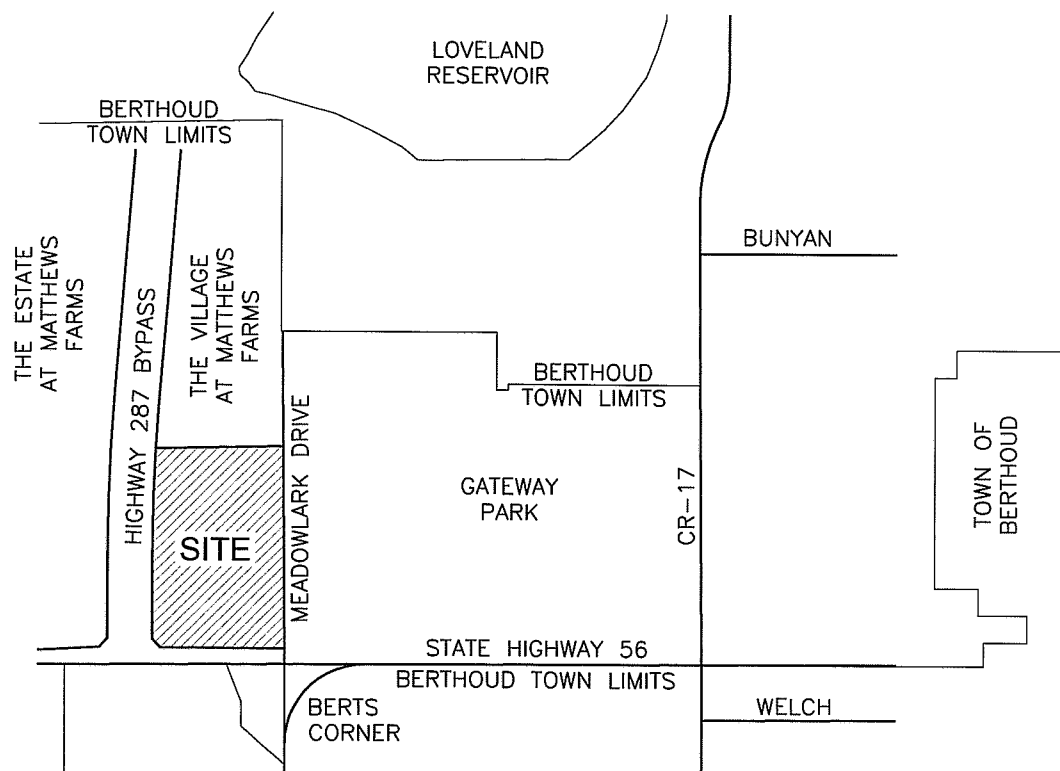
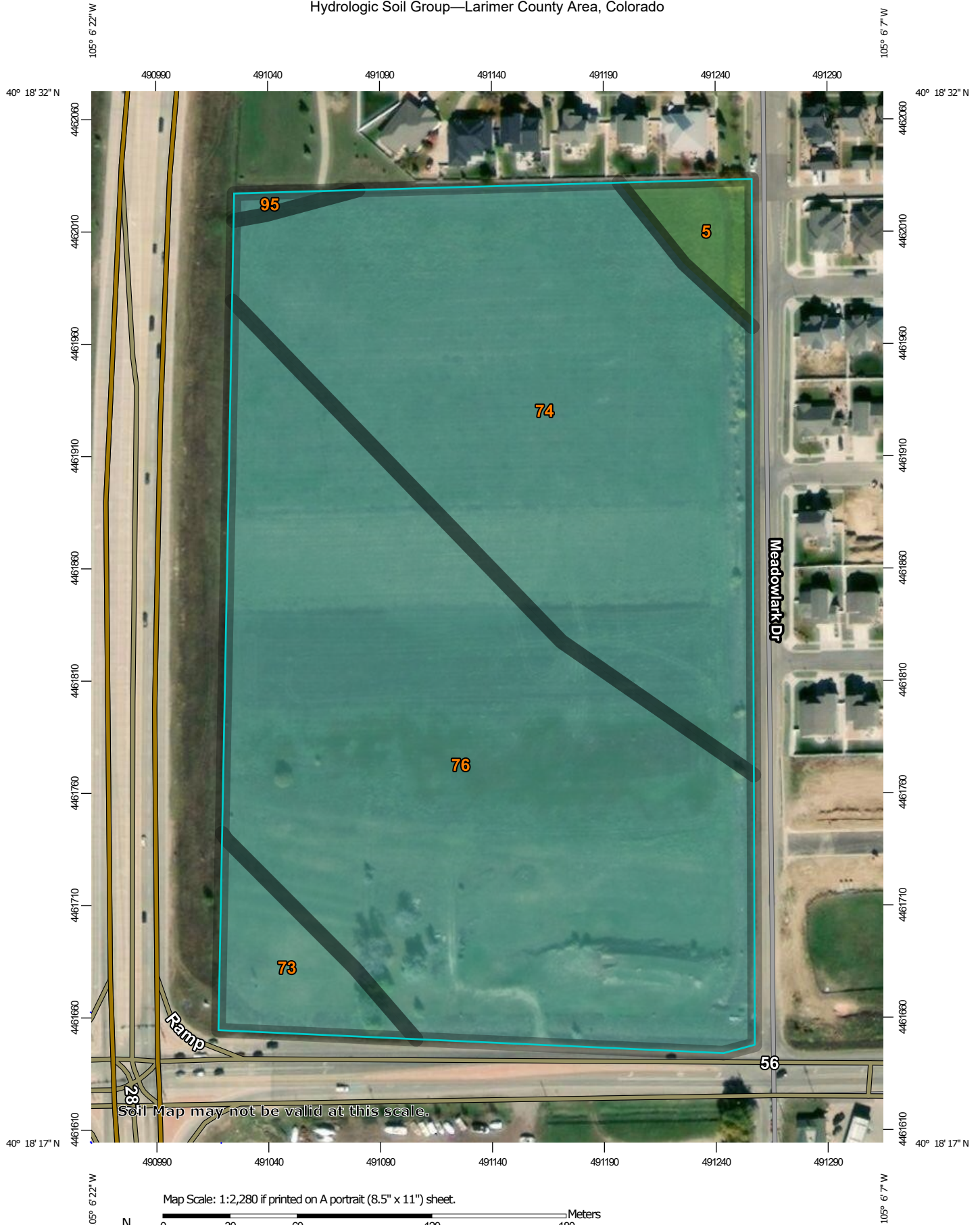


FIGURE 1
VICINITY MAP
BERTHOUD SAFEWAY

Hydrologic Soil Group—Larimer County Area, Colorado



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Larimer County Area, Colorado
 Survey Area Data: Version 13, Sep 10, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 20, 2015—Oct 21, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
5	Aquepts, loamy	A/D	0.5	2.3%
73	Nunn clay loam, 0 to 1 percent slopes	C	1.0	4.4%
74	Nunn clay loam, 1 to 3 percent slopes	C	8.9	40.2%
76	Nunn clay loam, wet, 1 to 3 percent slopes	C	11.7	52.7%
95	Satanta loam, 1 to 3 percent slopes	C	0.1	0.4%
Totals for Area of Interest			22.3	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

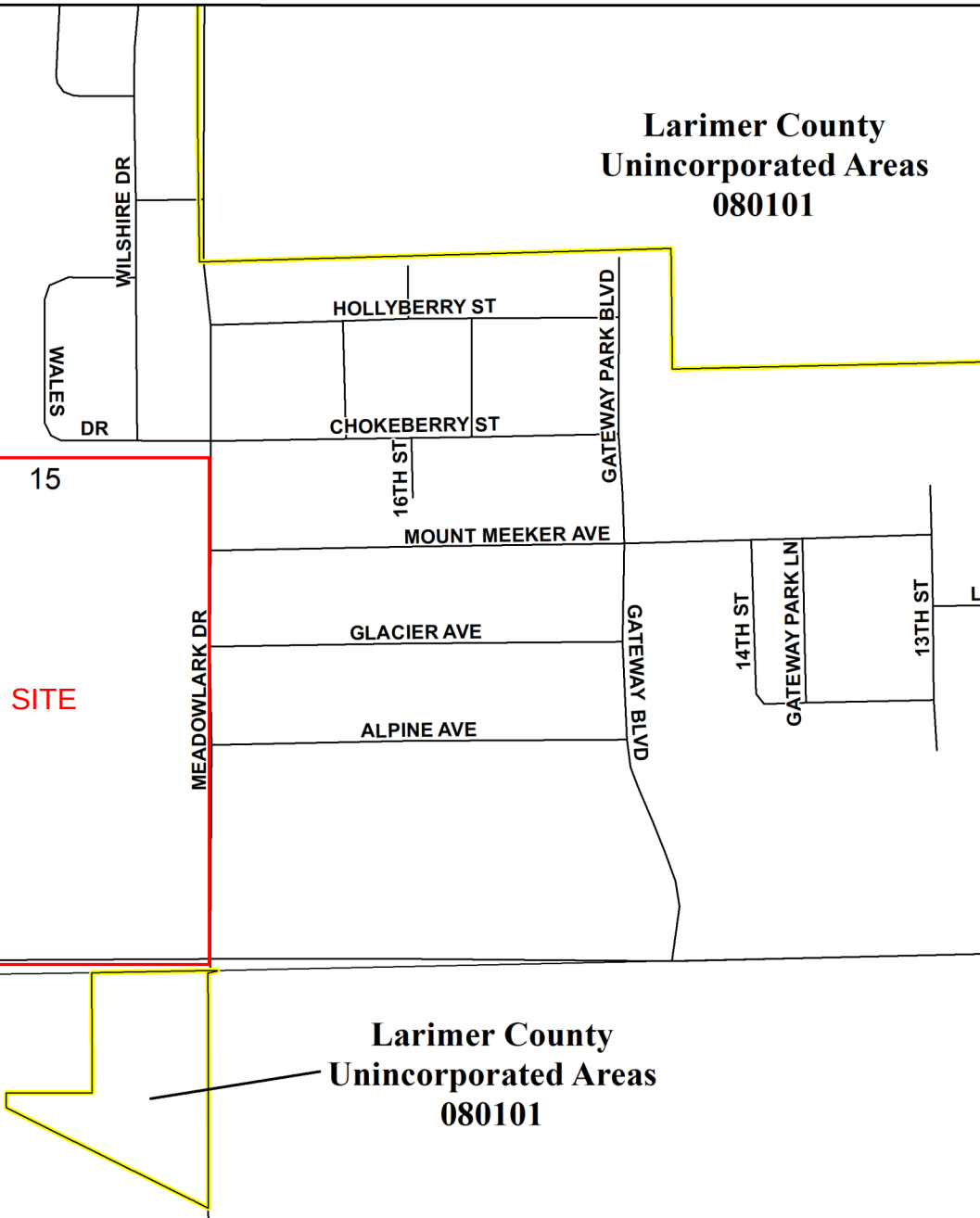
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

3110000 FT



Map Projection:
Universal Transverse Mercator (UTM) Zone 13N; No
Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet



NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

LARIMER COUNTY, COLORADO
and Incorporated Areas

PANEL 1386 OF 1420



Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
BERTHOUD, TOWN OF	080296	1386	H
LARIMER COUNTY	080101	1386	H

VERSION NUMBER
2.5.3.6

MAP NUMBER
08069C1386H

MAP REVISED
JANUARY 15, 2021

This is an official FIRMette showing a portion of the above-referenced flood map created from the MSC FIRMette Web tool. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For additional information about how to make sure the map is current, please see the Flood Hazard Mapping Updates Overview Fact Sheet available on the FEMA Flood Map Service Center home page at <https://msc.fema.gov>.

APPENDIX B

Hydrologic Calculations

**Runoff Coefficient and Percent Impervious Calculations
Time of Concentration and Drainage Basin Runoff Calculations**

Westside Crossing - Berthoud
Runoff Coefficient and Percent Impervious Calculation

				PV	Area 1 Land Use			LA	Area 2 Land Use			RO	Area 3 Land Use			APT	Area 4 Land Use			Basin Runoff Coefficient		
Basin / DP	Basin or DP Area (DP contributing basins)		Soil Type	% Imperv	Land Use Area	% Area	Comp Land Use % Imp	% Imperv	Land Use Area	% Area	Comp Land Use % Imp	% Imperv	Land Use Area	% Area	Comp Land Use % Imp	% Imperv	Land Use Area	% Area	Comp Land Use % Imp			
E1	300,118 sf	6.89ac	C	100%	0.00ac	0%	0%	2%	6.89ac	100%	2%	90%		0%	0%	75%		0%	0%	2.0%	0.15	0.49
E2	610,841 sf	14.02ac	C	100%	0.00ac	0%	0%	2%	14.02ac	100%	2%	90%		0%	0%	75%		0%	0%	2.0%	0.15	0.49
EOS1	51,297 sf	1.18ac	C	100%	0.47ac	40%	40%	2%	0.71ac	60%	1%	90%		0%	0%	75%		0%	0%	41.2%	0.44	0.65
OS1	66,703 sf	1.53ac	C	100%	1.12ac	73%	73%	2%	0.48ac	31%	1%	90%		0%	0%	75%		0%	0%	74.0%	0.68	0.79
OS2	19,218 sf	0.44ac	C	100%	0.30ac	67%	67%	2%	0.15ac	33%	1%	90%		0%	0%	75%		0%	0%	67.8%	0.63	0.76
OS3	19,581 sf	0.45ac	C	100%	0.35ac	79%	79%	2%	0.10ac	21%	0%	90%		0%	0%	75%		0%	0%	79.1%	0.72	0.81
OS4	26,658 sf	0.61ac	C	100%	0.38ac	62%	62%	2%	0.23ac	38%	1%	90%		0%	0%	75%		0%	0%	63.2%	0.60	0.74
EOS3		2.30ac	C	BASINS EOS3 & EOS4 RUNOFF VALUES ARE TAKEN FROM "THE ESTATES AT MATTHEWS FARM DRAINAGE REPORT"																16.0%	0.25	0.39
EOS4		0.17ac	C																	36.0%	0.40	0.63
OS10	16,023 sf	0.37ac	C	100%	0.33ac	89%	89%	2%	0.04ac	11%	0%	90%		0%	0%	75%		0%	0%	89.7%	0.80	0.85
A1	107,829 sf	2.48ac	C	100%	1.05ac	42%	42%	2%	0.94ac	38%	1%	90%	0.48ac	20%	18%	75%		0%	0%	60.8%	0.58	0.73
A2	26,799 sf	0.62ac	C	100%	0.36ac	58%	58%	2%	0.26ac	42%	1%	90%		0%	0%	75%		0%	0%	59.3%	0.57	0.73
A3	82,607 sf	1.90ac	C	100%	1.08ac	57%	57%	2%	0.44ac	23%	0%	90%	0.38ac	20%	18%	75%		0%	0%	75.2%	0.69	0.79
A4	71,932 sf	1.65ac	C	100%	1.08ac	65%	65%	2%	0.57ac	35%	1%	90%		0%	0%	75%		0%	0%	66.1%	0.62	0.75
A5	65,453 sf	1.50ac	C	100%	1.30ac	87%	87%	2%	0.20ac	13%	0%	90%		0%	0%	75%		0%	0%	86.8%	0.77	0.84
A6	46,198 sf	1.06ac	C	100%	0.56ac	52%	52%	2%	0.34ac	32%	1%	90%	0.16ac	15%	14%	75%		0%	0%	66.9%	0.63	0.76
B1	48,023 sf	1.10ac	C	100%	0.00ac	0%	0%	2%		0%	0%	90%	1.10ac	100%	90%	75%		0%	0%	90.0%	0.80	0.85
B2	57,708 sf	1.32ac	C	100%	0.77ac	58%	58%	2%	0.26ac	20%	0%	90%	0.29ac	22%	20%	75%		0%	0%	78.7%	0.71	0.81
B3	40,454 sf	0.93ac	C	100%	0.36ac	39%	39%	2%	0.25ac	27%	1%	90%		0%	0%	75%	0.31ac	33%	25%	64.7%	0.61	0.75
B4	61,360 sf	1.41ac	C	100%	0.69ac	49%	49%	2%	0.34ac	24%	0%	90%		0%	0%	75%	0.38ac	27%	20%	69.3%	0.64	0.77
B5	38,708 sf	0.89ac	C	100%	0.36ac	41%	41%	2%	0.53ac	60%	1%	90%		0%	0%	75%		0%	0%	41.7%	0.44	0.65
C	231,389 sf	5.31ac	C	100%	1.35ac	25%	25%	2%	0.66ac	12%	0%	90%		0%	0%	75%	3.30ac	62%	47%	72.3%	0.67	0.78
D	28,253 sf	0.65ac	C	100%	0.16ac	25%	25%	2%		0%	0%	90%		0%	0%	75%	0.49ac	75%	56%	81.2%	0.73	0.82
DP 4	A1-A6	9.20ac	C	100%	5.43ac	59%	59%	2%	2.75ac	30%	1%	90%	1.02ac	11%	10%	75%	0.00ac	0%	0%	69.6%	0.65	0.77
DP 11	B1-B5	5.65ac	C	100%	2.18ac	39%	39%	2%	1.38ac	24%	0%	90%	1.39ac	25%	22%	75%	0.69ac	12%	9%	70.4%	0.65	0.77

Basin Runoff Coefficient is based on Table 600-2, Berthoud Engineering and Infrastructure Standards

Runoff Coefficients and Percents Impervious (USDCM Table 6-3)

Hydrologic Soil Type:	C	Runoff Coef Calc Method							%Imp
Land Use	Abb	%	C ₂	C ₅	C ₁₀	C ₂₅	C ₅₀	C ₁₀₀	
Multi-Family (detached)	APT	75%	0.60	0.65	0.69	0.74	0.76	0.79	Weighted
Business: Neighborhood	BS	85%	0.69	0.73	0.76	0.80	0.81	0.83	%Imp
Drives and Walks	DR	90%	0.74	0.77	0.80	0.82	0.83	0.85	A
Streets - Gravel (Packed)	GR	40%	0.30	0.36	0.43	0.54	0.59	0.65	B
Historic Flow Analysis	HI	2%	0.01	0.05	0.15	0.33	0.40	0.49	C
Lawns	LA	2%	0.01	0.05	0.15	0.33	0.40	0.49	D
Off-site flow-Undeveloped	OF	45%	0.34	0.40	0.47	0.57	0.61	0.67	
Streets - Paved	PV	100%	0.83	0.86	0.87	0.88	0.88	0.89	
Roofs	RO	90%	0.74	0.77	0.80	0.82	0.83	0.85	
User Input 1	US1	80%	0.65	0.69	0.72	0.77	0.79	0.81	

Equations (% Impervious Calculation-USDCM Table 6-4):

$$\begin{aligned}
 C_A (2\text{yr}) &= 0.84i^{1.302} & C_A (50\text{yr}) &= 0.85i + 0.025 \\
 C_B (2\text{yr}) &= 0.84i^{1.169} & C_B (50\text{yr}) &= 0.56i + 0.328 \\
 C_{CD} (2\text{yr}) &= 0.83i^{1.122} & C_{CD} (50\text{yr}) &= 0.49i + 0.393 \\
 C_A (5\text{yr}) &= 0.86i^{1.276} & C_A (100\text{yr}) &= 0.78i + 0.110 \\
 C_B (5\text{yr}) &= 0.86i^{1.088} & C_B (100\text{yr}) &= 0.47i + 0.426 \\
 C_{CD} (5\text{yr}) &= 0.82i + 0.035 & C_{CD} (100\text{yr}) &= 0.41i + 0.484 \\
 C_A (10\text{yr}) &= 0.87i^{1.232} & i &= \% \text{ imperviousness as a decimal} \\
 C_B (10\text{yr}) &= 0.81i + 0.057 & C_A &= \text{Runoff coefficient for NRCS Type A Soils} \\
 C_{CD} (10\text{yr}) &= 0.74i + 0.132 & C_B &= \text{Runoff coefficient for NRCS Type B Soils} \\
 C_A (25\text{yr}) &= 0.84i^{1.124} & C_{CD} &= \text{Runoff coefficient for NRCS Type C and D Soils} \\
 C_B (25\text{yr}) &= 0.63i + 0.249 \\
 C_{CD} (25\text{yr}) &= 0.56i + 0.319
 \end{aligned}$$

Westside Crossing - Berthoud
Time of Concentration Calculation

Sub-Basin Data					Time of Concentration Estimate										t _c (1st DP in Urban Catchments)		Final t _c
Basin / Design Point	Contributing Basins	Area	C ₅	i	Initial/Overland Time (t _i)			Travel Time (t _t)					Comp.	Chan. Flow	t _c (1st DP)		
					Length	Slope	t _i	Length	Slope	Land Type	K	Velocity	t _t			t _c	
E1		6.89ac	0.05	2.0%	25lf	43.0%	2.7 min.	1101lf	0.7%	SP	7	0.6 ft/sec	31.3 min.	34.1 min.	1101lf	49.3 min.	34.1 min.
E2		14.02ac	0.05	2.0%	405lf	1.1%	37.4 min.	832lf	1.0%	SP	7	0.7 ft/sec	19.8 min.	57.2 min.	832lf	40.6 min.	40.6 min.
EOS1		1.18ac	0.37	41.2%	56lf	10.8%	4.5 min.	377lf	0.2%	SP	7	0.3 ft/sec	20.1 min.	24.6 min.	377lf	28.5 min.	24.6 min.
OS1		1.53ac	0.64	74.0%	29lf	2.0%	3.6 min.	1079lf	0.5%	PV	20	1.4 ft/sec	12.7 min.	16.3 min.	1079lf	26.6 min.	16.3 min.
OS2		0.44ac	0.59	67.8%	30lf	2.0%	4.1 min.	340lf	0.8%	PV	20	1.8 ft/sec	3.2 min.	7.2 min.	340lf	17.9 min.	7.2 min.
OS3		0.45ac	0.68	79.1%	60lf	2.0%	4.7 min.	270lf	2.0%	PV	20	2.8 ft/sec	1.6 min.	6.3 min.	270lf	14.1 min.	6.3 min.
OS4		0.61ac	0.55	63.2%	80lf	2.0%	7.1 min.	350lf	1.3%	GW	15	1.7 ft/sec	3.4 min.	10.5 min.	350lf	18.1 min.	10.5 min.
EOS3		2.30ac	BASINS EOS3 & EOS4 RUNOFF VALUES ARE TAKEN FROM 'THE ESTATES AT MATTHEWS FARM DRAINAGE REPORT'														12.6 min.
EOS4		0.17ac															7.3 min.
OS10		0.37ac	0.77	89.7%	80lf	1.0%	5.4 min.	130lf	0.5%	PV	20	1.4 ft/sec	1.5 min.	6.9 min.	130lf	12.2 min.	6.9 min.
A1		2.48ac	0.53	60.8%	100lf	1.2%	9.8 min.	410lf	1.5%	PV	20	2.4 ft/sec	2.8 min.	12.5 min.	410lf	18.8 min.	12.5 min.
A2		0.62ac	0.52	59.3%	60lf	1.2%	7.7 min.	390lf	1.5%	PV	20	2.4 ft/sec	2.7 min.	10.4 min.	390lf	19.0 min.	10.4 min.
A3		1.90ac	0.65	75.2%	80lf	1.2%	6.9 min.	200lf	1.5%	PV	20	2.4 ft/sec	1.4 min.	8.3 min.	200lf	14.6 min.	8.3 min.
A4		1.65ac	0.58	66.1%	80lf	1.2%	8.1 min.	230lf	1.5%	PV	20	2.4 ft/sec	1.6 min.	9.6 min.	230lf	16.5 min.	9.6 min.
A5		1.50ac	0.75	86.8%	70lf	1.2%	5.1 min.	280lf	1.5%	PV	20	2.4 ft/sec	1.9 min.	7.0 min.	280lf	13.0 min.	7.0 min.
A6		1.06ac	0.58	66.9%	90lf	1.2%	8.4 min.	220lf	1.5%	PV	20	2.4 ft/sec	1.5 min.	9.9 min.	220lf	16.3 min.	9.9 min.
B1		1.10ac	0.77	90.0%	50lf	0.5%	5.3 min.	200lf	1.0%	PV	20	1.9 ft/sec	1.7 min.	7.0 min.	200lf	12.3 min.	7.0 min.
B2		1.32ac	0.68	78.7%	50lf	2.0%	4.3 min.	270lf	1.5%	PV	20	2.4 ft/sec	1.8 min.	6.2 min.	270lf	14.5 min.	6.2 min.
B3		0.93ac	0.57	64.7%	100lf	2.5%	7.2 min.	290lf	1.3%	PV	20	2.3 ft/sec	2.1 min.	9.3 min.	290lf	17.4 min.	9.3 min.
B4		1.41ac	0.60	69.3%	70lf	2.0%	6.0 min.	370lf	1.5%	PV	20	2.4 ft/sec	2.5 min.	8.6 min.	370lf	16.9 min.	8.6 min.
B5	0.89ac	0.38	41.7%	70lf	1.0%	11.1 min.	280lf	1.5%	PV	20	2.4 ft/sec	1.9 min.	13.0 min.	280lf	21.5 min.	13.0 min.	
C		5.31ac	0.63	72.3%	80lf	2.0%	6.1 min.	780lf	1.0%	NBG	10	1.0 ft/sec	13.3 min.	19.5 min.	780lf	20.7 min.	19.5 min.
D		0.65ac	0.70	81.2%	90lf	3.0%	4.8 min.	700lf	1.1%	NBG	10	1.0 ft/sec	11.1 min.	15.9 min.	700lf	17.6 min.	15.9 min.

Equations:

$$t_i (\text{Overland}) = 0.395(1.1 - C_5)L^{0.5} S^{-0.333} \text{ (USDCM Eqn 6-3)}$$

C₅ = Runoff coefficient for 5-year

L = Length of overland flow (ft)

S = Average slope of overland flow path (ft/ft)

$$t_c (1st DP) = (26 - 17i) + L_t / (60 (14i + 9)S^{0.5}) \text{ (USDCM Eqn 6-5)}$$

t_c (1st DP) = First DP Time of Concentration in urban catchments

L_t = Length of Channelized Flow Path

i = imperviousness (expressed as a decimal)

$$t_t = L_t / 60KS^{0.5} \text{ (USDCM Eqn 6-4)}$$

t_t = Channelized flow time (travel time)(min.)

L_t = Waterway length (ft)

K = Conveyance Factor (see Table 6-2)

S = Watercourse slope (ft/ft)

Table 6-2

Type of Land Surface	Land Type	K
Grassed Waterway	GW	15
Heavy Meadow	HM	2.5
Nearly Bare Ground	NBG	10
Paved Area	PV	20
Riprap (Not Buried)	RR	6.5
Short Pasture/Lawns	SP	7
Tillage/Fields	TF	5

Westside Crossing - Berthoud
Runoff Calculation

Design Storm: 10 Year

Basin ID/ Design Point	Direct Runoff							Total Runoff				Street/Chan		Pipe			Travel Time			Remarks
	Area Designation	Area	C	T _c	C*A (acre)	i (in/hr)	Q	T _c	Sum C*A	i (in/hr)	Q	Slope	Q	Q	Slope	Pipe Size	L (ft)	Vel (ft/s)	T _t	
E1	E1	6.89 ac	0.15	34.1min	1.01	2.0	2.0 cfs			---	---								---	
E2	E2	14.02 ac	0.15	40.6min	2.06	1.8	3.7 cfs													
EOS1	EOS1	1.18 ac	0.44	24.6min	0.51	2.4	1.2 cfs													
OS1	OS1	1.53 ac	0.68	16.3min	1.04	3.0	3.1 cfs													
OS2	OS2	0.44 ac	0.63	7.2min	0.28	4.2	1.2 cfs													
OS3	OS3	0.45 ac	0.72	6.3min	0.32	4.4	1.4 cfs													
OS4	OS4	0.61 ac	0.60	10.5min	0.37	3.6	1.3 cfs													
EOS3	EOS3	2.30 ac	0.25	12.6min	0.58	3.4	1.9 cfs					1.0%	3.9cfs				620'	4.4	2.3min	To DP20/EX1
EOS4	EOS4	0.17 ac	0.40	7.3min	0.07	4.2	0.3 cfs													
OS10	OS10	0.37 ac	0.80	6.9min	0.29	4.2	1.2 cfs													
Ex. Village at Matthews Farm Detention Basin Outfall (M):							8.0 cfs													
Ex. 30" Culvert under HWY 287 (C):							15.0 cfs					1.0%	15.0cfs				730'	5.5	2.2min	To DP20/EX1
Ex. Tri-Corner Holdings Irrig 24" Culvert under HWY 287 (I):							6.2 cfs													
EX2	EOS3, EOS4 add M+C+I	2.47 ac						14.9min	0.64	3.1	2.0 cfs	0.2%	35.8cfs				1180'	5.8	3.4min	To EX2
											31.2 cfs									
EX1	DP EX1, EOS1, E1, E2 add M+C+I	16.49 ac						18.3min	4.23	2.8	11.9 cfs									
											41.1 cfs									
A1	A1	2.48 ac	0.58	12.5min	1.44	3.4	4.9 cfs			---	---									
A2	A2	0.62 ac	0.57	10.4min	0.35	3.7	1.3 cfs			---	---									
A3	A3	1.90 ac	0.69	8.3min	1.31	4.0	5.2 cfs			---	---			5.2cfs	0.5%	18-in	430'	4.2	1.7min	To DP1
A4	A4	1.65 ac	0.62	9.6min	1.03	3.8	3.9 cfs			---	---									
A5	A5	1.50 ac	0.77	7.0min	1.16	4.2	4.9 cfs			---	---									
A6	A6	1.06 ac	0.63	9.9min	0.67	3.7	2.5 cfs			---	---			2.5cfs	0.5%	18-in	220'	4.2	0.9min	To DP2
B1	B1	1.10 ac	0.80	7.0min	0.88	4.2	3.7 cfs			---	---									
B2	B2	1.32 ac	0.71	6.2min	0.95	4.4	4.1 cfs			---	---									
B3	B3	0.93 ac	0.61	9.3min	0.57	3.8	2.2 cfs			---	---									
B4	B4	1.41 ac	0.64	8.6min	0.91	3.9	3.6 cfs			---	---			3.6cfs	0.5%	18-in	60'	4.2	0.2min	To DP10
B5	B5	0.89 ac	0.44	13.0min	0.39	3.3	1.3 cfs			---	---									
C	C	5.31 ac	0.67	19.5min	3.54	2.7	9.7 cfs			---	---									
D	D	0.65 ac	0.73	15.9min	0.48	3.0	1.4 cfs			---	---									
Detention Basin A Release Rate:							1.3 cfs													
Detention Basin B Release Rate:							0.9 cfs													
Detention Basin C Release Rate:							0.3 cfs													

Westside Crossing - Berthoud

Runoff Calculation

Design Storm: 10 Year

Basin ID/ Design Point	Direct Runoff							Total Runoff				Street/Chan		Pipe			Travel Time			Remarks
	Area Designation	Area	C	T _c	C*A (acre)	i (in/hr)	Q	T _c	Sum C*A	i (in/hr)	Q	Slope	Q	Q	Slope	Pipe Size	L (ft)	Vel (ft/s)	T _t	
1	A1-A3	4.99 ac						10.0min	3.10	3.7	11.5 cfs									
2	A5+A6	2.56 ac						10.8min	1.83	3.6	6.6 cfs			6.6cfs	0.5%	24-in	210'	5.1	0.7min	To DP3
3	DP2+A4	4.21 ac						11.5min	2.85	3.5	10.0 cfs	0.5%	10.0cfs				370'	3	2.1min	To DP4
4	DP3 +DP1	9.20 ac						13.5min	5.95	3.3	19.4 cfs									
10	B1+B2+B4	3.84 ac						8.8min	2.73	3.9	10.6 cfs	0.5%	10.6cfs	10.6cfs	0.5%	24-in	560'	5.1	1.8min	To DP6
11	DP10+B3+B5	5.65 ac						10.6min	3.30	3.6	11.9 cfs									
20	EOS3,EOS4,D	3.12 ac						15.9min	1.12	3.0	3.4 cfs									
	add M + C + I										32.6 cfs			32.6cfs	0.5%	36-in	310'	6.7	0.8min	To DP21
21	DP20							16.7min	1.12	3.0	3.3 cfs									
	add M+C+I+Detention C										32.8 cfs			32.8cfs	0.5%	36-in	390'	6.7	1.0min	To DP22
22	DP21							17.7min	1.12	2.9	3.2 cfs									
	add M+C+I+Detention C+Detention B										33.6 cfs			33.6cfs	0.5%	36-in	400'	6.7	1.0min	To DP23
23	DP22+OS1							18.7min	2.16	2.8	6.0 cfs									
	add M+C+I+Detention C+Detention B+Detention A										37.7 cfs			37.7cfs	0.5%	36-in	215'	6.7	0.5min	To DP24
24	DP23+OS2							19.2min	2.44	2.8	6.7 cfs									
	add M+C+I+Detention C+Detention B+Detention A										38.4 cfs									

Equations (UDFCD):

$$i_x = A * P1 / (B + T_c)^C \text{ [IDF Formula]}$$

A=28.5, B=10.00, C=0.786 for all return periods

P1=One-hour point rainfall depth (in.)

P1 from Figure RA-3: Rainfall Intensity-Duration Curve for Area II, Larimer County SDCM

P1	Inches
10 yr	1.37 in

$$Q = CiA$$

Q = Peak Runoff Rate (cubic feet/second)

C = Runoff coef representing a ration of peak runoff rate to ave rainfall intensity for a duration equal to the runoff time of concentration.

i = average rainfall intensity in inches per hour

A = Drainage area in acres

Westside Crossing - Berthoud
Runoff Calculation

Design Storm: 100 Year

Basin ID/ Design Point	Direct Runoff							Total Runoff				Street/Chan		Pipe			Travel Time			Remarks
	Area Designation	Area	C	T _c	C*A (acre)	i (in/hr)	Q	T _c	Sum C*A	i (in/hr)	Q	Slope	Q	Q	Slope	Pipe Size	L (ft)	Vel (ft/s)	T _t	
E1	E1	6.89 ac	0.49	34.1min	3.39	4.2	14.1 cfs			---	---								---	
E2	E2	14.02 ac	0.49	40.6min	6.90	3.7	25.8 cfs													
EOS1	EOS1	1.18 ac	0.65	24.6min	0.77	5.0	3.9 cfs													
OS1	OS1	1.53 ac	0.79	16.3min	1.21	6.3	7.5 cfs													
OS2	OS2	0.44 ac	0.76	7.2min	0.34	8.7	2.9 cfs													
OS3	OS3	0.45 ac	0.81	6.3min	0.36	9.1	3.3 cfs													
OS4	OS4	0.61 ac	0.74	10.5min	0.45	7.6	3.5 cfs													
EOS3	EOS3	2.30 ac	0.39	12.6min	0.90	6.6	5.9 cfs					1.0%	3.9cfs				620'	4.4	2.3min	To DP20/EX1
EOS4	EOS4	0.17 ac	0.63	7.3min	0.11	8.3	0.9 cfs													
OS10	OS10	0.37 ac	0.85	6.9min	0.31	9.3	2.9 cfs													
Ex. Village at Matthews Farm Detention Basin Outfall (M):							13.5 cfs													
Ex. 30" Culvert under HWY 287 (C):							31.0 cfs					1.0%	15.0cfs				730'	5.5	2.2min	To DP20/EX1
Ex. Tri-Corner Holdings Irrig 24" Culvert under HWY 287 (I):							6.2 cfs													
EX2	EOS3, EOS4 add M+C+I	2.47 ac						14.9min	1.00	6.5	6.6 cfs									
EX1	DP EX1, EOS1, E1, E2 add M+C+I	16.49 ac						18.3min	12.07	5.9	57.3 cfs	0.2%	35.8cfs				1180'	5.8	3.4min	To EX2
											71.2 cfs									
											121.9 cfs									
A1	A1	2.48 ac	0.73	12.5min	1.82	7.1	12.8 cfs			---	---									
A2	A2	0.62 ac	0.73	10.4min	0.45	7.7	3.4 cfs			---	---									
A3	A3	1.90 ac	0.79	8.3min	1.50	8.3	12.5 cfs			---	---			12.5cfs	0.3%	18-in	430'	4.2	1.7min	To DP1
A4	A4	1.65 ac	0.75	9.6min	1.25	7.9	9.8 cfs			---	---									
A5	A5	1.50 ac	0.84	7.0min	1.26	8.8	11.1 cfs			---	---									
A6	A6	1.06 ac	0.76	9.9min	0.80	7.8	6.3 cfs			---	---			6.3cfs	0.3%	18-in	220'	4.2	0.9min	To DP2
B1	B1	1.10 ac	0.85	7.0min	0.94	8.8	8.3 cfs			---	---									
B2	B2	1.32 ac	0.81	6.2min	1.07	9.2	9.8 cfs			---	---									
B3	B3	0.93 ac	0.75	9.3min	0.70	8.0	5.5 cfs			---	---									
B4	B4	1.41 ac	0.77	8.6min	1.08	8.2	8.9 cfs			---	---			8.9cfs	0.3%	18-in	60'	4.2	0.2min	To DP10
B5	B5	0.89 ac	0.65	13.0min	0.58	7.0	4.1 cfs			---	---									
C	C	5.31 ac	0.78	19.5min	4.15	5.7	23.7 cfs			---	---									
D	D	0.65 ac	0.82	15.9min	0.53	6.3	3.4 cfs			---	---									
Detention Basin A Release Rate:							14.0 cfs													
Detention Basin B Release Rate:							6.9 cfs													
Detention Basin C Release Rate:							8.0 cfs													

Westside Crossing - Berthoud

Runoff Calculation

Design Storm: 100 Year

Basin ID/ Design Point	Direct Runoff							Total Runoff				Street/Chan		Pipe			Travel Time			Remarks
	Area Designation	Area	C	T _c	C*A (acre)	i (in/hr)	Q	T _c	Sum C*A	i (in/hr)	Q	Slope	Q	Q	Slope	Pipe Size	L (ft)	Vel (ft/s)	T _t	
1	A1-A3	4.99 ac						10.0min	3.77	7.8	29.3 cfs									
2	A5+A6	2.56 ac						10.8min	2.07	7.5	15.6 cfs			15.6cfs	0.3%	24-in	210'	5.1	0.7min	To DP3
3	DP2+A4	4.21 ac						11.5min	3.31	7.3	24.3 cfs	0.5%	24.3cfs				370'	3	2.1min	To DP4
4	DP3 +DP1	9.20 ac						13.5min	7.08	6.8	48.3 cfs									
10	B1+B2+B4	3.84 ac						8.8min	3.09	8.2	25.2 cfs	0.5%	25.2cfs	25.2cfs	0.3%	24-in	560'	5.1	1.8min	To DP6
11	DP10+B3+B5	5.65 ac						10.6min	3.79	7.6	28.7 cfs									
20	EOS3,EOS4,D	3.12 ac						15.9min	1.53	6.3	9.7 cfs									
	add M + C + I										60.4 cfs			60.4cfs	0.3%	36-in	310'	6.7	0.8min	To DP21
21	DP20							16.7min	1.53	6.2	9.5 cfs									
	add M+C+I+Detention C										68.2 cfs			68.2cfs	0.3%	36-in	390'	6.7	1.0min	To DP22
22	DP21							17.7min	1.53	6.0	9.2 cfs									
	add M+C+I+Detention C+Detention B										74.8 cfs			74.8cfs	0.3%	36-in	400'	6.7	1.0min	To DP23
23	DP22+OS1							18.7min	2.74	5.9	16.0 cfs									
	add M+C+I+Detention C+Detention B+Detention A										95.6 cfs			95.6cfs	0.3%	36-in	215'	6.7	0.5min	To DP24
24	DP23+OS2							19.2min	3.08	5.8	17.7 cfs									
	add M+C+I+Detention C+Detention B+Detention A										97.3 cfs									

Equations (UDFCD):

$$i_x = A * P1 / (B + T_c)^C \text{ [IDF Formula]}$$

A=28.5, B=10.00, C=0.786 for all return periods

P1=One-hour point rainfall depth (in.)

P1 from Figure RA-3: Rainfall Intensity-Duration Curve for Area II, Larimer County SDCM

P1	Inches
100 yr	2.87 in

$$Q = CiA$$

Q = Peak Runoff Rate (cubic feet/second)

C = Runoff coef representing a ration of peak runoff rate to ave rainfall intensity for a duration equal to the runoff time of concentration.

i = average rainfall intensity in inches per hour

A = Drainage area in acres

APPENDIX B.1
Supporting Hydrologic Tables and Figures



NOAA Atlas 14, Volume 8, Version 2
Location name: Berthoud, Colorado, USA*
Latitude: 40.3064°, Longitude: -105.1039°
Elevation: 5076.98 ft**
* source: ESRI Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.233 (0.183-0.299)	0.276 (0.216-0.354)	0.369 (0.288-0.475)	0.467 (0.363-0.605)	0.635 (0.492-0.897)	0.789 (0.589-1.12)	0.965 (0.693-1.40)	1.17 (0.801-1.74)	1.47 (0.965-2.24)	1.72 (1.09-2.63)
10-min	0.341 (0.268-0.437)	0.404 (0.317-0.519)	0.540 (0.422-0.696)	0.684 (0.532-0.887)	0.929 (0.720-1.31)	1.16 (0.862-1.64)	1.41 (1.01-2.05)	1.71 (1.17-2.55)	2.15 (1.41-3.29)	2.52 (1.59-3.84)
15-min	0.415 (0.326-0.533)	0.492 (0.386-0.633)	0.658 (0.515-0.849)	0.834 (0.649-1.08)	1.13 (0.878-1.60)	1.41 (1.05-2.00)	1.72 (1.24-2.50)	2.08 (1.43-3.10)	2.62 (1.72-4.01)	3.07 (1.94-4.69)
30-min	0.553 (0.434-0.710)	0.656 (0.515-0.843)	0.878 (0.687-1.13)	1.11 (0.865-1.44)	1.51 (1.17-2.13)	1.88 (1.40-2.66)	2.29 (1.65-3.32)	2.77 (1.90-4.12)	3.48 (2.29-5.32)	4.08 (2.58-6.22)
60-min	0.684 (0.538-0.879)	0.809 (0.635-1.04)	1.08 (0.846-1.39)	1.37 (1.07-1.78)	1.87 (1.45-2.65)	2.34 (1.75-3.31)	2.87 (2.06-4.16)	3.47 (2.38-5.18)	4.38 (2.88-6.70)	5.14 (3.26-7.85)
2-hr	0.816 (0.646-1.04)	0.961 (0.761-1.22)	1.29 (1.01-1.64)	1.64 (1.28-2.10)	2.24 (1.75-3.14)	2.80 (2.11-3.93)	3.44 (2.49-4.95)	4.17 (2.90-6.17)	5.28 (3.51-8.00)	6.21 (3.97-9.38)
3-hr	0.900 (0.716-1.14)	1.06 (0.839-1.34)	1.41 (1.11-1.79)	1.79 (1.41-2.28)	2.45 (1.93-3.42)	3.06 (2.32-4.28)	3.76 (2.75-5.38)	4.57 (3.19-6.71)	5.79 (3.87-8.71)	6.81 (4.38-10.2)
6-hr	1.08 (0.863-1.35)	1.26 (1.01-1.58)	1.66 (1.33-2.09)	2.09 (1.66-2.64)	2.83 (2.24-3.89)	3.51 (2.68-4.83)	4.28 (3.15-6.04)	5.17 (3.64-7.49)	6.49 (4.38-9.65)	7.61 (4.95-11.3)
12-hr	1.29 (1.04-1.59)	1.53 (1.24-1.90)	2.02 (1.63-2.51)	2.50 (2.00-3.13)	3.28 (2.59-4.40)	3.97 (3.04-5.36)	4.74 (3.50-6.56)	5.60 (3.96-7.97)	6.86 (4.66-10.0)	7.91 (5.19-11.6)
24-hr	1.56 (1.27-1.92)	1.84 (1.50-2.26)	2.37 (1.93-2.92)	2.89 (2.33-3.57)	3.69 (2.93-4.87)	4.40 (3.39-5.85)	5.18 (3.85-7.06)	6.04 (4.31-8.48)	7.29 (5.00-10.5)	8.32 (5.52-12.1)
2-day	1.82 (1.50-2.21)	2.14 (1.76-2.60)	2.72 (2.23-3.32)	3.27 (2.66-4.00)	4.11 (3.28-5.32)	4.83 (3.75-6.32)	5.61 (4.21-7.54)	6.47 (4.66-8.95)	7.70 (5.33-11.0)	8.71 (5.84-12.5)
3-day	1.97 (1.63-2.38)	2.30 (1.90-2.78)	2.90 (2.38-3.51)	3.46 (2.83-4.21)	4.31 (3.46-5.55)	5.04 (3.94-6.56)	5.84 (4.40-7.79)	6.70 (4.85-9.21)	7.95 (5.54-11.2)	8.96 (6.05-12.8)
4-day	2.09 (1.73-2.51)	2.43 (2.01-2.92)	3.05 (2.52-3.68)	3.62 (2.97-4.39)	4.49 (3.61-5.74)	5.23 (4.10-6.76)	6.03 (4.57-8.00)	6.90 (5.02-9.43)	8.14 (5.70-11.5)	9.15 (6.21-13.0)
7-day	2.35 (1.96-2.80)	2.76 (2.30-3.29)	3.48 (2.89-4.16)	4.11 (3.40-4.94)	5.04 (4.06-6.33)	5.80 (4.56-7.39)	6.60 (5.02-8.63)	7.45 (5.45-10.0)	8.64 (6.08-12.0)	9.59 (6.56-13.5)
10-day	2.59 (2.17-3.06)	3.05 (2.55-3.61)	3.83 (3.19-4.55)	4.50 (3.73-5.37)	5.46 (4.41-6.80)	6.24 (4.92-7.87)	7.04 (5.37-9.12)	7.88 (5.78-10.5)	9.03 (6.38-12.4)	9.93 (6.84-13.9)
20-day	3.31 (2.80-3.87)	3.83 (3.23-4.49)	4.69 (3.95-5.51)	5.42 (4.54-6.40)	6.44 (5.23-7.89)	7.25 (5.76-9.01)	8.07 (6.21-10.3)	8.91 (6.59-11.7)	10.0 (7.17-13.6)	10.9 (7.60-15.1)
30-day	3.90 (3.31-4.54)	4.48 (3.80-5.22)	5.43 (4.59-6.34)	6.22 (5.24-7.30)	7.32 (5.97-8.88)	8.17 (6.53-10.1)	9.03 (6.99-11.4)	9.91 (7.37-12.9)	11.1 (7.95-14.9)	12.0 (8.38-16.4)
45-day	4.63 (3.95-5.35)	5.32 (4.54-6.16)	6.44 (5.48-7.48)	7.36 (6.23-8.59)	8.61 (7.04-10.3)	9.56 (7.66-11.7)	10.5 (8.15-13.2)	11.4 (8.54-14.8)	12.6 (9.11-16.9)	13.5 (9.55-18.4)
60-day	5.22 (4.48-6.02)	6.06 (5.19-6.98)	7.38 (6.30-8.53)	8.44 (7.17-9.81)	9.86 (8.08-11.8)	10.9 (8.76-13.2)	11.9 (9.29-14.9)	12.9 (9.68-16.6)	14.2 (10.3-18.8)	15.1 (10.7-20.4)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

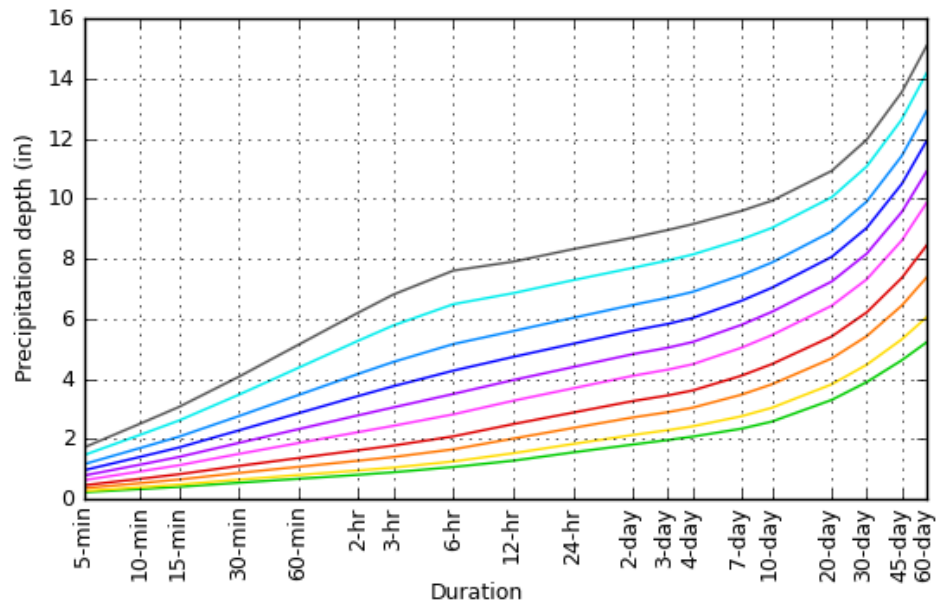
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

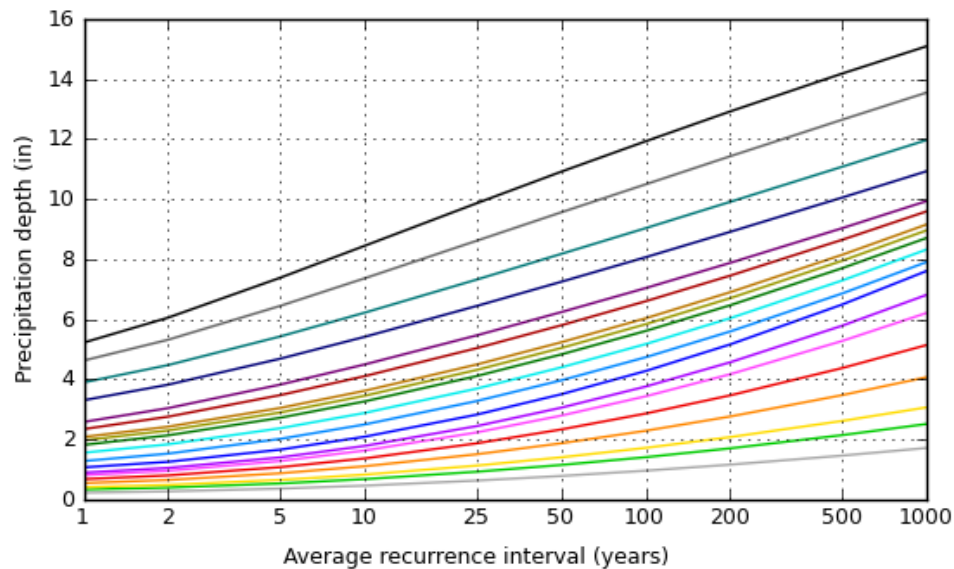
[Back to Top](#)

PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 40.3064°, Longitude: -105.1039°



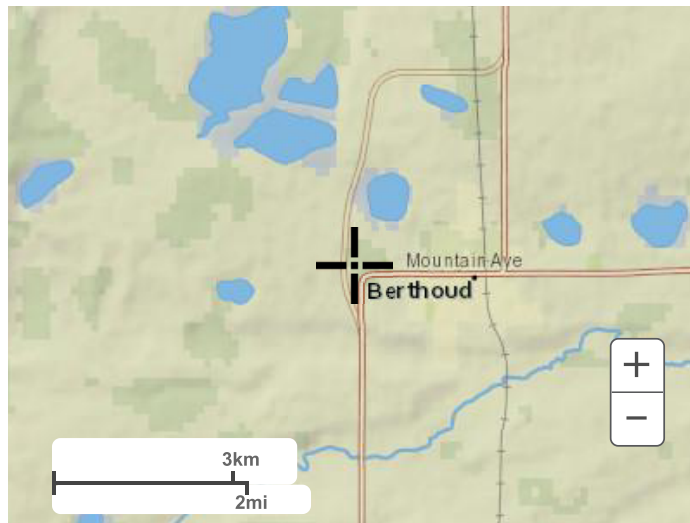
Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



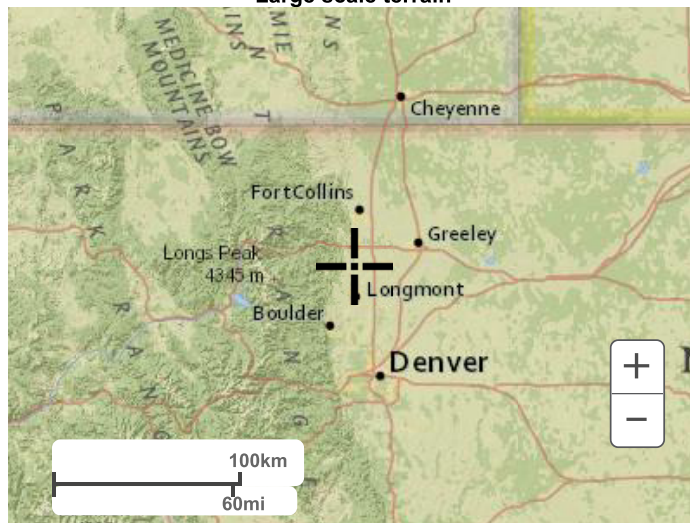
Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

Maps & aerials

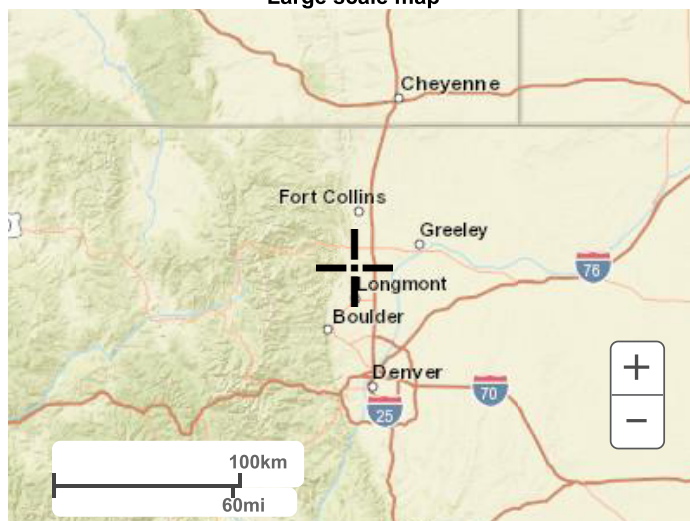
Small scale terrain



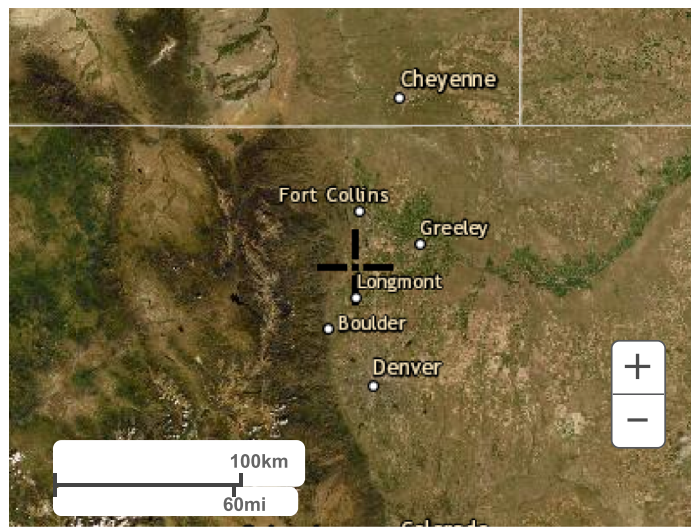
Large scale terrain



Large scale map



Large scale aerial



[Back to Top](#)

[US Department of Commerce](#)
[National Oceanic and Atmospheric Administration](#)
[National Weather Service](#)
[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

[Disclaimer](#)

APPENDIX C
Water Quality and Detention Calcs – Detention Basins A, B, & C

MHFD-Detention, Version 4.04 (February 2021)

Basin ID: Detention Basin A (Includes Underground Detention Volumes)



UG Det. Inv.

Optional User Overrides

	acre-feet
	acre-feet
0.81	inches
1.08	inches
1.38	inches
1.87	inches
2.32	inches
2.84	inches
4.32	inches

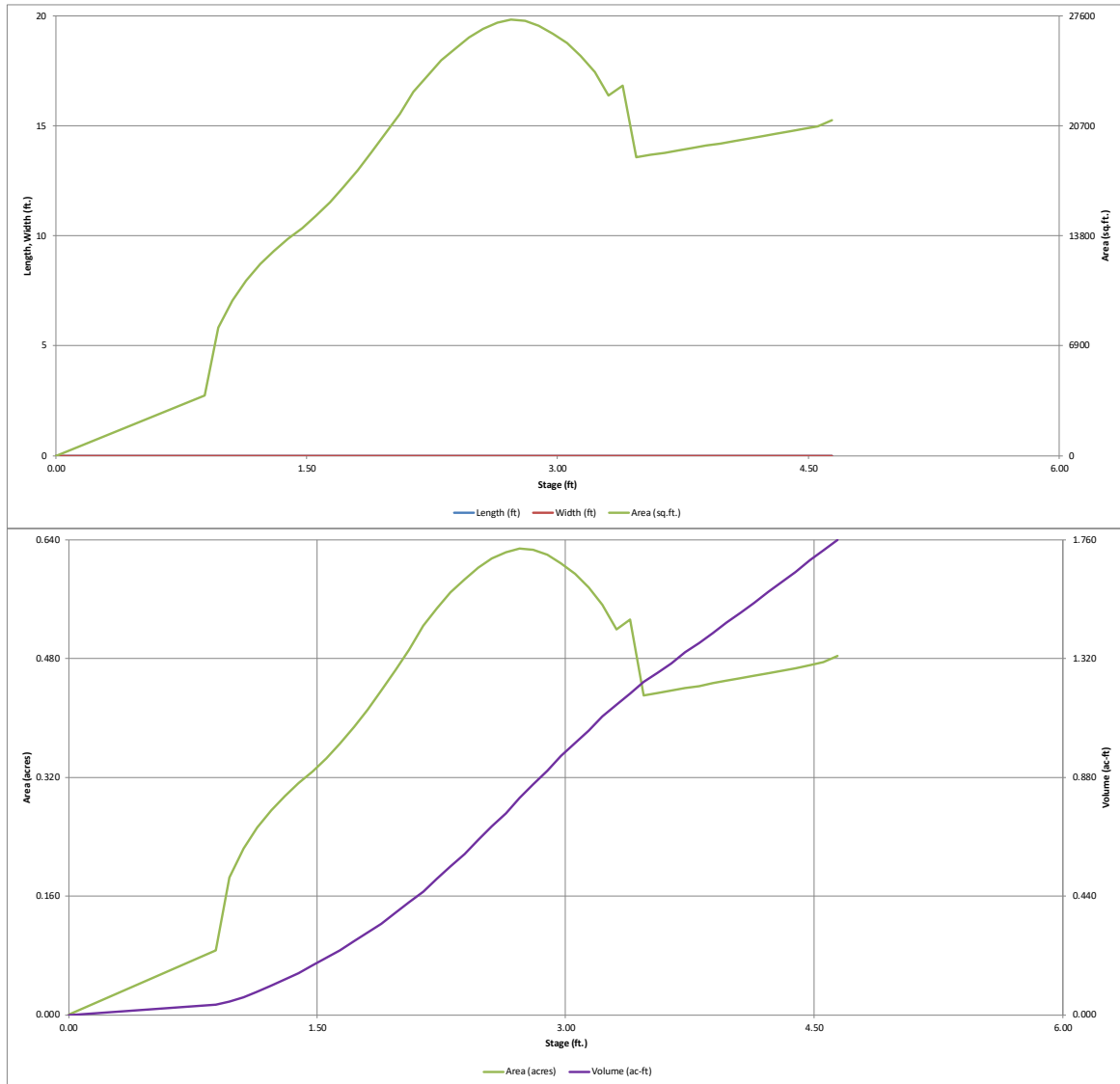
Top of UG Detention

Initial Surcharge Area (A_{DSV})	= user	ft ²
Surcharge Volume Length (L_{SV})	= user	ft
Surcharge Volume Width (W_{SV})	= user	ft
Depth of Basin Floor (H_{FLOOR})	= user	ft
Length of Basin Floor (L_{FLOOR})	= user	ft
Width of Basin Floor (W_{FLOOR})	= user	ft
Area of Basin Floor (A_{FLOOR})	= user	ft ²
Volume of Basin Floor (V_{FLOOR})	= user	ft ³
Depth of Main Basin (H_{MAIN})	= user	ft
Length of Main Basin (L_{MAIN})	= user	ft
Width of Main Basin (W_{MAIN})	= user	ft
Area of Main Basin (A_{MAIN})	= user	ft ²
Volume of Main Basin (V_{MAIN})	= user	ft ³
Calculated Total Basin Volume (V_{TOTAL})	= user	acre-feet

Stage Storage Table

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

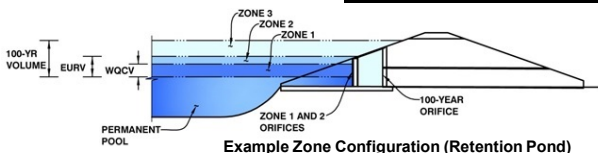


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: WESTSIDE CROSSING

Basin ID: Detention Basin A (Includes Underground Detention Volumes)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.55	0.209	Orifice Plate
Zone 2 (EURV)	2.43	0.413	Orifice Plate
Zone 3 (100-year)	3.39	0.569	Weir&Pipe (Restrict)
Total (all zones)		1.191	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 3.30 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = N/A inches
Orifice Plate: Orifice Area per Row = N/A inches

Calculated Parameters for Plate
WQ Orifice Area per Row = N/A ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.75	1.50					
Orifice Area (sq. inches)	1.25	1.25	1.25					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = N/A Not Selected ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = N/A Not Selected ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = N/A Not Selected inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = N/A Not Selected ft²
Vertical Orifice Centroid = N/A Not Selected feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Overflow Weir Front Edge Height, H_o = 2.50 Not Selected ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 3.00 Not Selected feet
Overflow Weir Grate Slope = 0.00 Not Selected H:V
Horiz. Length of Weir Sides = 3.00 Not Selected feet
Overflow Grate Type = Close Mesh Grate N/A
Debris Clogging % = 50% N/A %

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = 2.50 Not Selected feet
Overflow Weir Slope Length = 3.00 Not Selected feet
Grate Open Area / 100-yr Orifice Area = 4.58 Not Selected
Overflow Grate Open Area w/o Debris = 7.12 Not Selected ft²
Overflow Grate Open Area w/ Debris = 3.56 Not Selected ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe = 0.17 Not Selected ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 18.00 Not Selected inches
Restrictor Plate Height Above Pipe Invert = 14.80 Not Selected inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = 1.55 Not Selected ft²
Outlet Orifice Centroid = 0.67 Not Selected feet
Half-Central Angle of Restrictor Plate on Pipe = 2.27 Not Selected radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 3.40 Not Selected ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 90.00 Not Selected feet
Spillway End Slopes = 0.00 Not Selected H:V
Freeboard above Max Water Surface = Not Selected feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.24 Not Selected feet
Stage at Top of Freeboard = 3.64 Not Selected feet
Basin Area at Top of Freeboard = 0.44 Not Selected acres
Basin Volume at Top of Freeboard = 1.30 Not Selected acre-ft

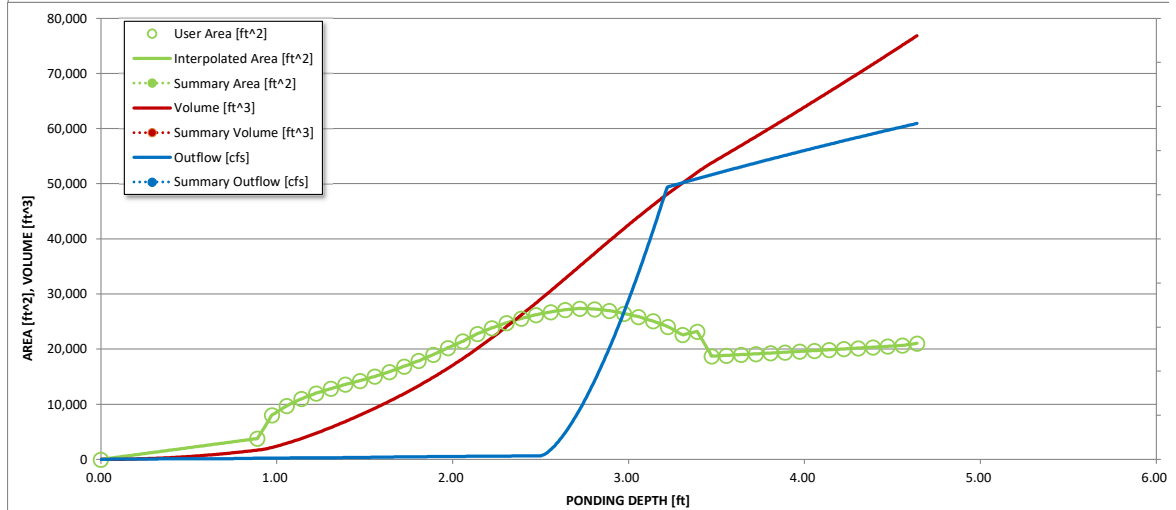
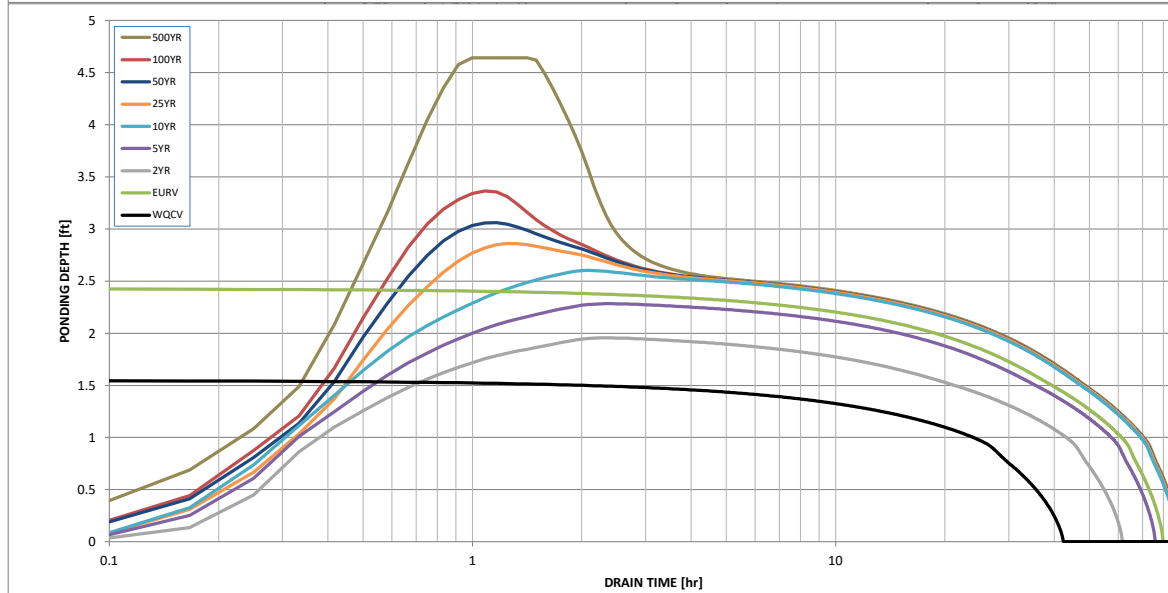
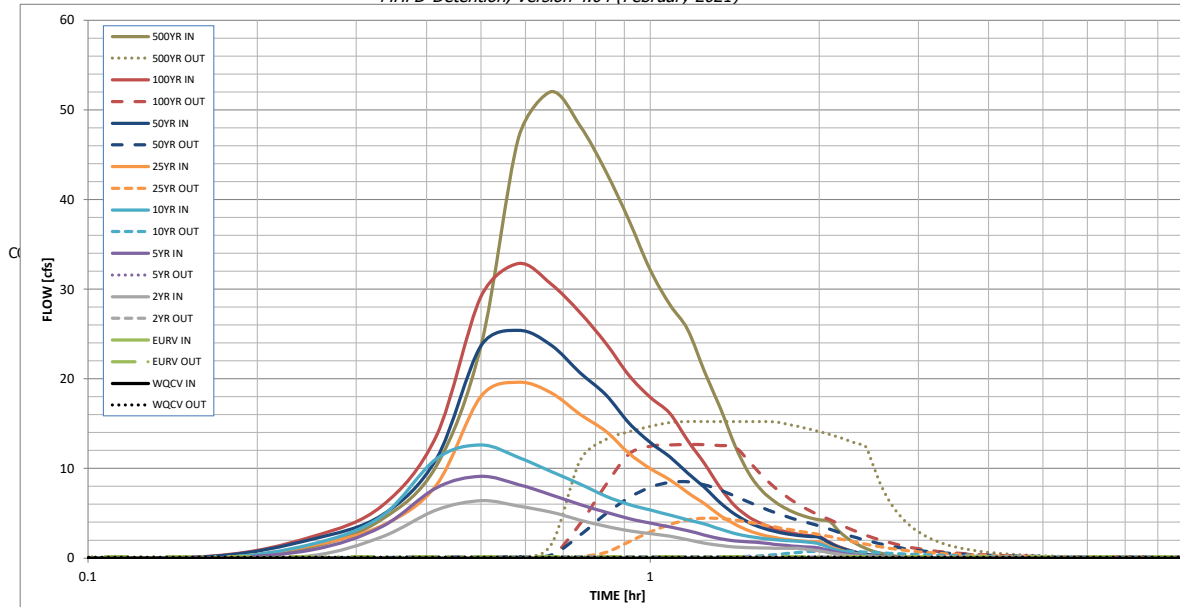
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.08	1.38	1.87	2.32	2.84	4.32
CUHP Runoff Volume (acre-ft) =	0.209	0.622	0.392	0.564	0.783	1.181	1.537	1.967	3.165
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.392	0.564	0.783	1.181	1.537	1.967	3.165
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.7	2.5	6.9	10.1	14.4	25.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.07	0.27	0.75	1.10	1.57	2.75
Peak Inflow Q (cfs) =	N/A	N/A	6.4	9.1	12.6	19.6	25.4	32.8	52.0
Peak Outflow Q (cfs) =	0.1	0.2	0.1	0.2	0.8	4.5	8.5	12.7	15.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.3	0.6	0.8	0.9	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.6	1.2	1.8	2.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	71	55	68	77	74	72	69	64
Time to Drain 99% of Inflow Volume (hours) =	41	76	59	72	83	82	81	79	76
Maximum Ponding Depth (ft) =	1.55	2.43	1.95	2.28	2.60	2.86	3.06	3.36	4.64
Area at Maximum Ponding Depth (acres) =	0.34	0.59	0.46	0.56	0.62	0.62	0.60	0.53	0.48
Maximum Volume Stored (acre-ft) =	0.210	0.625	0.369	0.538	0.728	0.885	1.007	1.179	1.764

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



PROJECT SUMMARY

CALCULATION DETAILS

- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 4,650 LF

STORAGE SUMMARY

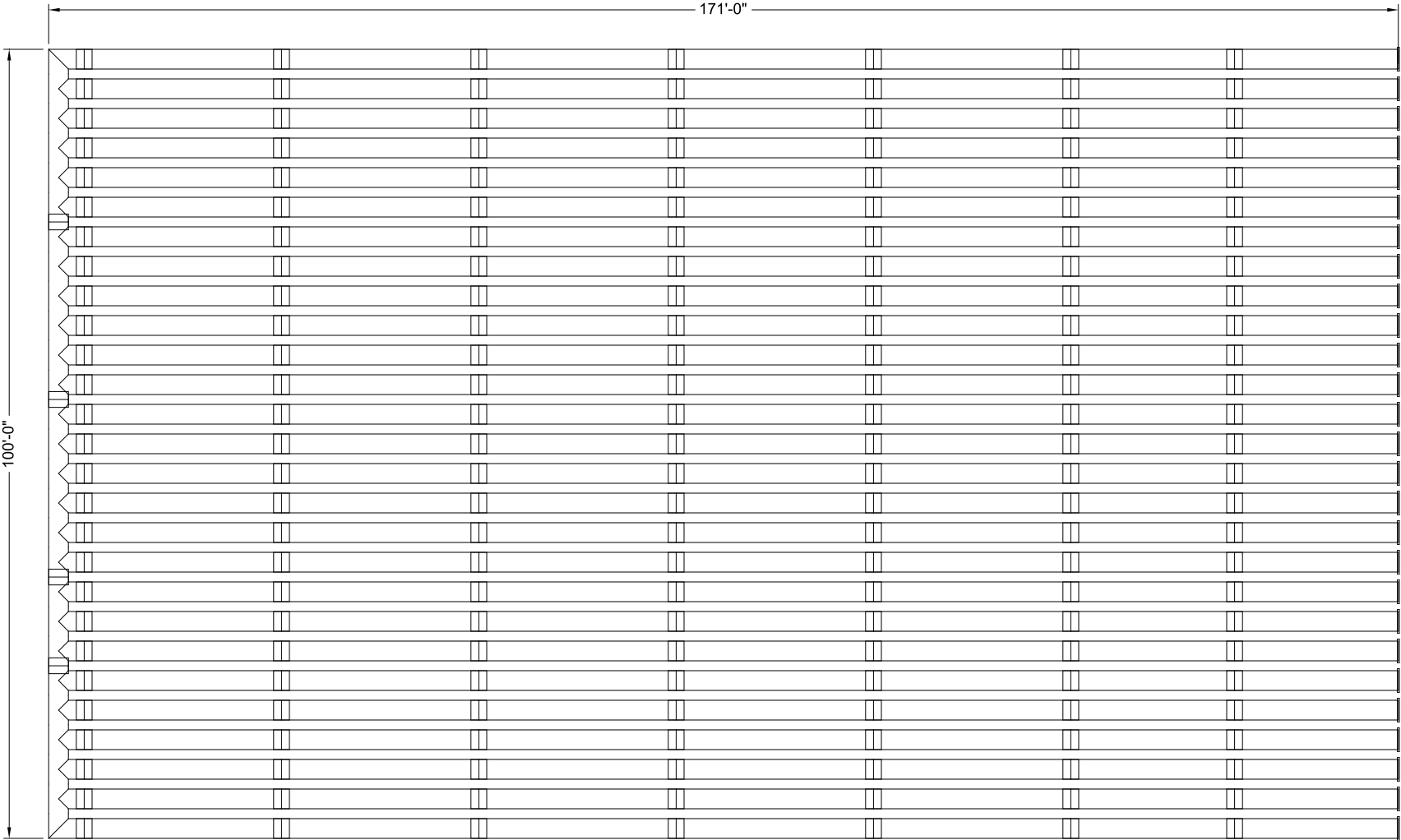
- STORAGE VOLUME REQUIRED = 22,800 CF
- PIPE STORAGE VOLUME = 22,823 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 22,823 CF

PIPE DETAILS

- DIAMETER = 30"
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 15"

BACKFILL DETAILS

- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2²/₃" x 1¹/₂" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 20'

C:\EXPORT\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.		
If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.		
DATE	REVISION DESCRIPTION	BY

CONTECH®

ENGINEERED SOLUTIONS LLC

www.ContechES.com

9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069

800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH®

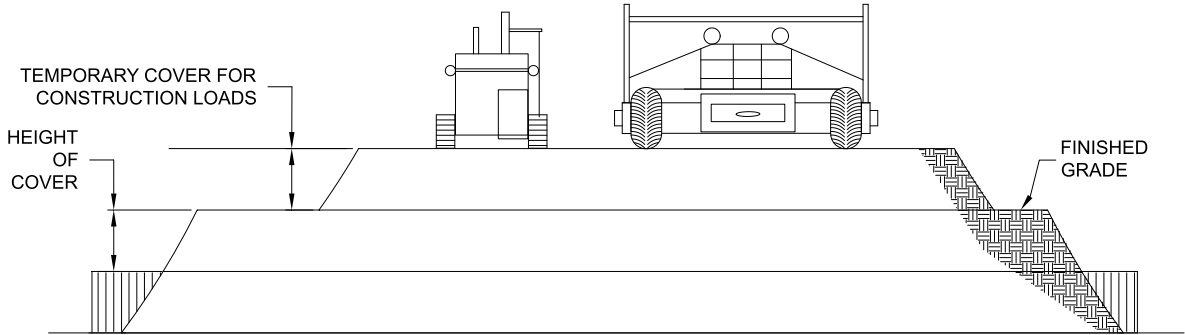
CMP DETENTION SYSTEMS

CONTECH
DYODS
DRAWING

DYO29865 Westside Crossing
24/36
Aurora, CO
DETENTION SYSTEM

PROJECT No.: 19924	SEQ. No.: 29865	DATE: 4/10/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

C:\EXPORT\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM



CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
MINIMUM COVER (FT)				
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL

THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS

CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

NOTE:

THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

DATE	REVISION DESCRIPTION	BY

PIPE

THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE

HANDLING AND ASSEMBLY

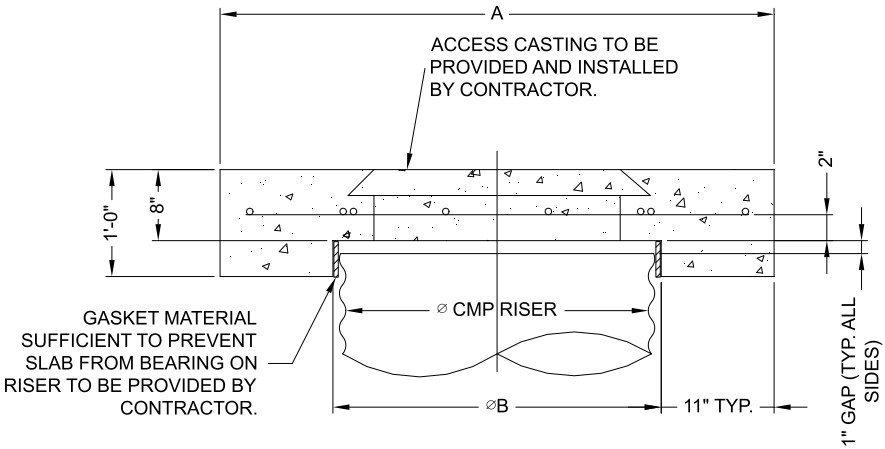
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

REQUIREMENTS

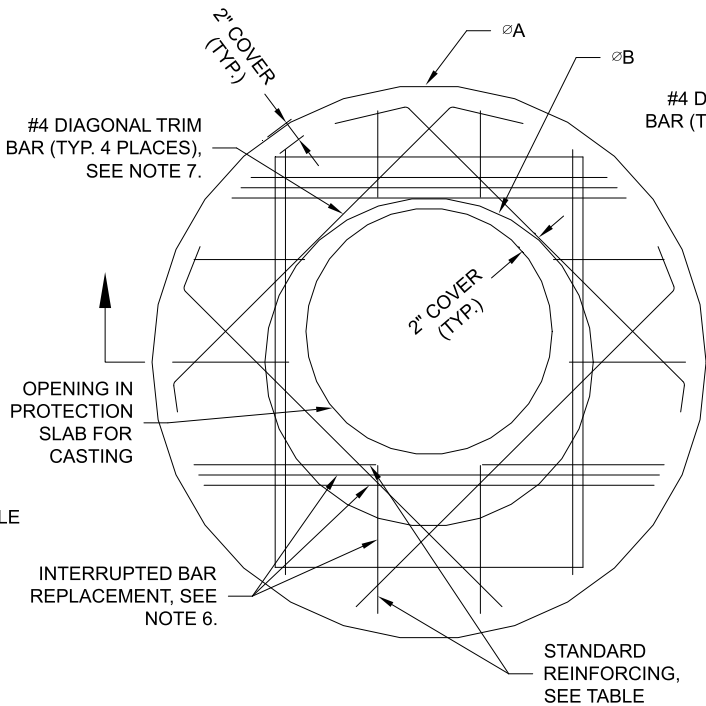
INSTALLATION

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.



SECTION VIEW



ROUND OPTION PLAN VIEW

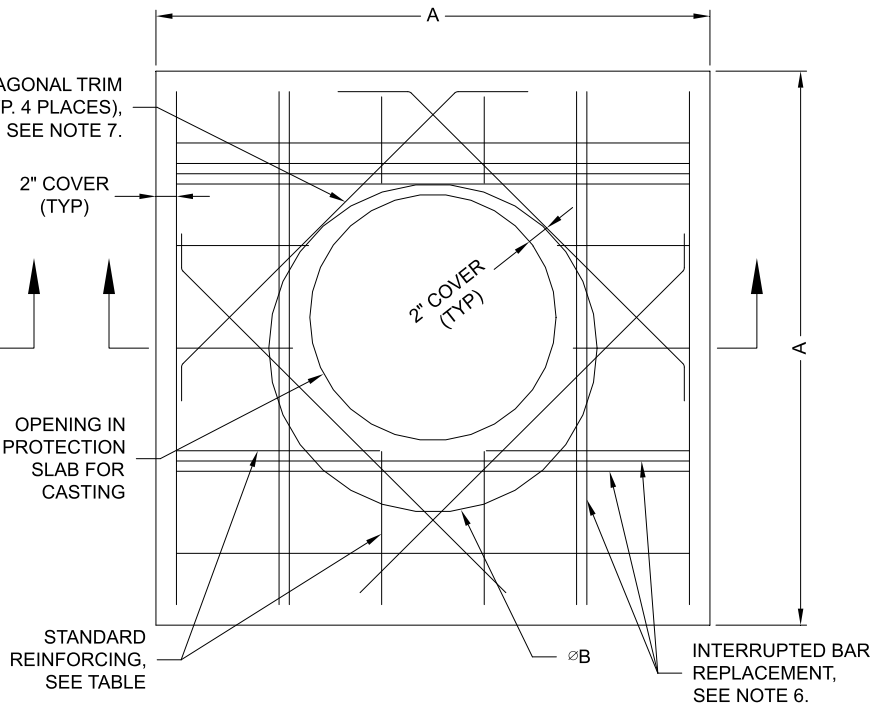
NOTES:

- DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
- DESIGN LOAD HS25.
- EARTH COVER = 1' MAX.
- CONCRETE STRENGTH = 3,500 psi
- REINFORCING STEEL = ASTM A615, GRADE 60.
- PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.

REINFORCING TABLE

Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



SQUARE OPTION PLAN VIEW

- TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
- PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
- DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.



ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX



CMP DETENTION SYSTEMS
CONTECH
DYODS
DRAWING

DYO29865 Westside Crossing
24/36
Aurora, CO
DETENTION SYSTEM

PROJECT No.: 19924	SEQ. No.: 29865	DATE: 4/10/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

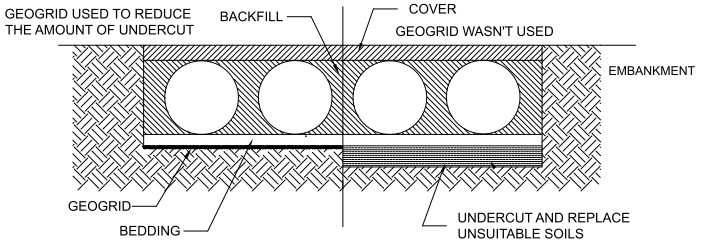
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

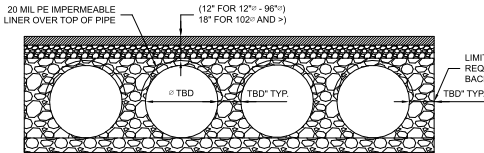


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

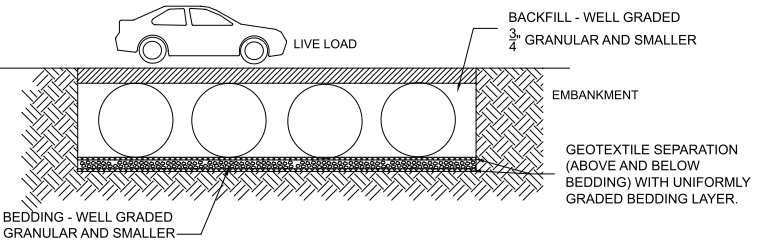
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

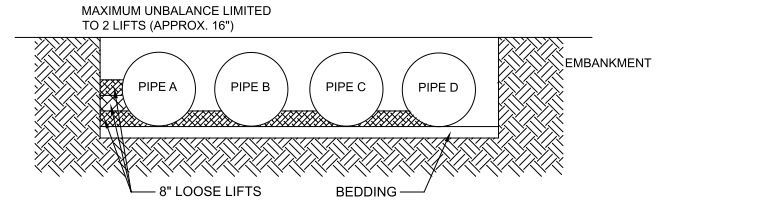
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



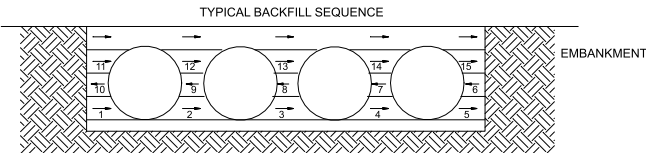
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

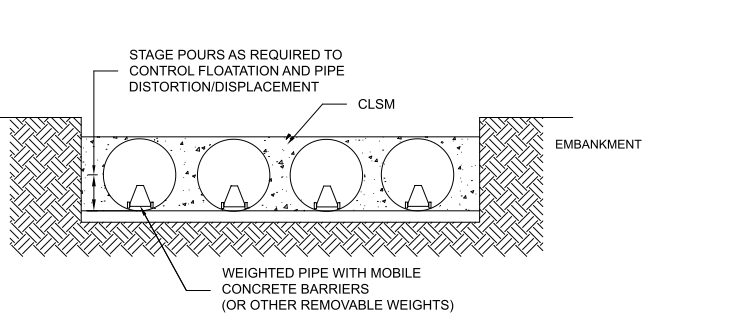


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

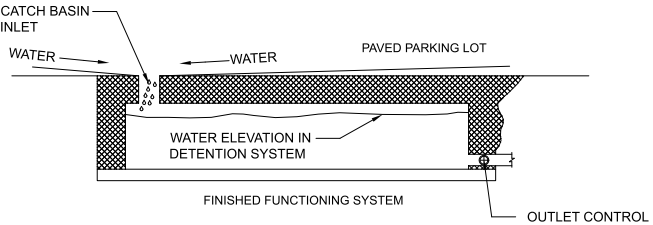


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

C:\EXPORT\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

DATE	REVISION DESCRIPTION	BY	

CONTECH

ENGINEERED SOLUTIONS LLC

www.ContechES.com

9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069

800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH

CMP DETENTION SYSTEMS

CONTECH
DYODS
DRAWING

DYO29865 Westside Crossing

24/36

Aurora, CO

DETENTION SYSTEM

PROJECT No.: 19924

SEQ. No.: 29865

DATE: 4/10/2023

DESIGNED: DYO

DRAWN: DYO

CHECKED: DYO

APPROVED: DYO

SHEET NO.: 1



Round Pipe Stage Storage Table

Contech Engineered Solutions, LLC Engineer:

Date

CEU

4/11/2023

Site Information

Project Name

Project State

Project Location

Westside Crossing

CO

Aurora

Enter Pipe I.D.= in.
Enter Desired Increment = in.

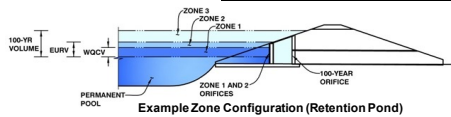
Total Volume/LF
4.91

Total CMP Length= ft.
System Invert= ft.

Inc Num	Water Level (in.)	Inc Area (sq. ft.)	Hyd Rad (ft.)	Top Width (ft.)	Volume (cf)	WS Elevation (ft.)
1	1	0.05	0.05	0.90	233	0.08
2	2	0.14	0.11	1.25	654	0.17
3	3	0.26	0.16	1.50	1188	0.25
4	4	0.39	0.21	1.70	1809	0.33
5	5	0.54	0.26	1.86	2501	0.42
6	6	0.70	0.30	2.00	3250	0.50
7	7	0.87	0.35	2.11	4048	0.58
8	8	1.05	0.39	2.21	4886	0.67
9	9	1.24	0.43	2.29	5759	0.75
10	10	1.43	0.47	2.36	6660	0.83
11	11	1.63	0.50	2.41	7584	0.92
12	12	1.83	0.54	2.45	8526	1.00
13	13	2.04	0.57	2.48	9481	1.08
14	14	2.25	0.60	2.49	10445	1.17
15	15	2.45	0.62	2.50	11413	1.25
16	16	2.66	0.65	2.49	12381	1.33
17	17	2.87	0.67	2.48	13345	1.42
18	18	3.08	0.69	2.45	14300	1.50
19	19	3.28	0.71	2.41	15241	1.58
20	20	3.48	0.73	2.36	16165	1.67
21	21	3.67	0.74	2.29	17066	1.75
22	22	3.86	0.75	2.21	17939	1.83
23	23	4.04	0.76	2.11	18778	1.92
24	24	4.21	0.76	2.00	19576	2.00
25	25	4.37	0.76	1.86	20325	2.08
26	26	4.52	0.76	1.70	21016	2.17
27	27	4.65	0.75	1.50	21638	2.25
28	28	4.77	0.73	1.25	22172	2.33
29	29	4.86	0.70	0.90	22592	2.42
30	30	4.91	0.63	0.00	22826	2.50

These results are submitted to you as a guideline only, without liability on the part of CONTECH Construction Products Inc. for accuracy or suitability to any particular application, and are subject to your verification.

MHFD-Detention, Version 4.04 (February 2021)

Basin ID: POND B

Selected BMP Type =	EDB	
Watershed Area =	5.10	acres
Watershed Length =	720	ft
Watershed Length to Centroid =	450	ft
Watershed Slope =	0.014	ft/ft
Watershed Imperviousness =	72.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCC Drain Time =	40.0	hours

Location for 1-hr Rainfall Depths = Denver - Capitol Building

Optional User Overrides

Water Quality Capture Volume (WQCV) =	0.121	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.359	acre-feet	acre-feet
2-yr Runoff Volume ($P1 = 0.81$ in.) =	0.226	acre-feet	0.81 inches
5-yr Runoff Volume ($P1 = 1.08$ in.) =	0.324	acre-feet	1.08 inches
10-yr Runoff Volume ($P1 = 1.37$ in.) =	0.442	acre-feet	1.37 inches
25-yr Runoff Volume ($P1 = 1.87$ in.) =	0.667	acre-feet	1.87 inches
50-yr Runoff Volume ($P1 = 2.34$ in.) =	0.874	acre-feet	2.34 inches
100-yr Runoff Volume ($P1 = 2.87$ in.) =	1.116	acre-feet	2.87 inches
500-yr Runoff Volume ($P1 = 4.38$ in.) =	1.794	acre-feet	4.38 inches
Approximate 2-yr Detention Volume =	0.220	acre-feet	
Approximate 5-yr Detention Volume =	0.323	acre-feet	
Approximate 10-yr Detention Volume =	0.402	acre-feet	
Approximate 25-yr Detention Volume =	0.511	acre-feet	
Approximate 50-yr Detention Volume =	0.583	acre-feet	
Approximate 100-yr Detention Volume =	0.686	acre-feet	

Zone 1 Volume (WQCV) =	0.121	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.237	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.327	acre-feet
Total Detention Basin Volume =	0.686	acre-feet
Initial Surcharge Volume (ISV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{MB}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV})	=	user	ft ²
Surcharge Volume Length (L_{SV})	=	user	
Surcharge Volume Width (W_{SV})	=	user	
Depth of Basin Floor (H_{FLOOR})	=	user	ft
Length of Basin Floor (L_{FLOOR})	=	user	
Width of Basin Floor (W_{FLOOR})	=	user	
Area of Basin Floor (A_{FLOOR})	=	user	ft ²
Volume of Basin Floor (V_{FLOOR})	=	user	ft ³
Depth of Main Basin (H_{MAIN})	=	user	
Length of Main Basin (L_{MAIN})	=	user	
Width of Main Basin (W_{MAIN})	=	user	
Area of Main Basin (A_{MAIN})	=	user	ft ²
Volume of Main Basin (V_{MAIN})	=	user	ft ³
Calculated Total Basin Volume (V_{TOTAL})	=	user	acre-feet

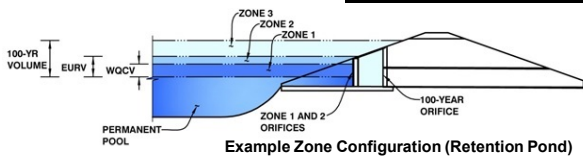
[illegible]

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: WESTSIDE CROSSING

Basin ID: POND B



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.84	0.121	Orifice Plate
Zone 2 (EURV)	2.88	0.237	Orifice Plate
Zone 3 (100-year)	4.05	0.327	Weir&Pipe (Restrict)
Total (all zones)		0.686	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Calculated Parameters for Plate

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.96	1.92					
Orifice Area (sq. inches)	0.63	0.63	1.70					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected
Invert of Vertical Orifice =	N/A	N/A
Depth at top of Zone using Vertical Orifice =	N/A	N/A
Vertical Orifice Diameter =	N/A	N/A

ft (relative to basin bottom at Stage = 0 ft)
ft (relative to basin bottom at Stage = 0 ft)
inches

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, H _o =	2.88	N/A
Overflow Weir Front Edge Length =	3.00	N/A
Overflow Weir Grate Slope =	0.00	N/A
Horiz. Length of Weir Sides =	4.00	N/A
Overflow Grate Type =	Type C Grate	N/A
Debris Clogging % =	50%	N/A

ft (relative to basin bottom at Stage = 0 ft)
feet
H:V
feet
feet
%

	Zone 3 Weir	Not Selected
Height of Grate Upper Edge, H _u =	2.88	N/A
Overflow Weir Slope Length =	4.00	N/A
Grate Open Area / 100-yr Orifice Area =	11.01	N/A
Overflow Grate Open Area w/o Debris =	8.35	N/A
Overflow Grate Open Area w/ Debris =	4.18	N/A

feet
feet
feet
ft²
ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.17	N/A
Outlet Pipe Diameter =	18.00	N/A
Restrictor Plate Height Above Pipe Invert =	8.00	

ft (distance below basin bottom at Stage = 0 ft)
inches
inches

	Zone 3 Restrictor	Not Selected
Outlet Orifice Area =	0.76	N/A
Outlet Orifice Centroid =	0.39	N/A
Half-Central Angle of Restrictor Plate on Pipe =	1.46	N/A

ft²
feet
radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	4.95	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	25.00	feet
Spillway End Slopes =	0.00	H:V
Freeboard above Max Water Surface =	0.00	feet

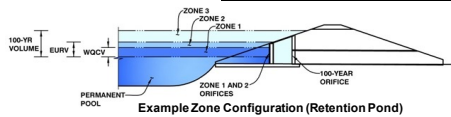
Spillway Design Flow Depth =	0.37	feet
Stage at Top of Freeboard =	5.32	feet
Basin Area at Top of Freeboard =	0.30	acres
Basin Volume at Top of Freeboard =	1.07	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF)

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.81	1.08	1.37	1.87	2.34	2.87	4.38
One-Hour Rainfall Depth (in) =	0.121	0.359	0.226	0.324	0.442	0.667	0.874	1.116	1.794
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.226	0.324	0.442	0.667	0.874	1.116	1.794
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.0	0.3	1.2	3.4	5.1	7.4	13.0
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.07	0.24	0.67	1.01	1.44	2.54
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	3.4	4.9	6.6	10.3	13.5	17.4	27.6
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.1	0.1	0.9	4.0	6.5	6.9	12.1
Peak Inflow Q (cfs) =	N/A	N/A	N/A	0.3	0.7	1.2	1.3	0.9	0.9
Peak Outflow Q (cfs) =	N/A	N/A	N/A	0.3	0.7	1.2	1.3	0.9	0.9
Ratio Peak Outflow to Predevelopment Q =	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Structure Controlling Flow =	N/A	N/A	N/A	N/A	0.1	0.5	0.8	0.8	0.9
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	38	67	55	65	69	67	64	62	56
Time to Drain 97% of Inflow Volume (hours) =	40	72	58	69	75	73	72	71	68
Time to Drain 99% of Inflow Volume (hours) =	1.84	2.88	2.26	2.66	2.98	3.19	3.34	3.80	5.09
Maximum Ponding Depth (ft) =	0.20	0.26	0.23	0.25	0.26	0.27	0.28	0.29	0.30
Area at Maximum Ponding Depth (acres) =	0.121	0.361	0.212	0.306	0.387	0.440	0.482	0.613	0.997
Maximum Volume Stored (acre-ft) =									

MHFD-Detention, Version 4.04 (February 2021)

Basin ID: POND C

Example Zone Configuration (Retention Pond)

Selected BMP Type =	EDB	
Watershed Area =	5.50	acres
Watershed Length =	700	ft
Watershed Length to Centroid =	370	ft
Watershed Slope =	0.014	ft/ft
Watershed Imperviousness =	80.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCC Drain Time =	40.0	hours

Location for 1-hr Rainfall Depths = Denver - Capitol Building

Optional User Overrides

Water Quality Capture Volume (WQCV) =	0.150	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.432	acre-feet	acre-feet
2-yr Runoff Volume ($P1 = 0.81$ in.) =	0.268	acre-feet	0.81 inches
5-yr Runoff Volume ($P1 = 1.08$ in.) =	0.380	acre-feet	1.08 inches
10-yr Runoff Volume ($P1 = 1.37$ in.) =	0.509	acre-feet	1.37 inches
25-yr Runoff Volume ($P1 = 1.87$ in.) =	0.748	acre-feet	1.87 inches
50-yr Runoff Volume ($P1 = 2.34$ in.) =	0.969	acre-feet	2.34 inches
100-yr Runoff Volume ($P1 = 2.87$ in.) =	1.225	acre-feet	2.87 inches
500-yr Runoff Volume ($P1 = 4.38$ in.) =	1.945	acre-feet	4.38 inches
Approximate 2-yr Detention Volume =	0.266	acre-feet	
Approximate 5-yr Detention Volume =	0.394	acre-feet	
Approximate 10-yr Detention Volume =	0.481	acre-feet	
Approximate 25-yr Detention Volume =	0.608	acre-feet	
Approximate 50-yr Detention Volume =	0.693	acre-feet	
Approximate 100-yr Detention Volume =	0.802	acre-feet	

Zone 1 Volume (WQCV) =	0.150	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.282	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.370	acre-feet
Total Detention Basin Volume =	0.802	acre-feet
Initial Surcharge Volume (ISV) =	<u>user</u>	ft ³
Initial Surcharge Depth (ISD) =	<u>user</u>	ft
Total Available Detention Depth (H_{total}) =	<u>user</u>	ft
Depth of Trickle Channel (H_{TC}) =	<u>user</u>	ft
Slope of Trickle Channel (S_{TC}) =	<u>user</u>	ft/ft
Slopes of Main Basin Sides (S_{MS}) =	<u>user</u>	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	<u>user</u>	

Initial Surcharge Area (A_{BIV})	=	user	ft ²
Surcharge Volume Length (L_{SV})	=	user	ft
Surcharge Volume Width (W_{SV})	=	user	ft
Depth of Basin Floor (H_{LFLOOR})	=	user	ft
Length of Basin Floor (L_{LFLOOR})	=	user	ft
Width of Basin Floor (W_{LFLOOR})	=	user	ft
Area of Basin Floor (A_{LFLOOR})	=	user	ft ²
Volume of Basin Floor (V_{LFLOOR})	=	user	ft ³
Depth of Main Basin (H_{MAIN})	=	user	ft
Length of Main Basin (L_{MAIN})	=	user	ft
Width of Main Basin (W_{MAIN})	=	user	ft
Area of Main Basin (A_{MAIN})	=	user	ft ²
Volume of Main Basin (V_{MAIN})	=	user	ft ³
Calculated Total Basin Volume (V_{TOTAL})	=	user	acre-feet

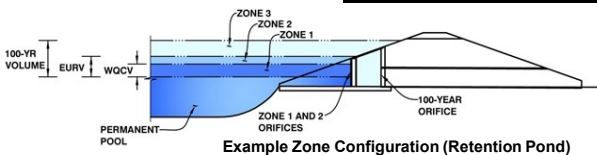
[illegible]

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: WESTSIDE CROSSING

Basin ID: POND C



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.86	0.150	Orifice Plate
Zone 2 (EURV)	3.15	0.282	Orifice Plate
Zone 3 (100-year)	4.68	0.370	Weir&Pipe (Restrict)
Total (all zones)		0.802	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = N/A ft (distance below the filtration media surface)
Underdrain Orifice Diameter = N/A inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = N/A ft²
Underdrain Orifice Centroid = N/A feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 3.32 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 13.30 inches
Orifice Plate: Orifice Area per Row = N/A inches

Calculated Parameters for Plate
WQ Orifice Area per Row = N/A ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.11	2.21					
Orifice Area (sq. inches)	0.89	0.89	1.75					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = N/A ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = N/A ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = N/A inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = N/A ft²
Vertical Orifice Centroid = N/A feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

Overflow Weir Front Edge Height, H_o = 3.32 ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 3.00 feet
Overflow Weir Grate Slope = 0.00 H:V
Horiz. Length of Weir Sides = 4.00 feet
Overflow Grate Type = Type C Grate
Debris Clogging % = 50%

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_i = 3.32 feet
Overflow Weir Slope Length = 4.00 feet
Grate Open Area / 100-yr Orifice Area = 10.17
Overflow Grate Open Area w/o Debris = 8.35 ft²
Overflow Grate Open Area w/ Debris = 4.18 ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe = 0.17 ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 18.00 inches
Restrictor Plate Height Above Pipe Invert = 8.50 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = 0.82 ft²
Outlet Orifice Centroid = 0.41 feet
Half-Central Angle of Restrictor Plate on Pipe = 1.52 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 4.73 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 20.00 feet
Spillway End Slopes = 0.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.49 feet
Stage at Top of Freeboard = 6.22 feet
Basin Area at Top of Freeboard = 0.25 acres
Basin Volume at Top of Freeboard = 0.94 acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.81	1.08	1.37	1.87	2.34	2.87	4.38
One-Hour Rainfall Depth (in) =	0.150	0.432	0.268	0.380	0.509	0.748	0.969	1.225	1.945
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.268	0.380	0.509	0.748	0.969	1.225	1.945
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.0	0.4	1.5	4.1	6.1	8.8	15.5
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.08	0.26	0.75	1.12	1.60	2.81
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	4.6	6.4	8.4	12.6	16.3	21.0	32.9
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.1	0.1	0.3	3.7	7.2	8.0	20.8
Peak Inflow Q (cfs) =	N/A	N/A	N/A	0.3	0.2	0.9	1.2	0.9	1.3
Peak Outflow Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Structure Controlling Flow =	N/A	N/A	N/A	N/A	0.0	0.4	0.8	0.9	1.0
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	39	68	56	65	73	70	68	65	59
Time to Drain 97% of Inflow Volume (hours) =	40	72	58	69	78	77	76	75	72
Time to Drain 99% of Inflow Volume (hours) =	1.86	3.15	2.36	2.84	3.36	3.61	3.78	4.29	5.07
Maximum Ponding Depth (ft) =	0.19	0.23	0.22	0.23	0.24	0.24	0.24	0.25	0.25
Area at Maximum Ponding Depth (acres) =	0.151	0.433	0.253	0.359	0.480	0.542	0.581	0.705	0.901
Maximum Volume Stored (acre-ft) =									

APPENDIX C.1
Hydraulic Calculations
Inlet and Street Capacity Calculations
UD-Sewer Results Summaries for Outfall Trunkline (10-Yr & 100-Yr)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet 2	Inlet 1
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	2.7	3.1
Major Q_{Known} (cfs)	6.8	7.5

Bypass (Carry-Over) Flow from Upstream

Inlets must be organized from upstream (left) to downstream (right) in order for bypass

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)		0.0
Major Bypass Flow Received, Q_b (cfs)		0.0

Watershed Characteristics

Subcatchment Area (acres)		
Percent Impervious		
NRCS Soil Type		

Watershed Profile

Overland Slope (ft/ft)		
Overland Length (ft)		
Channel Slope (ft/ft)		
Channel Length (ft)		

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)		
One-Hour Precipitation, P_1 (inches)		

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)		
One-Hour Precipitation, P_1 (inches)		

CALCULATED OUTPUT

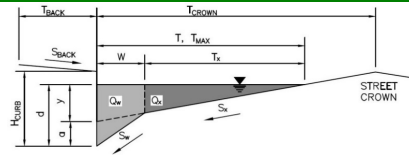
Minor Total Design Peak Flow, Q (cfs)	2.7	3.1
Major Total Design Peak Flow, Q (cfs)	6.8	7.5
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Westside Crossing - Berthoud

Inlet ID: Inlet 2

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	35.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	34.0	ft
W	=	2.00	ft
S_x	=	0.050	ft/ft
S_y	=	0.083	ft/ft
S_o	=	0.010	ft/ft
n_{STREET}	=	0.015	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	12.0	32.0	ft
d_{MAX}	6.0	8.3	inches
	☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

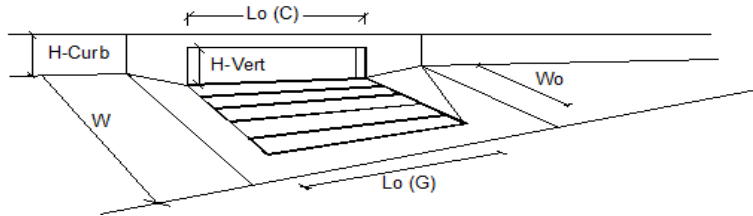
	Minor Storm	Major Storm	
Q_{allow}	8.7	23.9	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.70 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 6.80 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



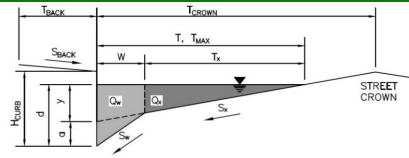
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L _o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W _o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C _f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity					
Total Inlet Interception Capacity		Q =	2.7	6.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _s =	0.0	0.0	cfs
Capture Percentage = Q _i /Q _a		C% =	100	100	%

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Westside Crossing - Berthoud

Inlet ID: Inlet 1

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	17.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	24.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.000	ft/ft
n_{STREET}	=	0.020	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	24.0	24.0	ft
d_{MAX}	6.0	12.0	inches
	☐	☐	

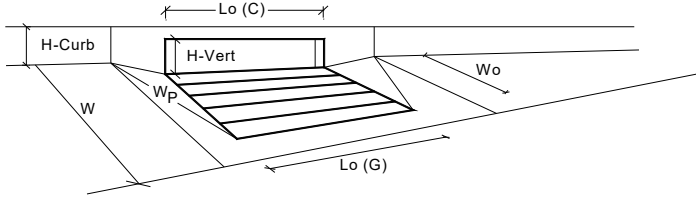
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	7.3	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.33	0.44	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	5.4	8.1	cfs
		Q _{PEAK REQUIRED} =	3.1	7.5	cfs

Note:

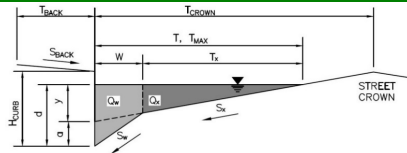
Inlet capacity is only considered for the 10-YR Event and is good. During the 100-YR Event, the outfall trunkline will be pressurized and the inlet at Design Point 23 will be inundated, at which point Meadowlark Ave. will be conveying the majority of the 100-YR Runoff to the existing channel located directly downstream of Design Point 24. See 'Meadowlark Capacity' calculation for street capacity calculations during a 100-YR Event.

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Westside Crossing - Berthoud

Inlet ID: Meadowlark Capacity

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	17.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	24.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_0	=	0.005	ft/ft
n_{STREET}	=	0.020	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	24.0	24.0	ft
d_{MAX}	6.0	12.0	inches
	☐	☐	

Maximum Capacity for 1/2 Street based On Allowable SpreadWater Depth without Gutter Depression ($T * S_x * 12$)Vertical Depth between Gutter Lip and Gutter Flowline ($W * S_w * 12$)Gutter Depression ($d_c - (W * S_x * 12)$)Water Depth at Gutter Flowline ($y + a$)Allowable Spread for Discharge outside the Gutter Section ($T - W$)

Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)

Discharge outside the Gutter Section, carried in Section T_x Discharge within the Gutter Section ($Q_T - Q_x - Q_{BACK}$)

Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)

Maximum Flow Based On Allowable Spread

Flow Velocity within the Gutter Section

 $V*d$ Product: Flow Velocity times Gutter Flowline Depth

	Minor Storm	Major Storm	
y	5.76	5.76	inches
d_c	2.0	2.0	inches
a	1.51	1.51	inches
d	7.27	7.27	inches
T_x	22.0	22.0	ft
E_0	0.245	0.245	
Q_x	11.1	11.1	cfs
Q_w	3.6	3.6	cfs
Q_{BACK}	0.2	0.2	cfs
Q_T	14.9	14.9	cfs
V	3.4	3.4	fps
$V*d$	2.1	2.1	

Maximum Capacity for 1/2 Street based on Allowable Depth

Theoretical Water Spread

Theoretical Spread for Discharge outside the Gutter Section ($T - W$)

Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)

Theoretical Discharge outside the Gutter Section, carried in Section T_{XTH} Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})Discharge within the Gutter Section ($Q_d - Q_x$)

Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)

Total Discharge for Major & Minor Storm (Pre-Safety Factor)

Average Flow Velocity Within the Gutter Section

 $V*d$ Product: Flow Velocity Times Gutter Flowline DepthSlope-Based Safety Factor for Minor/Major Storm depth reduction, $d \geq 6"$

Max Flow based on Allowable Depth (Safety Factor Applied)

Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)

Resultant Flow Depth at Street Crown (Safety Factor Applied)

	Minor Storm	Major Storm	
T_{TH}	18.7	43.7	ft
T_{XTH}	16.7	41.7	ft
E_0	0.318	0.130	
Q_{XTH}	5.3	61.0	cfs
Q_x	5.3	52.7	cfs
Q_w	2.5	9.2	cfs
Q_{BACK}	0.0	14.8	cfs
Q	7.8	76.7	cfs
V	3.0	5.0	fps
$V*d$	1.5	5.0	
R	1.00	1.00	
Q_d	7.8	76.7	cfs
d	6.00	12.00	inches
d_{CROWN}	0.00	4.73	inches

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

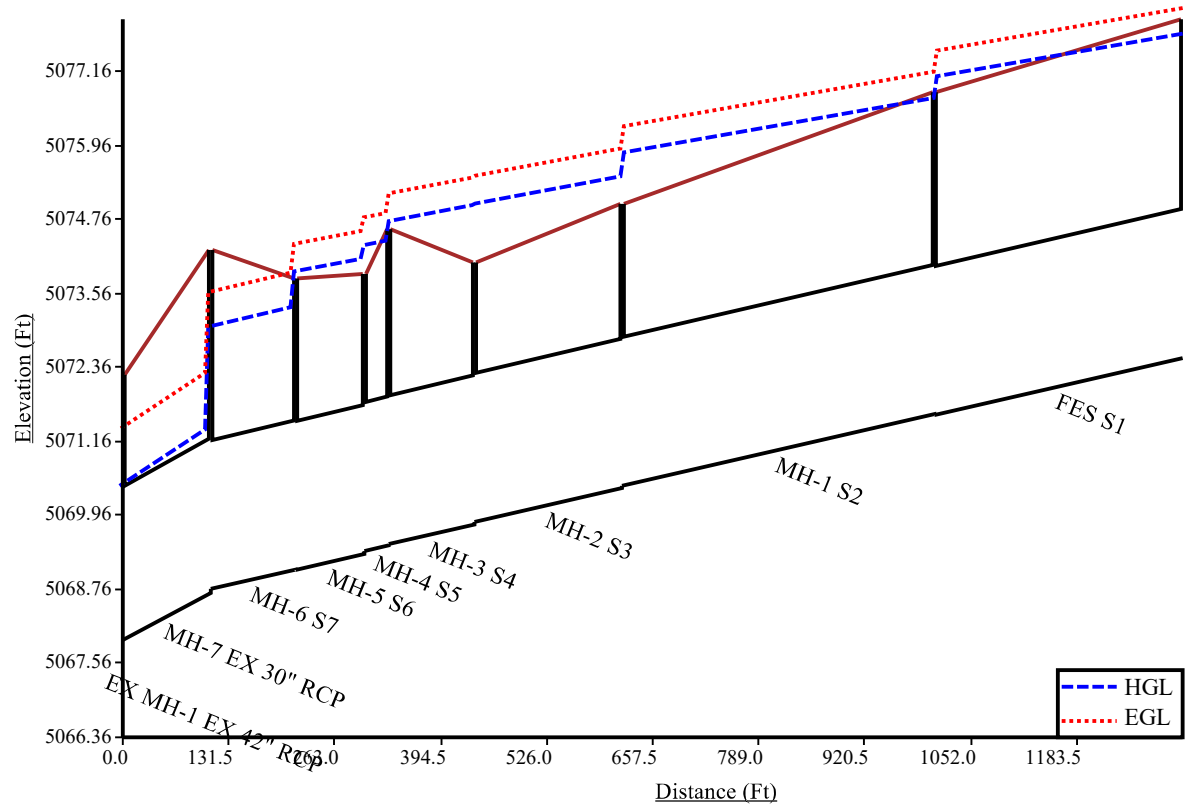
	Minor Storm	Major Storm	
Q_{allow}	7.8	14.9	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.10 cfs on sheet 'Inlet Management'**WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 60.30 cfs on sheet 'Inlet Management'**

Note:

Per the UDSewer Results Summary for the 100-YR Event (located in the appendix of this report), a flow of 37 cfs was chosen to enter the outfall trunkline as this elevation reflects the adjacent as-built top-of-curb elevation where flows overtop and enter Meadowlark Avenue at Design Point 20 (5078.38). The ultimate 100-YR Runoff for this project is 97.3 cfs at Design Point 24 (see Proposed Conditions Drainage Map located in the appendix for design point discharges and design point locations). Assuming 37 cfs is captured within the pipe network, 60.3cfs will enter Meadowlark Ave. via Detention Basin emergency spillways and overflow from Design Point 20. Per the calculations above, 76.7 cfs is the max flow allowed within the Meadowlark Ave. half street section (input parameters for max allowable spread and depth reflect Town of Berthoud Design and Construction Specifications Section 602.4 (C)).

Outfall Trunkline 10YR - Phase II



Program:

UDSEWER Math Model Interface 2.1.1.4

Run Date:

7/5/2023 2:04:26 PM

UDSewer Results Summary**Project Title:** Westside Crossing-Phase II**Project Description:** Outfall Trunkline-10YR

Table of Contents

System Input

Manhole Input

Manhole Output

Sewer Input

Sewer Flow

Sewer Sizing

EGL/HGL Summary

System Input Summary**Rainfall Parameters****Rainfall Return Period:** 10**Rainfall Calculation Method:** Formula**One Hour Depth (in):****Rainfall Constant "A":** 28.5**Rainfall Constant "B":** 10**Rainfall Constant "C":** 0.786**Rational Method Constraints****Minimum Urban Runoff Coeff.:** 0.20**Maximum Rural Overland Len. (ft):** 500**Maximum Urban Overland Len. (ft):** 300**Used UDFCD Tc. Maximum:** Yes**Sizer Constraints****Minimum Sewer Size (in):** 18.00**Maximum Depth to Rise Ratio:** 0.90**Maximum Flow Velocity (fps):** 18.0**Minimum Flow Velocity (fps):** 2.0**Backwater Calculations:****Tailwater Elevation (ft):** 5069.17

Manhole Input Summary:

[illegible]

Manhole Output Summary:

[illegible]

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
EX MH-1 EX 42" RCP	37.00	5067.42	0.5	5067.60	0.013	0.00	0.00	CIRCULAR	42.00 in	42.00 in
MH-7 EX 30" RCP	108.80	5067.94	0.7	5068.70	0.013	0.05	0.28	CIRCULAR	30.00 in	30.00 in
MH-6 S7	105.20	5068.76	0.3	5069.08	0.013	0.95	0.25	ELLIPSE	29.00 in	45.00 in
DAP	8.80	5070.60	2.0	5070.78	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in
MH-5 S6	85.70	5069.07	0.3	5069.33	0.013	0.05	0.25	ELLIPSE	29.00 in	45.00 in
MH-4 S5	30.00	5069.38	0.3	5069.47	0.013	0.49	0.00	ELLIPSE	29.00 in	45.00 in
MH-3 S4	106.30	5069.49	0.3	5069.81	0.013	0.71	0.00	ELLIPSE	29.00 in	45.00 in
MH-2 S3	183.30	5069.85	0.3	5070.40	0.013	0.06	0.00	ELLIPSE	29.00 in	45.00 in
DBP	13.00	5071.00	0.9	5071.12	0.013	1.00	0.00	CIRCULAR	18.00 in	18.00 in
MH-1 S2	387.30	5070.44	0.3	5071.60	0.013	0.05	0.25	ELLIPSE	29.00 in	45.00 in
DCP	11.50	5072.20	0.9	5072.30	0.013	1.00	0.00	CIRCULAR	18.00 in	18.00 in
FES S1	308.20	5071.59	0.3	5072.51	0.013	0.05	0.25	ELLIPSE	29.00 in	45.00 in
MEADOWLARK INLET MP-1	17.80	5069.10	0.5	5069.19	0.013	1.32	0.00	CIRCULAR	18.00 in	18.00 in
EX I-1 EX 18" RCP	126.70	5067.86	0.3	5068.24	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
EX MH-1 EX 42" RCP	71.33	7.41	23.10	7.08	21.94	7.55	1.10	Supercritical	38.40	0.00	
MH-7 EX 30" RCP	34.41	7.01	30.00	7.68	30.00	7.68	0.00	Pressurized	37.70	108.80	
MH-6 S7	37.73	6.01	23.78	7.43	28.98	6.01	0.67	Pressurized	37.70	105.20	
DAP	14.90	8.43	3.99	2.74	2.83	4.49	1.96	Pressurized	0.80	8.80	
MH-5 S6	37.73	6.01	22.47	7.12	26.39	5.93	0.73	Pressurized	33.80	85.70	
MH-4 S5	37.73	6.01	22.47	7.12	26.39	5.93	0.73	Pressurized	33.80	30.00	
MH-3 S4	37.73	6.01	22.47	7.12	26.39	5.93	0.73	Pressurized	33.80	106.30	
MH-2 S3	37.73	6.01	22.47	7.12	26.39	5.93	0.73	Pressurized	33.80	183.30	
DBP	9.99	5.65	4.24	2.83	3.65	3.51	1.34	Pressurized	0.90	13.00	
MH-1 S2	37.73	6.01	22.15	7.05	25.84	5.91	0.74	Pressurized	32.90	387.30	
DCP	9.99	5.65	2.42	2.11	2.14	2.53	1.28	Pressurized	0.30	11.50	
FES S1	37.73	6.01	22.05	7.03	25.67	5.90	0.75	Pressurized	32.60	308.20	
MEADOWLARK INLET MP-1	7.45	4.21	8.04	4.06	8.10	4.02	0.99	Pressurized	3.10	17.80	
EX I-1 EX 18" RCP	5.77	3.26	4.91	3.07	5.57	2.58	0.78	Pressurized	1.20	126.70	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
 - If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
 - If the sewer is pressurized, full flow represents the pressurized flow conditions.
-

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
EX MH-1 EX 42" RCP	38.40	CIRCULAR	42.00 in	42.00 in	36.00 in	36.00 in	42.00 in	42.00 in	9.62	
MH-7 EX 30" RCP	37.70	CIRCULAR	30.00 in	30.00 in	33.00 in	33.00 in	30.00 in	30.00 in	4.91	
MH-6 S7	37.70	ELLIPSE	29.00 in	45.00 in	42.00 in	42.00 in	29.00 in	45.00 in	6.28	
DAP	0.80	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
MH-5 S6	33.80	ELLIPSE	29.00 in	45.00 in	36.00 in	36.00 in	29.00 in	45.00 in	6.28	
MH-4 S5	33.80	ELLIPSE	29.00 in	45.00 in	36.00 in	36.00 in	29.00 in	45.00 in	6.28	
MH-3 S4	33.80	ELLIPSE	29.00 in	45.00 in	36.00 in	36.00 in	29.00 in	45.00 in	6.28	
MH-2 S3	33.80	ELLIPSE	29.00 in	45.00 in	36.00 in	36.00 in	29.00 in	45.00 in	6.28	
DBP	0.90	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
MH-1 S2	32.90	ELLIPSE	29.00 in	45.00 in	36.00 in	36.00 in	29.00 in	45.00 in	6.28	
DCP	0.30	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
FES S1	32.60	ELLIPSE	29.00 in	45.00 in	36.00 in	36.00 in	29.00 in	45.00 in	6.28	
MEADOWLARK INLET MP-1	3.10	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
EX I-1 EX 18" RCP	1.20	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
 - Sewer sizes should not decrease downstream.
 - All hydraulics were calculated using the 'Used' parameters.
-

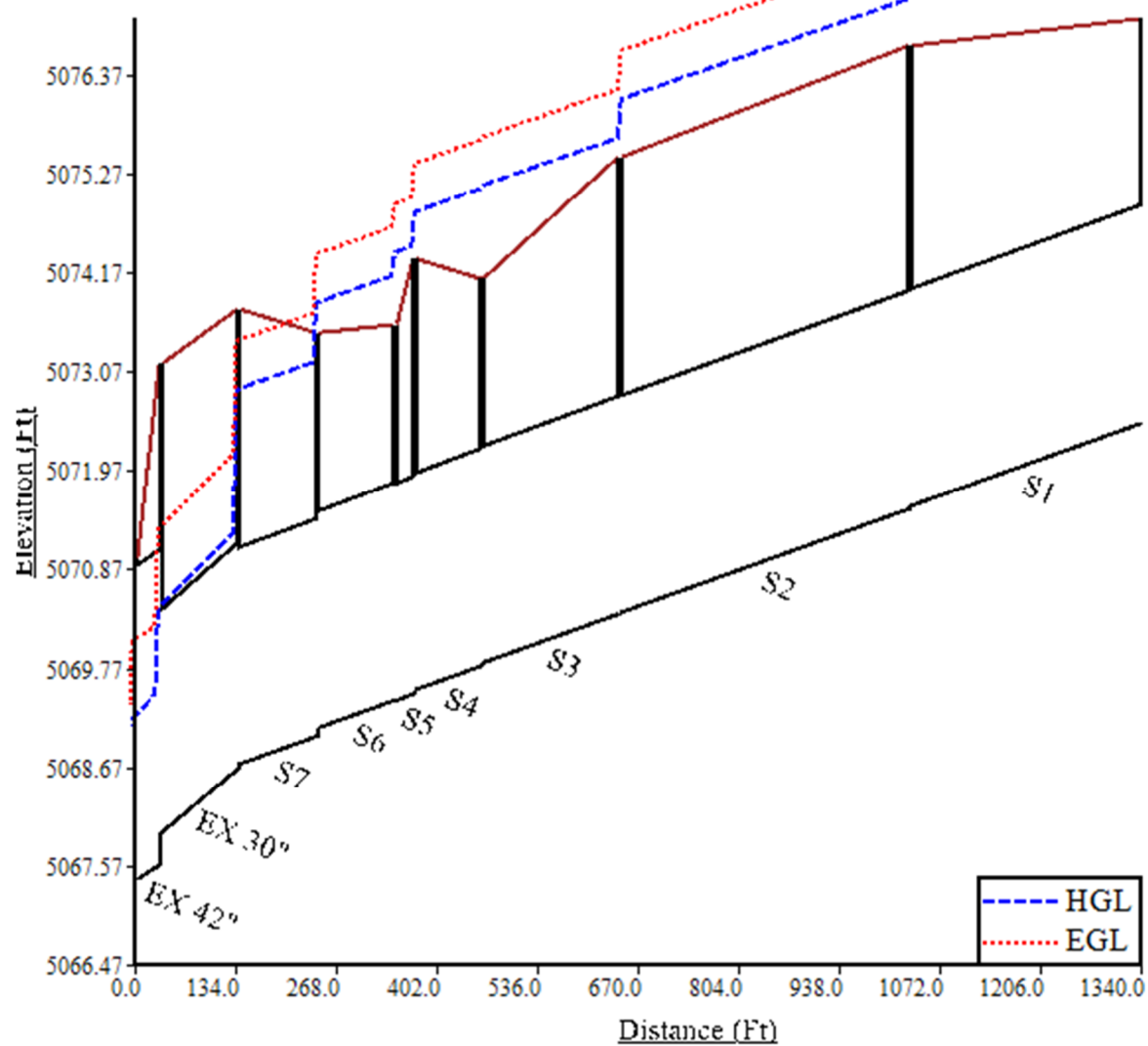
Grade Line Summary:

Tailwater Elevation (ft): 5069.17

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
EX MH-1 EX 42" RCP	5067.42	5067.60	0.00	0.00	5069.24	5069.53	5070.13	0.17	5070.30
MH-7 EX 30" RCP	5067.94	5068.70	0.05	0.00	5070.44	5071.35	5071.35	0.91	5072.27
MH-6 S7	5068.76	5069.08	0.53	0.78	5073.02	5073.33	5073.58	0.32	5073.89
DAP	5070.60	5070.78	0.00	0.00	5073.89	5073.89	5073.89	0.00	5073.89
MH-5 S6	5069.07	5069.33	0.02	0.45	5073.91	5074.12	5074.36	0.21	5074.57
MH-4 S5	5069.38	5069.47	0.22	0.00	5074.34	5074.41	5074.79	0.07	5074.86
MH-3 S4	5069.49	5069.81	0.32	0.00	5074.73	5074.99	5075.18	0.26	5075.44
MH-2 S3	5069.85	5070.40	0.03	0.00	5075.01	5075.45	5075.46	0.44	5075.90
DBP	5071.00	5071.12	0.00	0.00	5075.90	5075.91	5075.91	0.00	5075.91
MH-1 S2	5070.44	5071.60	0.02	0.34	5075.84	5076.73	5076.27	0.88	5077.15
DCP	5072.20	5072.30	0.00	0.00	5077.15	5077.15	5077.15	0.00	5077.15
FES S1	5071.59	5072.51	0.02	0.32	5077.08	5077.77	5077.50	0.69	5078.19
MEADOWLARK INLET MP-1	5069.10	5069.19	0.06	0.00	5073.91	5073.92	5073.95	0.02	5073.97
EX I-1 EX 18" RCP	5067.86	5068.24	0.00	0.00	5070.30	5070.31	5070.30	0.02	5070.32

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
 - Bend loss = Bend K * $V_{fi}^2 / (2 * g)$
 - Lateral loss = $V_{fo}^2 / (2 * g)$ - Junction Loss K * $V_{fi}^2 / (2 * g)$.
 - Friction loss is always Upstream EGL - Downstream EGL.
-

Outfall Trunkline - 100-YR



Program:

UDSEWER Math Model Interface 2.1.1.4

Run Date:

7/5/2023 2:18:41 PM

UDSewer Results Summary

Project Title: Westside Crossing-Phase II**Project Description:** Outfall Trunkline-100YR

Table of Contents

System Input

Manhole Input

Manhole Output

Sewer Input

Sewer Flow

Sewer Sizing

EGL/HGL Summary

System Input Summary

Rainfall Parameters**Rainfall Return Period:** 100**Rainfall Calculation Method:** Formula**One Hour Depth (in):****Rainfall Constant "A":** 28.5**Rainfall Constant "B":** 10**Rainfall Constant "C":** 0.786**Rational Method Constraints****Minimum Urban Runoff Coeff.:** 0.20**Maximum Rural Overland Len. (ft):** 500**Maximum Urban Overland Len. (ft):** 300**Used UDFCD Tc. Maximum:** Yes**Sizer Constraints****Minimum Sewer Size (in):** 18.00**Maximum Depth to Rise Ratio:** 0.90**Maximum Flow Velocity (fps):** 18.0**Minimum Flow Velocity (fps):** 2.0**Backwater Calculations:****Tailwater Elevation (ft):** 5070.92

Manhole Input Summary:

[illegible]

Manhole Output Summary:

[illegible]

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
EX MH-1 EX 42" RCP	37.00	5067.42	0.5	5067.60	0.013	0.00	0.00	CIRCULAR	42.00 in	42.00 in
MH-7 EX 30" RCP	108.80	5067.94	0.7	5068.70	0.013	0.05	0.28	CIRCULAR	30.00 in	30.00 in
MH-6 S7	105.20	5068.76	0.3	5069.08	0.013	0.95	0.25	ELLIPSE	29.00 in	45.00 in
DAP	8.80	5070.60	2.0	5070.78	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in
MH-5 S6	85.70	5069.07	0.3	5069.33	0.013	0.05	0.25	ELLIPSE	29.00 in	45.00 in
MH-4 S5	30.00	5069.38	0.3	5069.47	0.013	0.49	0.00	ELLIPSE	29.00 in	45.00 in
MH-3 S4	106.30	5069.49	0.3	5069.81	0.013	0.71	0.00	ELLIPSE	29.00 in	45.00 in
MH-2 S3	183.30	5069.85	0.3	5070.40	0.013	0.06	0.00	ELLIPSE	29.00 in	45.00 in
DBP	13.00	5071.00	0.9	5071.12	0.013	1.00	0.00	CIRCULAR	18.00 in	18.00 in
MH-1 S2	387.30	5070.44	0.3	5071.60	0.013	0.05	0.25	ELLIPSE	29.00 in	45.00 in
DCP	11.50	5072.20	0.9	5072.30	0.013	1.00	0.00	CIRCULAR	18.00 in	18.00 in
FES S1	308.20	5071.59	0.3	5072.51	0.013	0.05	0.25	ELLIPSE	29.00 in	45.00 in
MEADOWLARK INLET MP-1	17.80	5069.10	0.5	5069.19	0.013	1.32	0.00	CIRCULAR	18.00 in	18.00 in
EX I-1 EX 18" RCP	126.70	5067.86	0.3	5068.24	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
EX MH-1 EX 42" RCP	71.33	7.41	22.66	6.99	21.46	7.48	1.11	Supercritical Jump	37.00	1.37	
MH-7 EX 30" RCP	34.41	7.01	30.00	7.54	30.00	7.54	0.00	Pressurized	37.00	108.80	
MH-6 S7	37.73	6.01	23.55	7.38	28.48	6.00	0.69	Pressurized	37.00	105.20	
DAP	14.90	8.43	16.09	7.62	12.78	9.47	1.68	Pressurized	12.70	8.80	
MH-5 S6	37.73	6.01	23.55	7.38	28.48	6.00	0.69	Pressurized	37.00	85.70	
MH-4 S5	37.73	6.01	23.55	7.38	28.48	6.00	0.69	Pressurized	37.00	30.00	
MH-3 S4	37.73	6.01	23.55	7.38	28.48	6.00	0.69	Pressurized	37.00	106.30	
MH-2 S3	37.73	6.01	23.55	7.38	28.48	6.00	0.69	Pressurized	37.00	183.30	
DBP	9.99	5.65	12.20	5.41	11.00	6.10	1.22	Pressurized	6.90	13.00	
MH-1 S2	37.73	6.01	23.55	7.38	28.48	6.00	0.69	Pressurized	37.00	387.30	
DCP	9.99	5.65	13.15	5.78	12.19	6.28	1.16	Pressurized	8.00	11.50	
FES S1	37.73	6.01	23.55	7.38	28.48	6.00	0.69	Pressurized	37.00	308.20	
MEADOWLARK INLET MP-1	7.45	4.21	18.00	4.24	18.00	4.24	0.00	Pressurized	7.50	17.80	
EX I-1 EX 18" RCP	5.77	3.26	7.76	3.98	9.03	3.27	0.75	Pressurized	2.90	126.70	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
 - If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
 - If the sewer is pressurized, full flow represents the pressurized flow conditions.
-

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
EX MH-1 EX 42" RCP	37.00	CIRCULAR	42.00 in	42.00 in	33.00 in	33.00 in	42.00 in	42.00 in	9.62	
MH-7 EX 30" RCP	37.00	CIRCULAR	30.00 in	30.00 in	33.00 in	33.00 in	30.00 in	30.00 in	4.91	
MH-6 S7	37.00	ELLIPSE	29.00 in	45.00 in	42.00 in	42.00 in	29.00 in	45.00 in	6.28	
DAP	12.70	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
MH-5 S6	37.00	ELLIPSE	29.00 in	45.00 in	42.00 in	42.00 in	29.00 in	45.00 in	6.28	
MH-4 S5	37.00	ELLIPSE	29.00 in	45.00 in	42.00 in	42.00 in	29.00 in	45.00 in	6.28	
MH-3 S4	37.00	ELLIPSE	29.00 in	45.00 in	42.00 in	42.00 in	29.00 in	45.00 in	6.28	
MH-2 S3	37.00	ELLIPSE	29.00 in	45.00 in	42.00 in	42.00 in	29.00 in	45.00 in	6.28	
DBP	6.90	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
MH-1 S2	37.00	ELLIPSE	29.00 in	45.00 in	42.00 in	42.00 in	29.00 in	45.00 in	6.28	
DCP	8.00	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
FES S1	37.00	ELLIPSE	29.00 in	45.00 in	42.00 in	42.00 in	29.00 in	45.00 in	6.28	
MEADOWLARK INLET MP-1	7.50	CIRCULAR	18.00 in	18.00 in	21.00 in	21.00 in	18.00 in	18.00 in	1.77	
EX I-1 EX 18" RCP	2.90	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
 - Sewer sizes should not decrease downstream.
 - All hydraulics were calculated using the 'Used' parameters.
-

Grade Line Summary:

Tailwater Elevation (ft): 5070.92

Element Name	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
EX MH-1 EX 42" RCP	5067.42	5067.60	0.00	0.00	5070.92	5070.92	5071.15	0.01	5071.16
MH-7 EX 30" RCP	5067.94	5068.70	0.04	0.00	5070.96	5071.32	5071.32	0.88	5072.20
MH-6 S7	5068.76	5069.08	0.51	0.75	5072.92	5073.23	5073.46	0.30	5073.76
DAP	5070.60	5070.78	0.04	0.00	5073.27	5073.39	5074.07	0.13	5074.20
MH-5 S6	5069.07	5069.33	0.03	0.40	5073.66	5073.90	5074.20	0.25	5074.44
MH-4 S5	5069.38	5069.47	0.26	0.00	5074.17	5074.25	5074.71	0.09	5074.79
MH-3 S4	5069.49	5069.81	0.38	0.00	5074.64	5074.94	5075.18	0.31	5075.48
MH-2 S3	5069.85	5070.40	0.03	0.00	5074.98	5075.51	5075.52	0.53	5076.04
DBP	5071.00	5071.12	0.24	0.00	5076.04	5076.10	5076.28	0.06	5076.34
MH-1 S2	5070.44	5071.60	0.03	0.40	5075.94	5077.05	5076.48	1.12	5077.59
DCP	5072.20	5072.30	0.32	0.00	5077.59	5077.66	5077.91	0.07	5077.98
FES S1	5071.59	5072.51	0.03	0.40	5077.49	5078.38	5078.03	0.89	5078.91
MEADOWLARK INLET MP-1	5069.10	5069.19	0.37	0.00	5073.85	5073.94	5074.13	0.09	5074.22
EX I-1 EX 18" RCP	5067.86	5068.24	0.00	0.00	5071.12	5071.22	5071.16	0.10	5071.26

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = $Bend\ K * V_{fi}^2 / (2 * g)$
- Lateral loss = $V_{fo}^2 / (2 * g) - Junction\ Loss\ K * V_{fi}^2 / (2 * g)$.
- Friction loss is always Upstream EGL - Downstream EGL.

Note:

A Peak Flow Rate of 37 cfs was chosen for the 100-YR flow through the trunkline outfall as this resulted in an HGL elevation of 5078.38 at the upstream flared end section. This elevation reflects the adjacent as-built top-of-curb elevation where flows overtop and enter Meadowlark Avenue at Design Point 20 (see preliminary Proposed Conditions Drainage Map, Exhibit B, located in the appendix of this report). All remaining flows that aren't anticipated to enter the trunkline outfall system will enter Meadowlark Ave. and be analyzed using allowable street capacities per Town of Berthoud Design and Construction Specifications, Section 602.4 (C).

APPENDIX D
Relevant Pages from other Drainage Studies

January 2002 / Revised October 2002

U.S. Highway 287 Berthoud Bypass Segment #2 Final Hydrology & Hydraulics Report

CDOT Project No. NH2873-114

Colorado Department of Transportation

Region 4 • 1420 Second Street • Greeley, Colorado • 80631

SH287 UR 2002
Copy 2



URS



Town
Copy

FINAL DRAINAGE REPORT

GATEWAY PARK

BERTHOUD, COLORADO

Prepared By:

Drexel, Barrell & Co.

4840 Pearl East Circle, Suite 114

Boulder, Colorado 80301

(303) 442-4338

Prepared For:

Roche Constructors, Inc.

361 71st Avenue

Greeley, Colorado 80632

(970) 356-3611

Date Prepared: April 5, 2001

Revised May 26, 2001

Revised January 8, 2002

Project No. E5082.3

As can be seen in the CUHP Output Summary, located in Appendix B, Sub-Basin 42 has a 2-year historic peak flow of 9.7 cfs and a 100-year historic peak flow of 30.6 cfs. Similarly, Sub-Basin 43 has a 2-year historic peak flow of 8.6 cfs and a 100-year historic peak flow of 28.4 cfs. Once developed, the peak discharge from the West Pond will be 4.8 cfs and 25.4 cfs for 2-year and the 100-year storms respectively. Similarly, the peak discharge from the East Pond will be 5.8 cfs and 28.0 cfs for the 2-year and 100-year storms respectively. While the on-site detention ponds have the effect of reducing the peak flows from the developed site, the overall flows are slightly higher when offsite flows are considered. This phenomenon is due primarily to the coincidence of peak flows from offsite and developed sources. This condition was considered in the preliminary design phase with the recommendation to include the detention ponds in the final design even though it results in a higher peak discharge from on-site and off-site sources.

Off-site runoff from the west of the project (Sub-Basins 1 and 2) will be directed into a swale that will be designed to carry the runoff along the southern boundary to the southeast corner of the site. Similarly, off site runoff from the north (Sub-Basins 3, 15 and 16) will be directed into a swale that will begin at the approximate midpoint of the northern boundary line and flow east and south along the northern and eastern boundaries to the southeast corner of the site. Although this latter swale will not have the capacity to handle an emergency surge in excess of that generated during a 100-year storm event, the park area located at the center of this project will provide for a means of flood transmission through the development.

As discussed previously, runoff collected at the intersection of U.S. 287 and County Road 17 currently sheet flows to the southeast across the intersection. A significant portion of this project will be the elimination of this problem and will involve the installation of a 9'x4' box culvert beneath the intersection. The box culvert will terminate in a swale, designed as part of Berthoud Common Subdivision, that begins at the southeast corner of the intersection, flows to the south until reaching the south side of Welch Avenue, and then turns east, paralleling Welch Avenue. The design of this swale considered the eventuality of further upstream development and was sized to accommodate the flow rates suggested in the Bein SID Study. In addition, the swale lies within an easement that extends to U.S. 287 right-of-way, allowing it to be directly accessed from either the north or the northwest.

A subsurface irrigation pipe will be installed along the eastern property line of this project, replacing the existing open channel ditch owned by the Loveland Lake and Ditch Company. The integrity of this ditch will be maintained throughout the course of this project.

FINAL DRAINAGE REPORT
THE VILLAGE AT MATTHEWS FARMS
BERTHOUD, COLORADO

Prepared By:

Gorton Scott Engineering, LLC
3210 Billington Drive
Erie, Colorado 80516
(303) 438-5658

Prepared For:

M and K Investments of Berthoud, LLC
900 NCR 19
Berthoud, Colorado 80513
(970) 532-7741

Date Prepared: June 4, 2002
Revised: July 14, 2002

Town Copy

Basin EOS3 – Basin EOS3 constitutes a portion of the largely undeveloped area and a portion of Block 4. The runoff generated within this basin will sheet flow off of the site to the south, as it does currently.

Basin EOS4 – Basin EOS4 is located in the southeast corner of the site and includes a portion of an outlot that is adjacent to Block 4 and a small portion of the southern extreme of Meadowlark Drive. The runoff generated in this basin will be collected in the swale that flows to the south, along the west side of Meadowlark Drive.

All of the calculations used to determine runoff coefficients, times of concentration and peak runoff rates (2 year and 100 year frequencies) can be found in Appendix B of this report.

STORM WATER DETENTION

Although separated, the three detention facilities located in The Village at Matthews Farms (Ponds EA, EB, and EC) will work as one facility. Ponds EA and EB will be connected to Pond EC with the use of subsurface piping, that will allow storm water to flow back and forth between the ponds. The combining of the three ponds will yield the following characteristics (the calculations used to determine this information are located in Appendix B):

Basins Intercepted: Basins E1 through E14

2 year Storage Volume Required: 0.59 acre-feet

2 year Storage Volume Provided: 0.59 acre-feet

2 year Allowable Release Rate: 3.5 cfs (adjusted down to account for the un-detained Basins EOS1 through EOS4)

2 year Release Rate: 3.5 cfs (adjusted down to account for the un-detained Basins EOS1 through EOS4)

2 year Water Surface Elevation: 5073.85

100 year Storage Volume Required: 2.04 acre-feet

100 year Storage Volume Provided: 2.06 acre-feet

100 year Allowable Release Rate: 13.5 cfs (adjusted down to account for the un-detained Basins EOS1 through EOS4)

100 year Release Rate: 13.5 cfs (adjusted down to account for the un-detained Basins EOS1 through EOS4)

100 year Water Surface Elevation: 5075.80

Outlet Description: The 2 year release rate will be metered with the use of a low flow orifice that will be partially blocked with a horizontal steel plate. The 100 year release will be metered with the use of a weir. Both of these structures will be placed in the side of a Type C inlet. The inlet will discharge, via a culvert, to the aforementioned Meadowlark Drive swale. Since the downstream invert of the culvert is below the flow line elevation of the ditch, it will be necessary to widen and deepen the ditch all the way to the intersection of Meadowlark Drive and State Highway 56.

Developed Runoff Coefficients

Matthews Farms (East Side)

Berthoud, Colorado

Basin	Area "A" (acres)	Description	C	CA	I (%)	IA(%)
EOS1		Residential (See Note)	0.47	0.00	37%	0%
		Parks	0.25	0.00	5%	0%
	0.58	Unimproved Areas	0.20	0.12	2%	1%
		Asphalt - Concrete - Roofs	0.95	0.00	90%	0%
		Lawns, Sandy Soil 2-7%	0.15	0.00	0%	0%
	ΣCA =			0.12		
	ΣA =			0.58		
Weighted Runoff Coefficient (ΣCA/ΣA) =				0.20		
					ΣIA =	1%
					ΣA =	0.58
Weighted Imperviousness (ΣIA/ΣA) =						2%
EOS2	0.77	Residential (See Note)	0.47	0.36	37%	28%
		Parks	0.25	0.00	5%	0%
	0.21	Unimproved Areas	0.20	0.04	2%	0%
	0.01	Asphalt - Concrete - Roofs	0.95	0.01	90%	1%
		Lawns, Sandy Soil 2-7%	0.15	0.00	0%	0%
	ΣCA =			0.41		
	ΣA =			0.99		
Weighted Runoff Coefficient (ΣCA/ΣA) =				0.42		
					ΣIA =	30%
					ΣA =	0.99
Weighted Imperviousness (ΣIA/ΣA) =						30%
EOS3	0.77	Residential (See Note)	0.47	0.36	37%	28%
	0.01	Parks	0.25	0.00	5%	0%
	1.45	Unimproved Areas	0.20	0.29	2%	3%
	0.07	Asphalt - Concrete - Roofs	0.95	0.07	90%	6%
		Lawns, Sandy Soil 2-7%	0.15	0.00	0%	0%
	ΣCA =			0.72		
	ΣA =			2.30		
Weighted Runoff Coefficient (ΣCA/ΣA) =				0.31		
					ΣIA =	38%
					ΣA =	2.30
Weighted Imperviousness (ΣIA/ΣA) =						16%
EOS4	0.01	Residential (See Note)	0.47	0.00	37%	0%
	0.08	Parks	0.25	0.02	5%	0%
		Unimproved Areas	0.20	0.00	2%	0%
	0.06	Asphalt - Concrete - Roofs	0.95	0.06	90%	5%
	0.02	Lawns, Sandy Soil 2-7%	0.15	0.00	0%	0%
	ΣCA =			0.08		
	ΣA =			0.17		
Weighted Runoff Coefficient (ΣCA/ΣA) =				0.50		
					ΣIA =	6%
					ΣA =	0.17
Weighted Imperviousness (ΣIA/ΣA) =						36%

Time of Concentration

Matthews Farms (East Side)

Berthoud, Colorado

Basin Data			Initial / Overland Time t_i			Travel Time t_t				t_i+t_t	t_c Check (Urbanized Basins)		Result
Basin	Area (ac)	C	Length (ft)	Slope (%)	t_i	Length (ft)	Slope (%)	Vel (fps)	t_t (min)	t_c (min)	Total Length (ft)	$t_c = (L/180)+10$	t_c (min)
EH	31.22	0.20	500	0.6	44.6	1730	0.5	1.1	26.2	70.8	N/A	N/A	70.8
E1	3.19	0.28	130	0.8	18.8	641	0.6	1.2	8.9	27.7	771	14.3	14.3
E2	5.27	0.43	145	0.9	15.6	472	0.6	1.6	4.9	20.5	617	13.4	13.4
E3	1.21	0.32	119	0.8	17.1	359	0.6	1.6	3.7	20.8	478	12.7	12.7
E4	4.20	0.47	97	1.9	9.4	1018	0.5	1.5	11.3	20.7	1115	16.2	16.2
E5	0.80	0.49	88	1.0	10.7	112	0.5	1.5	1.2	11.9	200	11.1	11.1
E6	0.70	0.33	80	2.8	9.1	445	0.5	1.5	4.9	14.0	525	12.9	12.9
E7	0.58	0.63	84	2.9	5.6	210	0.8	1.8	1.9	7.5	294	11.6	7.5
E8	1.65	0.29	153	1.1	18.1	409	0.7	1.3	5.2	23.3	562	13.1	13.1
E9	0.98	0.47	87	2.0	8.7	387	0.5	1.5	4.3	13.0	474	12.6	12.6
E10	2.77	0.39	500	0.8	32.0	407	0.5	1.5	4.5	36.5	907	15.0	15.0
E11	0.41	0.28	59	25.0	4.0	100	0.5	1.5	1.1	5.1	159	10.9	5.1
E12	2.16	0.47	94	2.0	9.1	826	0.6	1.6	8.6	17.7	920	15.1	15.1
E13	2.25	0.49	98	2.0	9.0	725	0.6	1.6	7.6	16.6	823	14.6	14.6
E14	1.01	0.34	47	11.9	4.3	573	0.5	1.5	6.4	10.7	620	13.4	10.7
EOS1	0.58	0.20	66	1.0	13.7	0			0.0	13.7	66	10.4	10.4
EOS2	0.99	0.42	73	1.5	9.5	0			0.0	9.5	73	10.4	9.5
EOS3	2.30	0.31	181	0.9	20.6	288	0.5	1.1	4.4	25.0	469	12.6	12.6
EOS4	0.17	0.50	78	2.7	7.1	24	0.7	1.7	0.2	7.3	102	10.6	7.3

Notes: Overland Flow Times were calculated using the following equation: $1.87 \times (1.1 - C) \times D^{1/2} / S^{1/3}$

Travel Times velocities were obtained from Figure 3-2, Volume I, Urban Drainage and Flood Control District Storm Drainage Criteria Manual. The "Shallow Gutter Flow" curve was used for all basins except Basins EH, E1, E8 and EOS3, which utilized the "Grassed Waterway" curve.

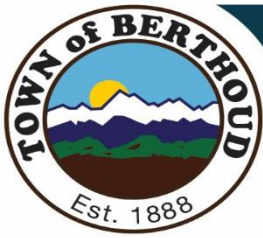
Since Basin EH has been analyzed under historic conditions, the "Urbanized Check" was not used.

Runoff
Matthews Farms (East Side)
Berthoud, Colorado

Basin	Area (acres)	CC _r (C _r =1.00)	CC _r (C _r =1.25)	Tc (min)	I ₂ (in/hr)	I ₁₀₀ (in/hr)	Q ₂ (cfs)	Q ₁₀₀ (cfs)
EH	31.22	0.20	0.25	70.8	0.9	2.4	5.6	18.7
E1	3.19	0.28	0.35	14.3	2.4	6.2	2.1	6.9
E2	5.27	0.43	0.54	13.4	2.4	6.4	5.4	18.2
E3	1.21	0.32	0.40	12.7	2.5	6.6	1.0	3.2
E4	4.20	0.47	0.59	16.2	2.2	5.9	4.3	14.6
E5	0.80	0.49	0.61	11.1	2.6	6.9	1.0	3.4
E6	0.70	0.33	0.41	12.9	2.5	6.5	0.6	1.9
E7	0.58	0.63	0.79	7.5	3.0	8.2	1.1	3.8
E8	1.65	0.29	0.36	13.1	2.5	6.5	1.2	3.9
E9	0.98	0.47	0.59	12.6	2.5	6.6	1.2	3.8
E10	2.77	0.39	0.49	15.0	2.3	6.1	2.5	8.3
E11	0.41	0.28	0.35	5.1	3.3	9.3	0.4	1.3
E12	2.16	0.47	0.59	15.1	2.3	6.1	2.3	7.8
E13	2.25	0.49	0.61	14.6	2.3	6.2	2.5	8.5
E14	1.01	0.34	0.43	10.7	2.6	7.0	0.9	3.0
EOS1	0.58	0.20	0.25	10.4	2.7	7.0	0.3	1.0
EOS2	0.99	0.42	0.53	9.5	2.8	7.3	1.2	3.8
EOS3	2.30	0.31	0.39	12.6	2.5	6.6	1.8	5.9
EOS4	0.17	0.50	0.63	7.3	3.0	8.3	0.3	0.9

APPENDIX E

Exhibit A: Existing Conditions Drainage Plan
Exhibit B: Proposed Conditions Drainage Plan



Town of Berthoud
807 Mountain Ave.
P.O. Box 1229
Berthoud, CO 80513
970.532.2643

REVIEW COMMENTS

DATE: July 27, 2023

Note: A Technical Review Committee Meeting is required prior to moving forward in the process.

Project Name: Westside Crossing Phase 2

Project Type: Preliminary Plat

Location: NE Corner of US HWY 287 and HWY 56

Project Applicant: Scott Charpentier

It has been approximately four weeks since your submittal. As promised, the Town of Berthoud is providing comments to you at this time to advance the development review process.

THE FOLLOWING AGENCIES RECEIVED OR WERE MAILED THIS SUBMITTAL AND THEIR RESPONSES ARE PROVIDED ON THE FOLLOWING PAGES:

TOWN OF BERTHOUD

- ☐ Engineer/Public Works Director
- ☐ Project Planner
- ☐ Town Attorney
- ☐ Town Arborist
- ☐ Traffic Consultant

OTHER AGENCIES

- ☐ Berthoud Fire Protection District
- ☐ Little Thompson Water District
- ☐ Ditch Companies
- ☐ CDOT
- ☐ Larimer County Engineering
- ☐ Larimer County Health Dept.
- ☐ Larimer County Planning

Specific and complete comments are provided under each individual agency's section. Please read the entire report and address each comment. If you have any questions or concerns regarding any comment, contact the Planning Department or the individual agency to clarify the statement and reach an understanding. It is in your interest to do so in order to streamline the review process.

"NO RESPONSE" indicates an agency has not sent any comments to the project planner before the writing of this summary.

If you have any questions concerning comments on your project or the development review process, please feel free to contact the Planning Department at 281.352.2709.

TECHNICAL REVIEW COMMITTEE COMMENTS

DATE: July 27, 2023

Project Name: Westside Crossing

PLANNING
Community Development Department
281-352-2709 will.charles@baselinecorp.com

Response received: 07/27/2023

1. Preliminary Plat is scheduled for PC on 8/10. Any outstanding comments will be added as conditions of approval.

LTWD
Clayton Orback corback@ltwd.org

Response received: 07/25/2023

See attached.

BASELINE ENGINEERING
Luke Seeber luke.seeber@baselinecorp.com; Noah Nemmers noah@baselinecorp.com

Response received: 07/26/2023

See attached.

Please Note: Comments noted in these plans and/or project documents may be applicable in many locations. Please address all comments consistently throughout all project plans and/or documents.

GRADING NOTES	
1.	CONSTRUCTION SHALL ADHERE TO THE FOLLOWING SEQUENCE UNLESS OTHERWISE SPECIFIED BY THE TOWN ENGINEER: SANITARY SEWER INSTALLATION, WATER MAIN INSTALLATION, CURB AND GUTTER INSTALLATION, WATER SERVICE INSTALLATION.
2.	COMPACTION OF ALL TRENCHES MUST BE ATTAINED AND COMPACTION TEST RESULTS SUBMITTED TO THE ENGINEER AND THE TOWN OF BERTHOUD PRIOR TO FINAL ACCEPTANCE.
3.	ALL WORK, INCLUDING CORRECTION WORK, SHALL BE INSPECTED BY A TOWN REPRESENTATIVE WHO SHALL HAVE THE AUTHORITY TO HALT CONSTRUCTION WHEN STANDARD CONSTRUCTION PRACTICES ARE NOT BEING ADHERED TO.
4.	DEVELOPER AND BUILDER SHALL REGULARLY PATROL THE PUBLIC LANDS ADJACENT TO THE DEVELOPMENT TO REMOVE CONSTRUCTION DEBRIS AND KEEP THE SITE CLEAN AND SAFE.
5.	ALL SITE GRADING (EXCAVATION, EMBANKMENT, AND COMPACTION) SHALL CONFORM TO THE RECOMMENDATIONS OF THE LATEST SOILS INVESTIGATION FOR THIS PROJECT. THIS SHALL FURTHER BE IN CONFORMANCE WITH THE TOWN OF BERTHOUD STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC AND PRIVATE IMPROVEMENTS", LATEST EDITION. A CDPs GENERAL PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES SHALL BE OBTAINED PRIOR TO ANY GRADING BEING PERFORMED ON SITES ONE (1) ACRE OR LARGER IN SIZE. THESE PERMITS CAN BE OBTAINED FROM THE STATE WATER QUALITY CONTROL DIVISION.
6.	NATURAL VEGETATION SHALL BE RETAINED AND PROTECTED WHEREVER POSSIBLE. EXPOSURE OF SOIL TO EROSION BY REMOVAL OR DISTURBANCE OF VEGETATION SHALL BE LIMITED TO THE AREA REQUIRED FOR IMMEDIATE CONSTRUCTION OPERATION AND FOR THE SHORTEST PRACTICAL PERIOD OF TIME.
7.	TOPSOIL SHALL BE STOCKPILED TO THE EXTENT PRACTICABLE ON THE SITE FOR USE ON AREAS TO BE REVEGETATED. ANY AND ALL STOCKPILES SHALL BE LOCATED AND PROPER MEASURES TAKEN TO CONTROL EROSION AND SEDIMENT MOVEMENT.
8.	AT ALL TIMES, THE PROPERTY SHALL BE MAINTAINED AND/OR WATERED TO PREVENT WIND-CAUSED EROSION. EARTHWORK OPERATIONS SHALL BE DISCONTINUED WHEN DUST SIGNIFICANTLY IMPACTS ADJACENT PROPERTY. IF EARTHWORK IS COMPLETE OR DISCONTINUED AND DUST FROM THE SITE CONTINUES TO CREATE PROBLEMS, THE OWNER/DEVELOPER SHALL IMMEDIATELY INSTITUTE MITIGATIVE MEASURES AND SHALL CORRECT DAMAGE TO ADJACENT PROPERTY.
9.	PERMANENT SLOPES SHALL NOT EXCEED 4:1 (H:V) IN AREAS TO BE SEED OR SOODED. RETAINING WALLS SHALL BE REVIEWED AND APPROVED BY SEPARATE APPLICATION TO THE TOWN OF BERTHOUD.

10. THIS EROSION AND SEDIMENT CONTROL PLAN HAS BEEN SUBMITTED TO THE TOWN OF BERTHOUD AND IS IN GENERAL CONFORMANCE WITH THE TOWN'S EROSION CONTROL STANDARDS. ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURE MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEM OR IF THE PROPOSED EROSION CONTROL MEASURES DO NOT FUNCTION AS INTENDED. THE REQUIREMENTS OF THIS EROSION CONTROL PLAN AND THE OBLIGATION OF THE LANDOWNER SHALL RUN WITH THE LAND UNTIL SUCH TIME AS THE EROSION CONTROL PLAN IS PROPERLY COMPLETED, OFFICIALLY MODIFIED, OR VOIDED.

WATER NOTES:

1. ALL WATER MATERIALS, CONSTRUCTION, AND TESTING SHALL MEET THE REQUIREMENTS OF BERTHOUD STANDARDS AND SPECIFICATIONS AND THE BERTHOUD FIRE PROTECTION DISTRICT SPECIFICATIONS.

2. FIRE HYDRANT SPECIFICATIONS:

- a. ALL FIRE HYDRANTS WILL BE MUELLER.
- b. ALL HYDRANTS WILL HAVE A FIVE AND ONE-QUARTER (5-1/4) INCH OR LARGER VALVE OPENING, TWO (2) TWO AND ONE-HALF (2-1/2) INCH HOSE NOZZLES, ONE (1) PUMPER NOZZLE AND SIX (6) INCH OR LARGER MECHANICAL JOINT INLET.
- c. ALL NOZZLES SHALL HAVE NATIONAL STANDARD THREADS.
- d. THE HYDRANT SHALL BE OF TRAFFIC HAZARD TYPE WITH SAFETY FEATURES WHICH WILL PREVENT BARREL BREAKAGE.

3. EROSION CONTROL MEASURES SHALL BE MAINTAINED UNTIL THE EROSION CONTROL PLAN IS COMPLETED, MODIFIED, OR OPEN RIGHT

3. WATER SERVICE LINE SPECIFICATIONS:
 - a. CORPORATION STOPS SHALL HAVE INLET THREADED CC TYPE, OUTLET COPPER COMPRESSION OR FLARE, NO SOLDERING WILL BE ALLOWED.
 - b. SERVICE SADDLES SHALL BE "O" RING GASKET, DOUBLE BAND, OR HINGE PIN CC THREAD 3 INCH - 2 INCH COPPER.
 - c. CURB STOP STYLE SHALL BE COMPRESSION OR FLARED COPPER BOTH ENDS, MINNEAPOLIS PATTERN VALVE-THREADS AROUND TO ALLOW MINNEAPOLIS STYLE CURB BOX.
 - d. CURB BOX SHALL HAVE MINNEAPOLIS BASE EXTENSION TYPE CURB BOXES, CAST IRON LID AND BASE WITH BRASS PENTAGON HEAD PLUG USING A 1 1/2 INCH UPPER SECTION.
4. ALL WATER VALVES SHALL OPEN LEFT.
5. THE MINIMUM COVER OVER THE WATER LINE IS 5 FEET AND THE MAXIMUM COVER IS 6 FEET UNLESS OTHERWISE NOTED IN THE PLANS AND APPROVED BY THE TOWN.
6. PRIOR TO INSTALLATION OF WATER MAINS, ROAD/DRIVE CONSTRUCTION MUST HAVE PROGRESSED TO AT LEAST THE "SUB-GRADE" STATE. SUB-GRADE IS DEFINED AS AN ELEVATION OF NO MORE THAN SEVEN (7) INCHES BELOW THE FINISHED STREET GRADE. ALL VALVE BOXES AND FIRE HYDRANTS WILL BE ADJUSTED TO THE FINAL FINISHED GRADE BY THE CONTRACTOR.
7. BEFORE ANY TAPS ARE MADE FROM MAINS, APPLICATIONS FOR THE TAPS MUST BE RECEIVED AND APPROVED BY THE TOWN.
8. TRACER WIRE SHALL BE USED FOR ALL NON-METALLIC WATER MAINS. TRACER WIRE SHALL BE BROUGHT UP TO TEST STATIONS AT ALL FIRE HYDRANTS.
9. PVC WATER MAINS SHALL BE AWWA C900, DR 18
10. ALL WATER SERVICES SHALL BE TYPE K COPPER.

11. CONTRACTOR TO CONTACT BUILDING DEPARTMENT PRIOR TO INSTALLATION OF METER SETTER.

SANITARY NOTES

1. MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE LATEST EDITION OF THE TOWN OF BERTHOUD STANDARDS AND SPECIFICATIONS AND WORK SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY AUTHORIZED TOWN OF BERTHOUD PERSONNEL.

2. NEW SEWER MAINS SHALL BE POLYVINYL CHLORIDE (PVC) ASTM D3034 SDR-35 PIPE AND IN ACCORDANCE WITH THE ABOVE REFERENCED SPECIFICATIONS.
3. CONTRACTOR TO VERIFY LOCATIONS AND ELEVATIONS OF EXISTING UTILITIES PRIOR TO COMMENCING ANY CONSTRUCTION.

4. THE CONTRACTOR SHALL NOTIFY THE TOWN A MINIMUM OF 48 HOURS AND A MAXIMUM OF 96 HOURS PRIOR TO STARTING CONSTRUCTION OR PRIOR TO RESUMING CONSTRUCTION AFTER A BREAK.

5. MAINTAIN A MINIMUM OF 10 FEET HORIZONTAL SEPARATION OUTSIDE DIAMETER TO OUTSIDE DIAMETER BETWEEN WATER MAINS AND ALL SEWER MAINS AND MANHOLES.

6. ALL SEWER MAINS CROSSING WATER MAINS WITH LESS THAN 18 INCHES OF SEPARATION SHALL BE ENCASED IN CONCRETE

7. RIM ELEVATIONS SHOWN ARE APPROXIMATE AND SHOULD NOT BE TAKEN AS FINAL. ALL MANHOLES SHALL BE FINAL ADJUSTED AFTER PAVING SUCH THAT THE RIM IS $\frac{1}{4}$ TO $\frac{1}{2}$ INCH BELOW FINISHED ASPHALT. MANHOLES IN UNPAVED AREAS SHALL BE SET SO THAT THE RIM IS 0.5' ABOVE FINISHED GRADE. BURIED MANHOLES LOCATED IN CULVERTED AREAS ARE APPROXIMATE. TOWN ENGINEERS ARE PLEASED TO CALL A LOW RIM MANHOLES FACTORY AND BUY A BOTTOM OF

8. INVERT (AS-BUILT) DATA SHALL BE COLLECTED BY A LICENSED SURVEYOR ON EACH PIPE INVERT IN A MANHOLE. CENTER OF MANHOLE SURVEYING IS NOT

9. THE CONTRACTOR SHALL HAVE A SET OF APPROVED PLANS ON SITE AT ALL TIMES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RECORDING ACTUAL RECORD DRAWING DIMENSIONS AND DISTANCES AS WELL AS SERVICE LOCATIONS ON THESE PLANS AND SUBMITTING THEM TO THE ENGINEER FOR

10. BEFORE ANY CONSTRUCTION COMMENCES, A PLUG SHALL BE INSTALLED TO PREVENT DRAINAGE THROUGH THE NEW SEWER LINE FROM ENTERING THE EXISTING SEWER LINE. THIS PLUG WILL BE INSTALLED IN THE MANHOLE, WHICH CONNECTS NEW WORK WITH THE EXISTING AND MAY NOT BE REMOVED UNTIL

11. UNDERDRAINS, IF INSTALLED, ARE THE RESPONSIBILITY OF THE DEVELOPER. THE TOWN ASSUMES NO LIABILITY FOR ANY PORTION OF OR ANY DAMAGE CAUSED BY UNDERDRAINS. ABSOLUTELY NO PART OF AN UNDERDRAIN SYSTEM, INCLUDING CLEAN OUTS, WILL BE ALLOWED INSIDE OF SANITARY SEWER MANHOLES.

ALL UNDERDRAINS SHALL BE INSTALLED BELOW THE SANITARY SEWER AND OFFSET TO THE SIDE. PIPE MATERIAL SHALL BE DIFFERENT COLOR THAN SANITARY SEWER.

12. NO SERVICE LATERALS SMALLER THAN 8-INCH IN DIAMETER SHALL ENTER MANHOLES.

13. SERVICE CROSSINGS OF CURB SHALL BE MARKED WITH A CUT "S" IN CURB FACE. PAINT IS NOT ACCEPTABLE. SERVICE SHALL BE EXTENDED INTO THE LOT A MINIMUM OF 10 FEET.

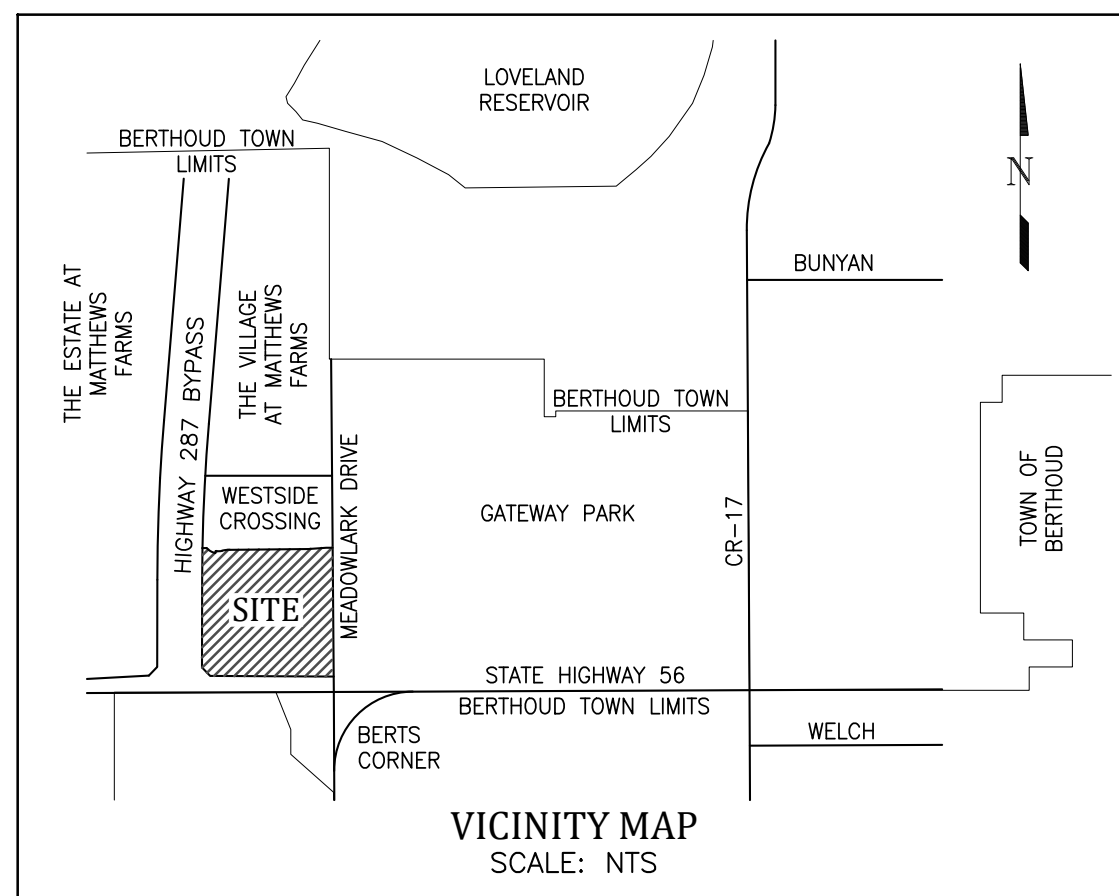
14. CONTRACTOR SHALL MARK THE END OF ALL SEWER SERVICES AND MAIN STUBS WITH A CARBONITE COMPOSITE UTILITY MARKER WITH MINIMUM OF FOUR FEET ABOVE GRADE, PAINTED GREEN.

15. ALL 8-INCH PIPES SHALL HAVE SQUIGGLE (DOT #8 BEDDING) UNLESS OTHERWISE SHOWN OR THE TOWN MAY APPROVE AN ALTERNATE BEDDING IN SPECIAL

16. PRIOR TO APPROVAL, ALL SANITARY SEWER PIPES SHALL BE PRESSURE TESTED PER ASTM C924. ALL MANHOLES SHALL BE VACUUM-TESTED PER UNIB-98.

17. PRIOR TO REMOVAL OF PLUGS AT MANHOLES, PIPE SHALL BE JET-CLEANED AND VACUUMED TO REMOVE DEBRIS AND VIDEOED. NOTICE SHALL BE GIVEN TO THE TOWN INSPECTOR ONE (1) WEEK PRIOR TO CLEANING. INSPECTOR MUST BE PRESENT DURING THE OPERATION. ONCE APPROVAL HAS BEEN GIVEN BY INSPECTOR, PLUGS MAY ONLY BE REMOVED AFTER CONDITIONAL ACCEPTANCE BY THE TOWN.

19. TWENTY (20) MONTHS AFTER CONSTRUCTION AND PRIOR TO THE EXPIRATION OF WARRANTY, THE DEVELOPER SHALL CAMERA/VIDEO THE SANITARY SEWER



1	COVER
2	PRELIMINARY SITE PLAN
3	PRELIMINARY UTILITY PLAN
4	PRELIMINARY GRADING PLAN
5	PRELIMINARY DETAIL SHEET AND STREET SECTIONS
6	L1.1 OVERALL LANDSCAPE PLAN
7	L1.2 PRELIMINARY LANDSCAPE PLAN 'A'
8	L1.3 PRELIMINARY LANDSCAPE PLAN 'B'
9	L1.4 LANDSCAPE NOTES & PLAN MATERIAL SCHEDULE
10	L1.5 LANDSCAPE DETAILS

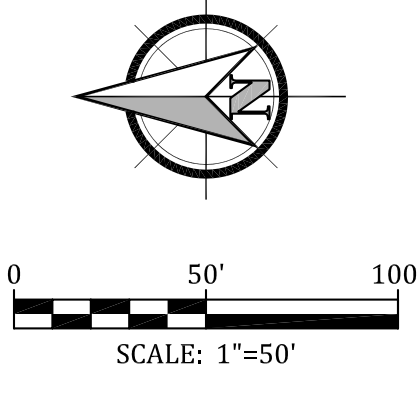
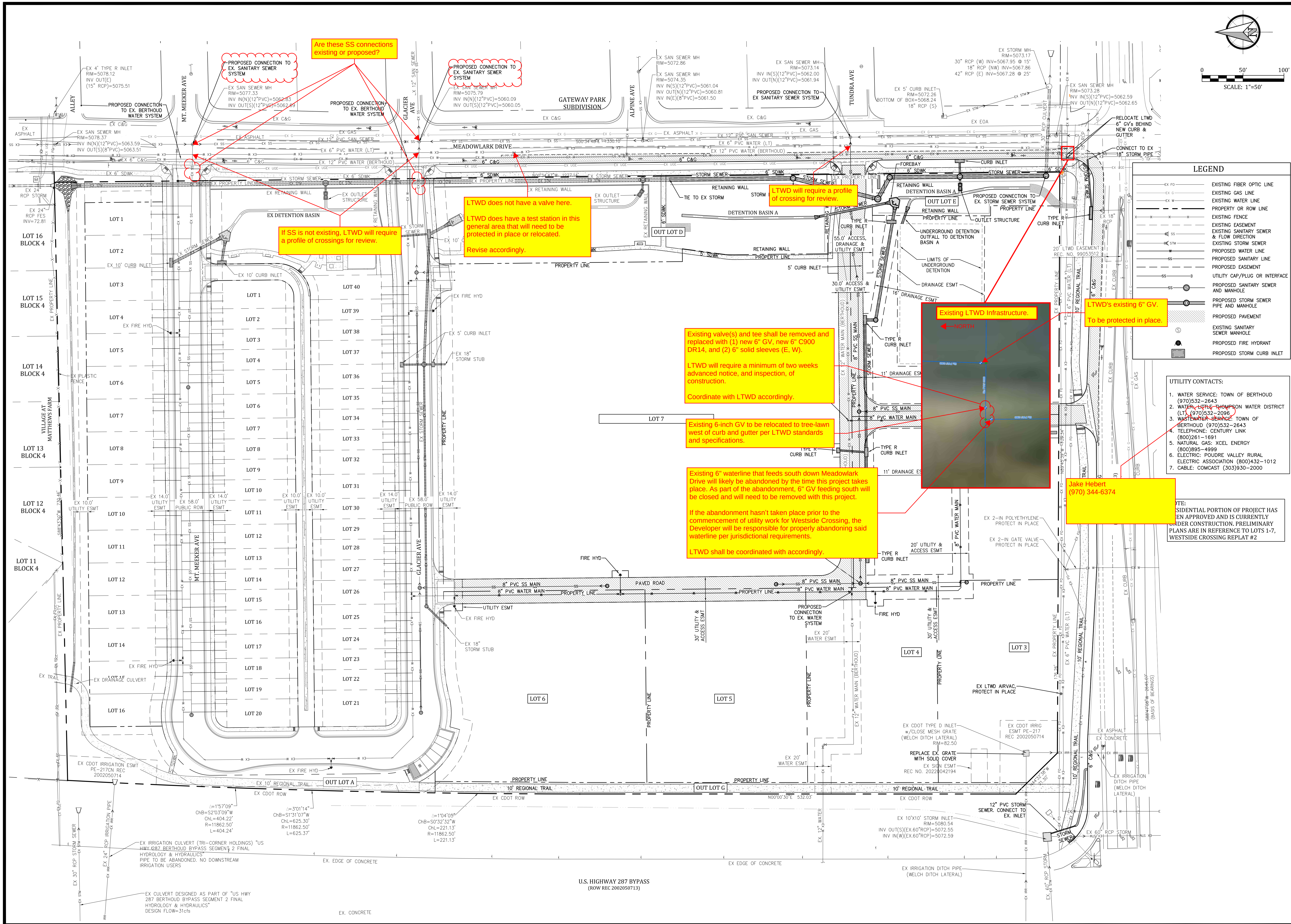
<u>PROJECT TEAM</u> <u>ENGINEER</u> KIOWA ENGINEERING CORP. 7175 WEST JEFFERSON AVE., STE 2200 LAKEWOOD, CO 80235 303-692-0369 MERICHSEN@KIOWAENGINEERING.COM MATTHEW ERICHSEN, PE, CFM	<u>LANDSCAPE ARCHITECT</u> STACKLOT 5639 SOUTH CURTICE STREET LITTLETON, CO 80120 303-808-4523 STEVE@STACKLOT.COM STEVE WIENS
<u>SURVEYOR</u> KING SURVEYORS 650 E. GARDEN DRIVE WINDSOR, CO, 80550 970-686-5011 CONTACT@KINGSURVEYORS.COM CHRISTOPHER A. DEPAULIS, PLS#38105	<u>OWNER</u> BERTHOUD GATEWAY, LLC 970-222-7268 SCOTT@CFMONEY.COM SCOTT CHARPENTIER

ABBREVIATIONS	
ASSY = ASSEMBLY	NTS = NOT TO SCALE
BNDY = BOUNDARY	OD = OUTSIDE DIAMETER
BOP = BOTTOM OF PIPE	PC = POINT OF HORIZONTAL CURVATURE
C&G = CURB & GUTTER	PLBG = PLUMBING
CL = CENTERLINE	PCC = POINT OF CONNECTION
CO = CROWN OUT	PP = PROPOSED
CRA = CONCRETE REVERSE ANCHOR	PRP = POINT OF REVERSE CURVE
CR = POINT OF CURB RETURN	PROP = PROPERTY
CS = CROSS SLOPE	PRT = PRIVATE
CT = CONCRETE THURST BLOCK	PTI = POINT OF HORIZONTAL TANGENCY
DC = DUCTILE IRON PIPE	PPV = POLY VINYL CHLORIDE PIPE
DTL = DETAIL	PVC = POINT OF VERTICAL CURVATURE
EL = ELEVATION	PVI = POINT OF VERTICAL INTERSECTION
ES = EDGE OF ASPHALT	PVT = POINT OF VERTICAL TANGENCY
ESMT = EXISTING	R = RADIUS
EX = EXISTING	R = RIGHT
FC = FACE OF CURB	RCP = REINFORCED CONCRETE PIPE
FES = FLARED END SECTION	RD = ROOF DRAIN (STORM LINE)
FL = FLANGE	ROW = RIGHT OF WAY
FL = FLOWLINE	RT = RIGHT
GB = GRADE BREAK	SH = SHEET
GI = GREASE INTERCEPTOR	SOI = SAND OIL INTERCEPTOR
HP = HIGH POINT	SS = SANITARY SEWER
HORIZ = HORIZONTAL	STA = STATION
HYD = HYDRANT	STD = STANDARD
ID = INSIDE DIAMETER	TA = TOP OF ASPHALT
L = LEFT	TB = THRUST BLOCK
L = LEFT	TC = TOP OF CURB
LF = LINEAR FEET	TOA = TOP OF ASPHALT
LP = LOW POINT	TOT = TOP OF CONCRETE
MAX = MAXIMUM	TOP = TOP OF PIPE
MH = MANHOLE	TYP = TYPICAL
MIN = MINIMUM	VC = VERTICAL CURVE

LEGEND

	PROPOSED ROLL OVER CURB
	PROPOSED 6" VERTICAL CURB
	CURB RAMPS TYPICAL
	EXISTING FIRE HYDRANT
	EXISTING WATER VALVE
	EXISTING WATER METER
	EXISTING GAS VALVE
	EXISTING SANITARY SEWER MANHOLE
	EXISTING STORM SEWER MANHOLE
	EXISTING WATER MANHOLE
	EXISTING GAS METER
	EXISTING TELEPHONE MANHOLE
	EXISTING TELEPHONE PEDESTAL
	EXISTING CABLE TV PEDESTAL
	EXISTING LIGHT POLE
	EXISTING GROUND LIGHT
	EXISTING UTILITY POLE
	EXISTING ELECTRIC BOX
	EXISTING ELECTRIC TRANSFORMER
	EXISTING ELECTRIC MANHOLE
	EXISTING ELECTRIC PULL BOX
	EXISTING FIBER OPTIC VAULT
	SOIL BORING LOCATION
	EXISTING OR PROPOSED PROPERTY LINE
	EXISTING EASEMENT
	EXISTING FENCE
	EXISTING IRRIGATION LINE
	EXISTING WATER LINE
	EXISTING SANITARY SEWER & FLOW DIRECTION
	EXISTING STORM
	EXISTING UNDERGROUND ELECTRIC LINE
	EXISTING OVERHEAD UTILITY LINE
	EXISTING OVERHEAD ELECTRIC LINE
	EXISTING UNDERGROUND TELEPHONE LINE
	EXISTING FIBER OPTIC LINE
	EXISTING GAS LINE
	PROPOSED SANITARY SERVICE
	PROPOSED WATER LINE OR SERVICE
	PROPOSED FIRE HYDRANT
	PROPOSED SANITARY SEWER AND MANHOLE
	PROPOSED STORM SEWER PIPE AND MANHOLE
	PROPOSED STORM COMBINATION INLET
	PROPOSED STORM CURB INLET

WESTSIDE CROSSING
PRELIMINARY PLAT
COVER SHEET
BERTHOUD, COLORADO



LEGEND	
EX FO	EXISTING FIBER OPTIC LINE
EX G	EXISTING GAS LINE
EX W	EXISTING WATER LINE
---	PROPERTY OR ROW LINE
---	EXISTING FENCE
---	EXISTING EASEMENT
---	EXISTING SANITARY SEWER & FLOW DIRECTION
---	EXISTING STORM SEWER
---	PROPOSED WATER LINE
---	PROPOSED SANITARY LINE
---	PROPOSED EASEMENT
---	UTILITY CAP/PLUG OR INTERFACE
---	PROPOSED SANITARY SEWER AND MANHOLE
---	PROPOSED STORM SEWER PIPE AND MANHOLE
---	PROPOSED PAVEMENT
---	EXISTING SANITARY SEWER MANHOLE
---	PROPOSED FIRE HYDRANT
---	PROPOSED STORM CURB INLET

- UTILITY CONTACTS:
1. WATER SERVICE: TOWN OF BERTHOUD (970)532-2643
 2. WATER: LITTLE THOMPSON WATER DISTRICT (LT) (970)532-2096
 3. WASTEWATER SERVICE: TOWN OF BERTHOUD (970)532-2643
 4. TELEPHONE: CENTURY LINK (800)261-1691
 5. NATURAL GAS: XCEL ENERGY (800)895-4999
 6. ELECTRIC: POUDRE VALLEY RURAL ELECTRIC ASSOCIATION (800)432-1012
 7. CABLE: COMCAST (303)930-2000

NOTE: A PORTION OF PROJECT HAS BEEN APPROVED AND IS CURRENTLY UNDER CONSTRUCTION. PRELIMINARY PLANS ARE IN REFERENCE TO LOTS 1-7, WESTSIDE CROSSING REPLAT #2

Kiowa

Engineering Corporation

7175 West Jefferson Avenue, Suite 2200
Lakewood, Colorado 80235
(303) 692-0369

WESTSIDE CROSSING
PRELIMINARY PLAT
PRELIMINARY UTILITY PLAN
BERTHOUD, COLORADO

Project No.: 19043.2

Date: July 7, 2023

Design: JJM

Drawn: JJM

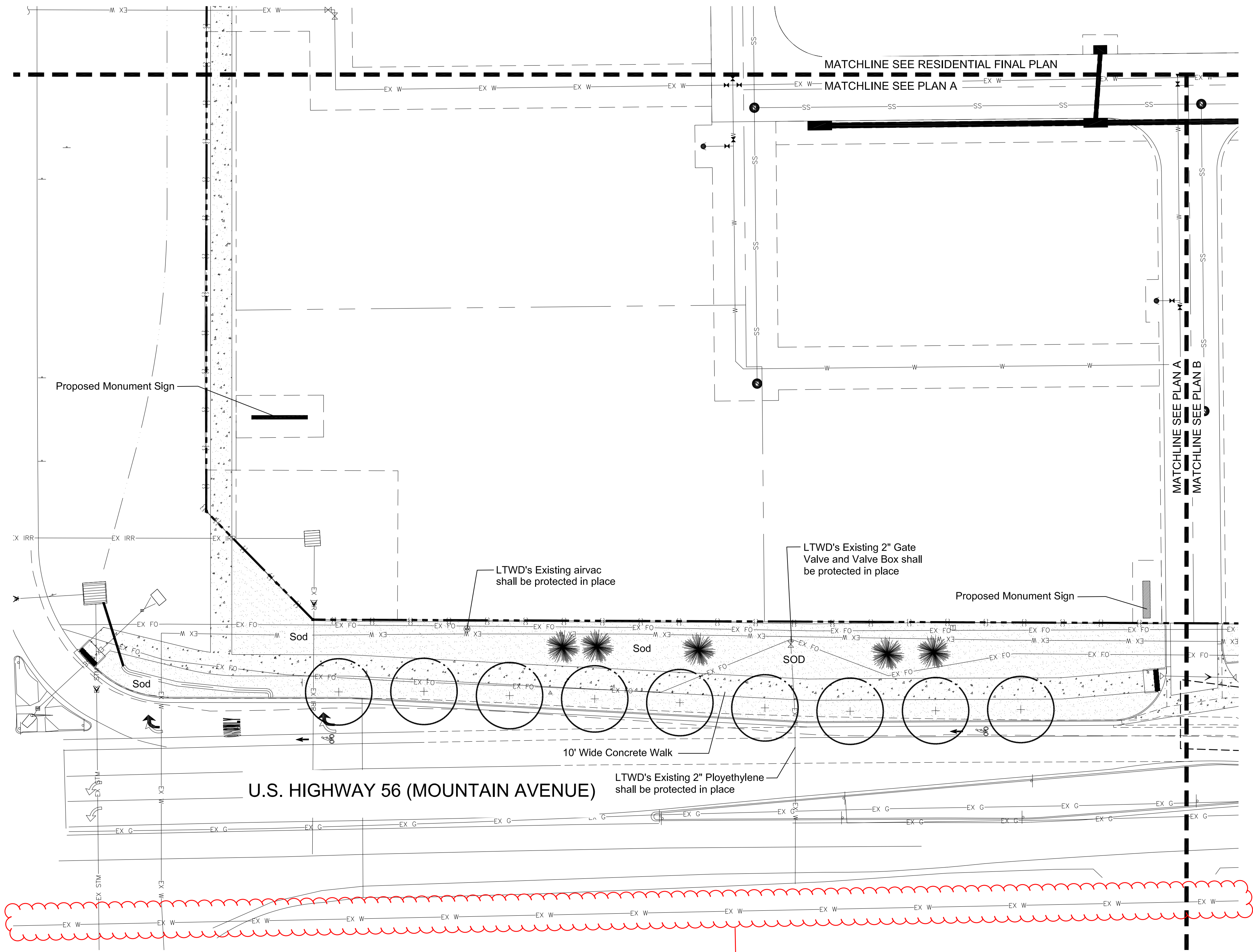
Check: MWE

Revisions:

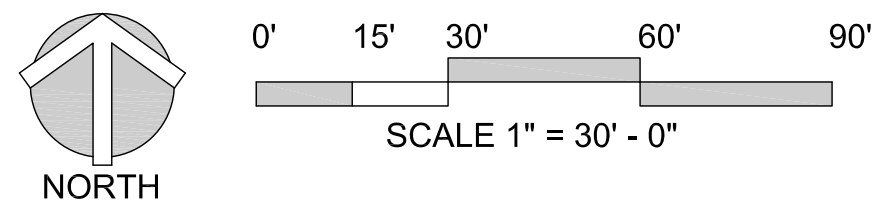
SHEET

3

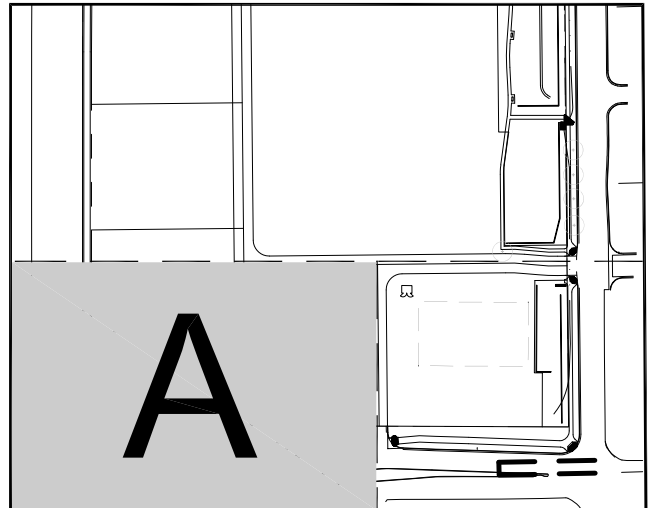
OF 10 SHEETS



PRELIMINARY LANDSCAPE PLAN A



LTWD does not have a waterline here.
Revise / call out ownership.



KEYMAP SCALE 1" = 300' - 0"

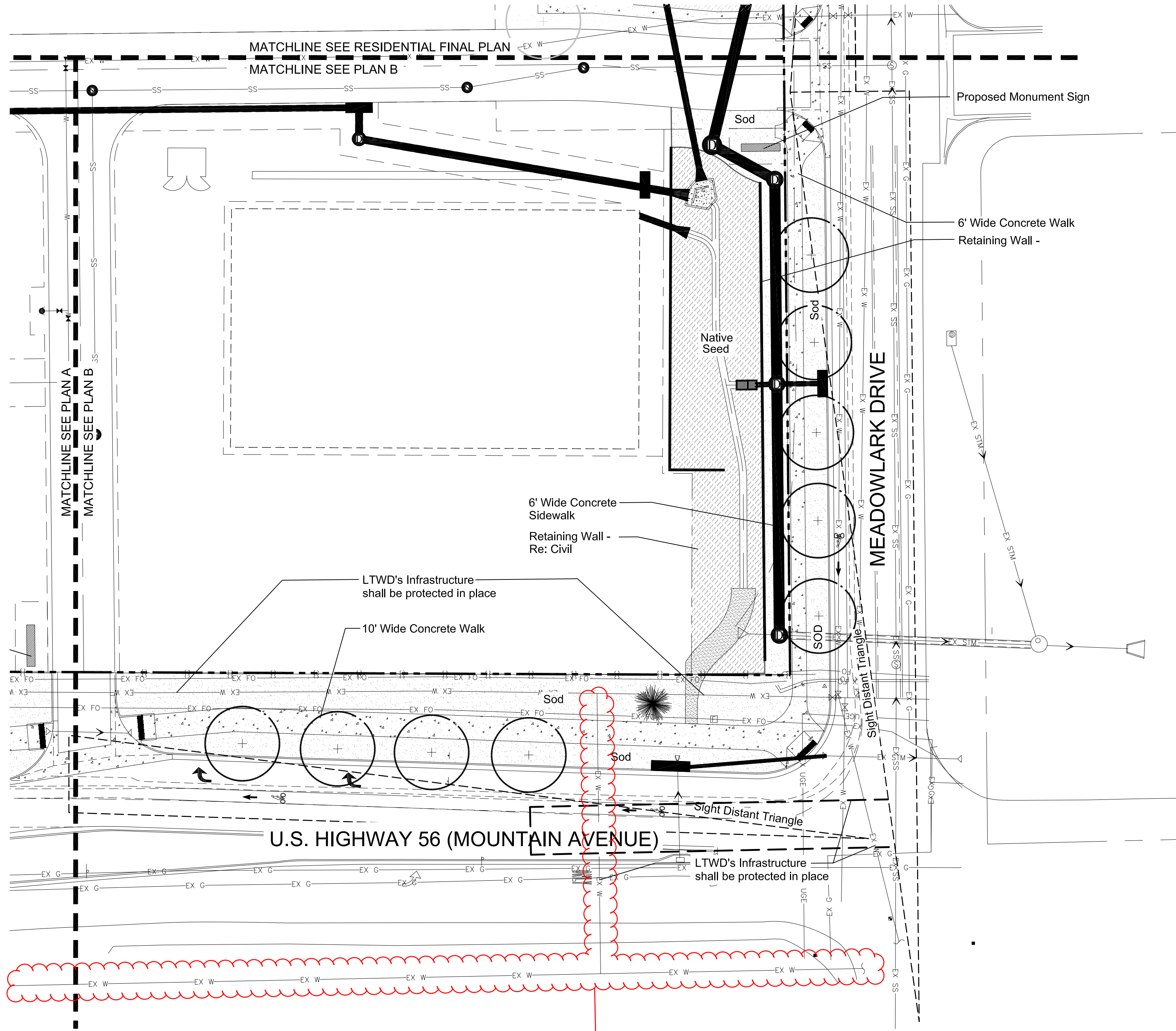
LEGEND:

- EXISTING SANITARY SEWER MANHOLE
- EXISTING TELEPHONE PEDESTAL
- EXISTING CABLE TV PEDESTAL
- EXISTING LIGHT POLE
- EXISTING ELECTRIC BOX
- EXISTING ELECTRIC MANHOLE
- EXISTING EASEMENT
- PROPOSED EASEMENT
- EXISTING WATER LINE
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING OVERHEAD UTILITY LINE
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING UNDERGROUND TELEPHONE LINE
- EXISTING FIBER OPTIC LINE
- EXISTING GAS LINE
- PROPOSED SANITARY SERVICE
- PROPOSED WATER LINE OR SERVICE
- PROPOSED STORM LINE
- PROPOSED FIRE HYDRANT
- PROPOSED STORM SEWER PIPE AND MANHOLE
- PROPOSED CONTOUR
- DECIDUOUS TREES
- ORNAMENTAL TREES
- EVERGREEN TREE
- SHRUBS
- ORNAMENTAL GRASSES
- LOCALLY AVAILABLE FESCUE SOD MIX
- NON - IRRIGATED NATIVE GRASS MIX MIX RATIO:
 - 23% BLUE GRAMA
 - 10% BUFFALO GRASS
 - 20% GREEN NEEDLEGRASS
 - 20% SIDE OATS GRAMA
 - 25 WESTERN WHEATGRASS
 - 2% SAND DROPSEED
- NOTE: EROSION CONTROL BLANKET TO BE INSTALLED WHERE APPLICABLE
- SHREDDED CEDAR MULCH
- STEEL EDGING WITH PROTECTIVE CAP
- MATCHLINE
- PROPERTY LINE

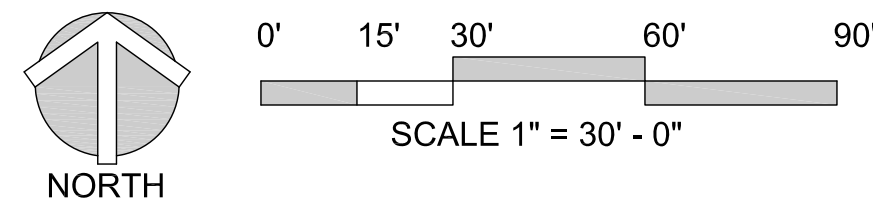
Westside Crossing
Preliminary Plat

Preliminary Landscape Plan A

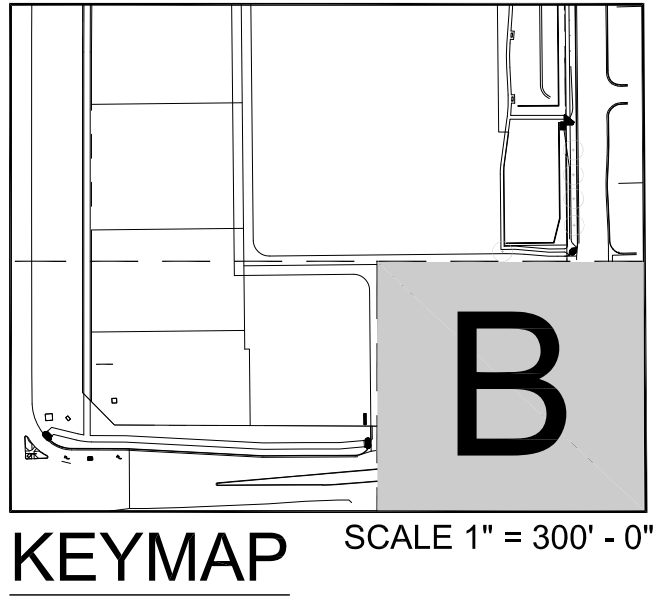
DATE:	REVISION:	Project Mgr:	JAH
4/28/23	Second Submittal	Drawn By:	SDW
6/28/23	Third Submittal	Checked By:	JAH
7/5/23	Fourth Submittal	Date:	1/5/23
		Scale:	1" = 30'



PRELIMINARY LANDSCAPE PLAN B



LTWD does not have a waterline here.
Revise / call out ownership.



LEGEND:

- EXISTING SANITARY SEWER MANHOLE
- EXISTING TELEPHONE PEDESTAL
- EXISTING CABLE TV PEDESTAL
- EXISTING LIGHT POLE
- EXISTING ELECTRIC BOX
- EXISTING ELECTRIC MANHOLE
- EXISTING EASEMENT
- PROPOSED EASEMENT
- EXISTING WATER LINE
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING OVERHEAD UTILITY LINE
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING UNDERGROUND TELEPHONE LINE
- EXISTING FIBER OPTIC LINE
- EXISTING GAS LINE
- PROPOSED SANITARY SERVICE
- PROPOSED WATER LINE OR SERVICE
- PROPOSED FIRE HYDRANT
- PROPOSED STORM SEWER PIPE AND MANHOLE
- PROPOSED CONTOUR
- PROPOSED RETAINING WALL
- SIGHT DISTANT TRIANGLE
- DECIDUOUS TREES
- ORNAMENTAL TREES
- EVERGREEN TREE
- SHRUBS
- ORNAMENTAL GRASSES
- LOCALLY AVAILABLE FESCUE SOD MIX
- NON - IRRIGATED NATIVE GRASS MIX MIX RATIO:
 - 23% BLUE GRAMA
 - 10% BUFFALO GRASS
 - 20% GREEN NEEDLEGRASS
 - 20% SIDE OATS GRAMA
 - 25% WESTERN WHEATGRASS
 - 2% SAND DROPSEED
- NOTE: EROSION CONTROL BLANKET TO BE INSTALLED WHERE APPLICABLE
- SHREDDED CEDAR MULCH
- STEEL EDGING WITH PROTECTIVE CAP
- MATCHLINE
- PROPERTY LINE

Westside Crossing
Preliminary Plat

Preliminary Landscape Plan B

DATE:	REVISION:				
4/28/23	Second Submittal				
6/28/23	Third Submittal				
7/5/23	Fourth Submittal				
Project Mgr:		JAH			
Drawn By:		SDW			
Checked By:		JAH			
Date:		1/5/23			
Scale:		1" = 30'			

SHEET

L1.3
3 of 5

Preliminary Drainage Report.pdf Markup Summary

Iseeber (1)



Subject: Engineer
Page Label: 6
Author: Iseeber
Date: 7/26/2023 10:20:19 AM
Status:
Color: ■
Layer:
Space:

If flooding of Meadowlark did not happen prior to the proposed development, an additional solution will need to be proposed so that flooding does not occur