TOWN OF ERIE

645 Holbrook Street
Erie, CO 80516

Meeting Agenda

Planning Commission

Wednesday, April 1, 2026 | **6:30 PM** | **Council Chambers**

In Person Meeting
Link to Watch or Comment Virtually: https://bit.ly/1APR26PCMtg
To Sign Up for Public Comment: www.erieco.gov/PublicComment

I. CALL TO ORDER & PLEDGE OF ALLEGIANCE TO FLAG

II. ROLL CALL

III. APPROVAL OF THE AGENDA

IV. APPROVAL OF MINUTES

2026-241 Approval of the March 18, 226 Planning Commission Meeting Minutes

Attachments: March 18, 2026 Planning Commission Meeting Minutes

V. PUBLIC COMMENTS

(This agenda item provides the public an opportunity to discuss items other than items that are on the agenda. The Planning Commission is not prepared to decide on matters brought up at this time, but if warranted, will place them on a future agenda.)

VI. GENERAL BUSINESS

2026-170 A Resolution of the Planning Commission of the Town of Erie Recommending Approval of the Spring Hill Preliminary Plat with Conditions

Attachments:
PC Resolution P26-07
Staff Presentation
Staff Report
Applicant Presentation
Proposed Preliminary Plat
Parks and Open Space Exhibit
Application and Narrative
Additional Application Materials 1
Additional Application Materials 2
Additional Application Materials 3
Neighborhood Meetings Summaries
Public Notice Postings
Public Comments

2026-207 A Resolution of the Planning Commission of the Town of Erie Recommending Approval to the Town Council of the Rezoning of the Sierra Vista property to Community Mixed Use (CMU) and Airport (AP)

Attachments:
Resolution P26-06
Staff Report
Staff Presentation
CMU and AP Use table
Applicant Presentation
Applicant Submittals
Combined Reviews
Neighborhood Meeting Information
Proposed Sierra Vista Zoning Map
Proposed Sierra Vista Minor Subdivision
PC Public Hearing Notices
Broomfield Final Comment

VII. STAFF REPORTS

(This agenda items is reserved for specific items from Staff requiring Commission direction or just relaying important information.)

VIII. COMMISSIONER REPORTS AND DISCUSSION ITEMS

(This agenda item is for all Planning Commission reports and items of information as well as Commission discussion items, not listed on the agenda.)

IX. ADJOURNMENT

Translation Services

Persons planning to attend the meeting who need sign language interpretation, translation services, assisted listening systems, Braille, taped material, or other accommodation should email the Town Clerk's Office at TownClerk@ErieCO.gov or call 303-926-2710. Please submit requests at least 48 hours prior to the meeting.

Si requiere una copia en español de esta publicación o necesita un intérprete durante la reunión del Consejo, por favor llame a la Ciudad al TownClerk@ErieCO.gov o 303-926-2710. Por favor envíe sus solicitudes al menos 48 horas antes de la reunión.

File #: 2026-241, **Version:** 1

SUBJECT:
Approval of the March 18, 2026 Planning Commission Meeting Minutes

DEPARTMENT: Planning & Development

PRESENTER(S): Melinda Helmer, Secretary

TIME ESTIMATE: 0 minutes

FISCAL SUMMARY:
N/A

POLICY ISSUES:
The minutes are provided for Commission verification and approval to confirm the accuracy of recorded decisions and discussions.

STAFF RECOMMENDATION:
Staff recommends approval of the meeting minutes

SUMMARY/KEY POINTS
The minutes are provided for Commission verification and approval to confirm the accuracy of recorded decisions and discussions.

ATTACHMENT(S):
1. March 18, 2026 Planning Commission Meeting Minutes

TOWN OF ERIE

645 Holbrook Street
Erie, CO 80516

Meeting Minutes

Wednesday, March 18, 2026

6:30 PM

In Person Meeting
Link to Watch or Comment Virtually: https://bit.ly/18Mar26PCMtg
Council Chambers
To Sign Up for Public Comment: www.erieco.gov/PublicComment

Planning Commission

I. CALL TO ORDER & PLEDGE OF ALLEGIANCE TO FLAG

Chair Hemphill called the March 18, 2026 Planning Commission Meeting to order at 6:31pm.

II. ROLL CALL

Roll Call:
Commissioner Booth - present
Commissioner Burns - absent/escused
Commissioner Dreckman - present
Commissioner Sawusch - absent/excused
Commissioner Baham - present
Vice Chair Braudes- present
Chair Hemphill - present

A quorum was present for tonight's meeting.

III. APPROVAL OF THE AGENDA

Commissioner Booth moved to approve the March 18, 2026 Planning Commission Meeting agenda. The motion, seconded by Commissioner Dreckman, carried with all voting in favor thereof.

Motion passes unanimously.

IV. APPROVAL OF MINUTES

2026-205 Approval of the February 18, 2026 Planning Commission Meeting Minutes

Attachments: Feb. 18 Meeting Minutes

Chair Hemphill requested the following modifications to the February 18, 2026 Planning Commission Meeting Minutes as follows:
Amend the minutes for Agenda Item 2026-100, to include the following sentence after announcing the agenda and before opening the hearing." Agenda Item 2026-1 was closed without objection due to a staff and legal determination that a new Public Hearing was required." This is to help close out the other agenda.

Chair Hemphill moved to approve the February 18, 2026 Planning Commission Meeting Minutes with the noted modifications. The motion, seconded by Vice Chair Braudes, carried with all voting in favor thereof.

Motion passes unanimously.

V. PUBLIC COMMENTS

No public comments were taken.

VI. GENERAL BUSINESS

2026-118 A Resolution of the Planning Commission of the Town of Erie

Recommending that the Town Council Adopt an Ordinance Amending Title 10 of the Erie Municipal Code Regarding the Use of Manufactured Homes as Dwelling Units

Attachments: Resolution No. P26-05

Draft Ordinance

Staff Report

Presentation

Chair Hemphill announced Agenda Item 2026-118: A Resolution of the Planning Commission of the Town of Erie Recommending that the Town Council Adopt an Ordinance Amending Title 10 of the Erie Municipal Code Regarding the Use of Manufactured Homes as Dwelling Units.

Chair Hemphill noted the time at 6:34pm and turned it over to staff for a presentation.

Kelly Driscoll, Deputy Director of Planning & Development gave background on the agenda item allowing manufactured homes as ADU's, what state law allows, and the proposed changes in the Town's Unified Development Code (UDC). This proposed change is a straightforward change with updated language that would allow manufactured homes as Accessory Dwelling Units.

This amendment is scheduled for the April 14, 2026 Town Council meeting. Staff recommends the Planning Commission adopt this Ordinance amending Title 10 of the Erie Municipal Code Regarding the Use of Manufactured Homes as Dwelling Units.

Chair Hemphill opened it up for discussion and questions of the Commission. Some questions/comments included the following:
- Would tiny homes be part of this?

Commissioner Baham moved to approve Resolution P26-05: A Resolution of the Planning Commission of the Town of Erie Recommending that the Town Council Adopt an Ordinance Amending Title 10 of the Erie Municipal Code Regarding the Use of Manufactured Homes as Dwelling Units. The motion, seconded by Commissioner Dreckman, carried with all voting in favor thereof.

Motion carries unanimously.

2026-172 Discussion on Proposition 123 Fast Track

Chair Hemphill announced Agenda Item 2026-172: Discussion of Proposition 123 Fast Track.

Chair Hemphill noted the time at 6:40pm and noted that this item is a quick update regarding the joint study session of Town Council and the Planning Commission on June 2, 2026. The Town Council will appoint new Planning Commission members and there will be one meeting prior to this joint session. The Commission can take some time to discuss now or at the May meeting with new Commission members.

There has been interest in discussing the potential expansion of the

Commission's duties and role. Chair Hemphill would like to ensure that the Commission is generally aligned and will work productively with Council in these efforts.

There was some question as to who will lead/run this joint session and if updates will be provided to the Commission. Staff will be in attendance for the study session.

Chair Hemphill requested to have another discussion item added to the 5/20 meeting so the new members can participate and get up to speed.

VII. STAFF REPORTS

Kelly Driscoll provided the Commission with an update on the Planning Commission appointment process. Council narrowed the applicant pool of 11 interested parties down to 6 for the interviews. Interviews will be held in April.

VIII. COMMISSIONER REPORTS AND DISCUSSION ITEMS

Vice Chair Braudes hoped everyone had a good St. Patrick's Day.

Commissioner Booth clarified the date of Planning Commission member interviews.

Chair Hemphill reminded everyone about completing Security Training and noted that he will not be in attendance for the April 1, 2026 Planning Commission Meeting. Vice Chair Braudes will run the meeting.

Chair Hemphill also noted that Sustainability had a Resilience Action Plan that had some planning components. It would be good for the Commission to review it.

IX. ADJOURNMENT

Commissioner Booth moved to adjourn the March 18, 2026 Planning Commission Meeting. The motion, seconded by Commissioner Dreckman, carried with all voting in favor thereof.

Chair Hemphill adjourned the March 18, 2026 Planning Commission Meeting at 6:45 pm.

Translation Services

Planning Commission

Board Meeting Date: 4/1/2026

File #: 2026-170, **Version:** 1

SUBJECT:
A Resolution of the Planning Commission of the Town of Erie Recommending Approval of the Spring Hill Preliminary Plat

DEPARTMENT: Planning & Development

PRESENTER(S): Harry Brennan, Senior Planner

TIME ESTIMATE: 60 minutes
For time estimate: please put 0 for Consent items.

POLICY ISSUES:
Planning Commission has the authority to review and make a recommendation on the Preliminary Plat to Town Council.

STAFF RECOMMENDATION:
Staff finds the Spring Hill Preliminary Plat complies with the Approval Criteria and recommends the Planning Commission recommend approval of the Preliminary Plat, with the following condition: the Applicant shall make all necessary technical corrections as directed by staff prior to the public hearing on the Application by the Town Council.

SUMMARY/KEY POINTS
Consideration of a Preliminary Plat to subdivide 300 acres into 632 residential lots and 49 tracts for future residential development.
Proposed single-family detached, duplex, and townhome lots.
Plan includes 10-acre school site, 36+ acres of parks and open space

BACKGROUND OF SUBJECT MATTER:
The applicant proposes a Preliminary Plat with 632 lots and for future residential development and 49 tracts for future open space, parks, and school land dedication. The applicant anticipates that these lots would develop with single family detached, duplex, and townhome residential units. The proposed tracts will accommodate public open space and parks, site drainage, private open spaces and alleys, utilities, and trails. The preliminary plat proposes access from Highway 52, and Weld County Road 3, as well as a connection with the existing Morgan Hill subdivision to the south.

If approved, the next steps for development of the subject site will include a Development Agreement(s), and Final Plat(s) application that will be reviewed by staff with final acceptance by the Town Council. A Site Plan will also be required for the townhome areas.

ATTACHMENT(S):

1. Planning Commission Resolution
2. Staff Presentation
3. Staff Report
4. Applicant Presentation
5. Proposed Preliminary Plat
6. Parks and Open Space Exhibit
7. Application and Narrative
8. Additional Application Materials 1
9. Additional Application Materials 2
10. Additional Application Materials 3
11. Neighborhood Meeting Summaries
12. Public Notice Postings
13. Public Comment

Note - DRT Comments from all rounds of DRT review are available, here: <https://portal.laserfiche.com/Portal/Browse.aspx?id=346530&repo=r-a69d230a>

Town of Erie
Planning Commission
Resolution No. P26-07

A Resolution of the Planning Commission of the Town of Erie Recommending Approval of the Spring Hill Preliminary Plat with Conditions

Whereas, on April 1, 2021, ME, LLC (the "Applicant") filed an application (the "Application") for approval of the Spring Hill Preliminary Plat (the "Preliminary Plat"), for real property more particularly described in **Exhibit A** attached hereto; and

Whereas, on April 1, 2026, the Planning Commission held a properly-noticed public hearing on the Application.

Now, Therefore be it resolved by the Planning Commission of the Town of Erie, Colorado, that:

Section 1. Findings. Upon consideration of the Application and supporting documentation, hearing the statements of Town staff and the public, and giving due consideration to the matter, the Planning Commission finds and determines as follows:

a. The Application meets the applicable criteria set forth in Title 10 of the Erie Municipal Code (the "UDC"); and

b. The Application is consistent with the Comprehensive Plan.

Section 2. Decision. Based on the foregoing findings, the Planning Commission hereby recommends that the Town Council approve the Application with the following condition: the Applicant shall make all necessary technical corrections as directed by staff prior to the public hearing on the Application by the Town Council.

Adopted this 1st day of April, 2026.

_____
Ben Hemphill, Chair

Attest:

_____
Doug Trettin, Secretary

Exhibit A
Legal Description

Tract B, Spring Hill Minor Subdivision, Town of Erie, County of Weld, State of Colorado.

Spring Hill
Preliminary Plat

Planning Commission

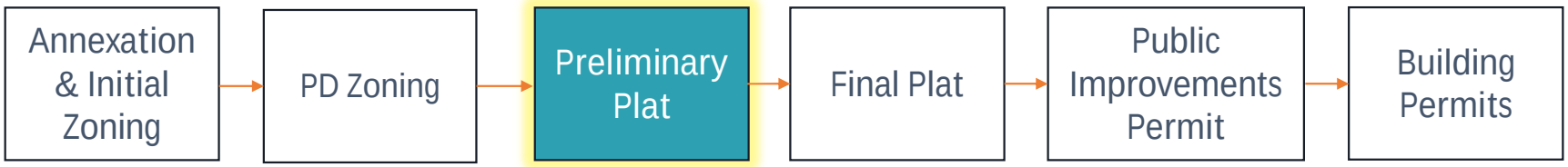
Harry Brennan, Senior Planner

April 1, 2026

Request

Review of Preliminary Plat

- Project Size: 600 Acres
- Lots/Tracts: 632 Lots/49 Tracts
- Gross Density: 2.1 DU/AC
- Existing Zoning: Spring Hill PD
- Existing Use: Undeveloped

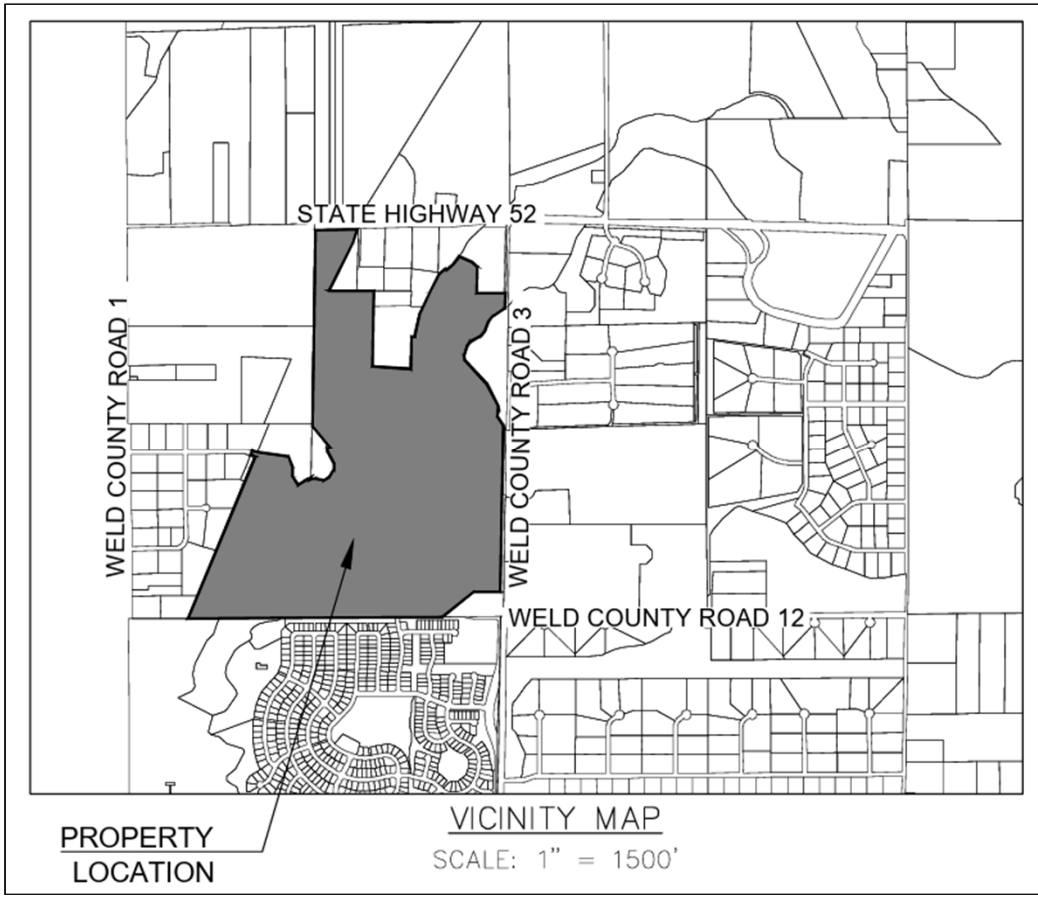


Overview

- Background
- Proposal
- Decision

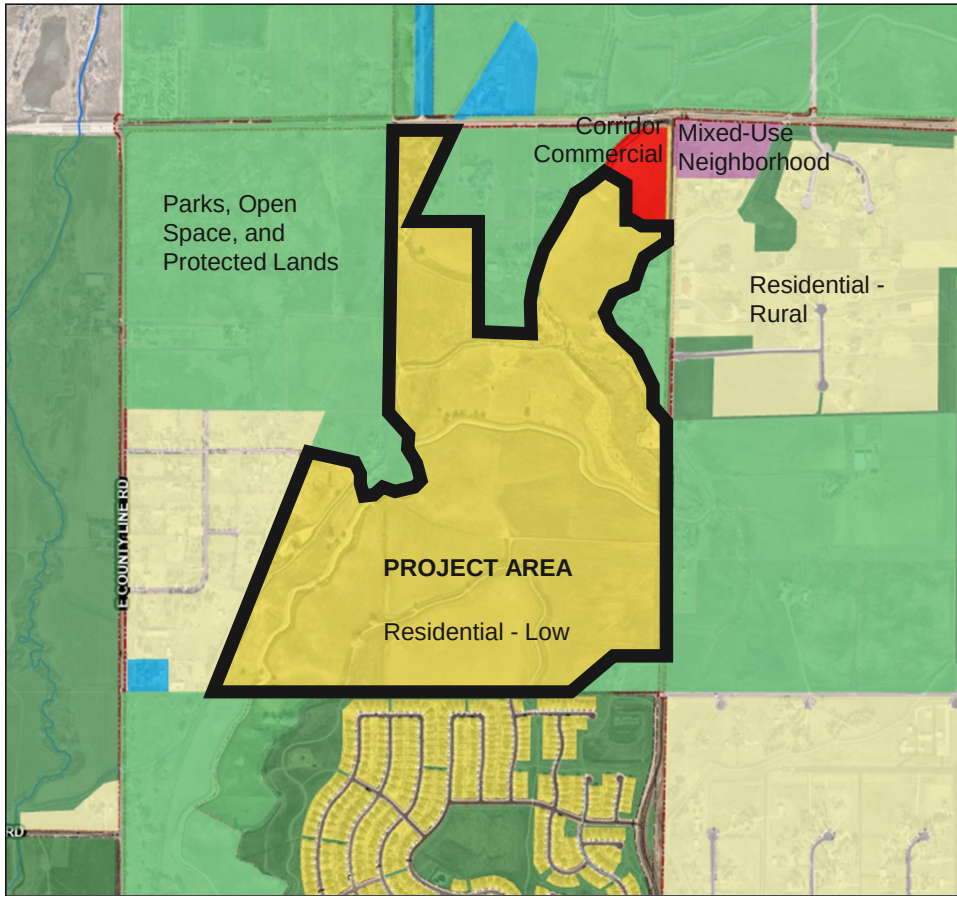
Location

- South of Hwy 52, West of WCR 3, North of Morgan Hill



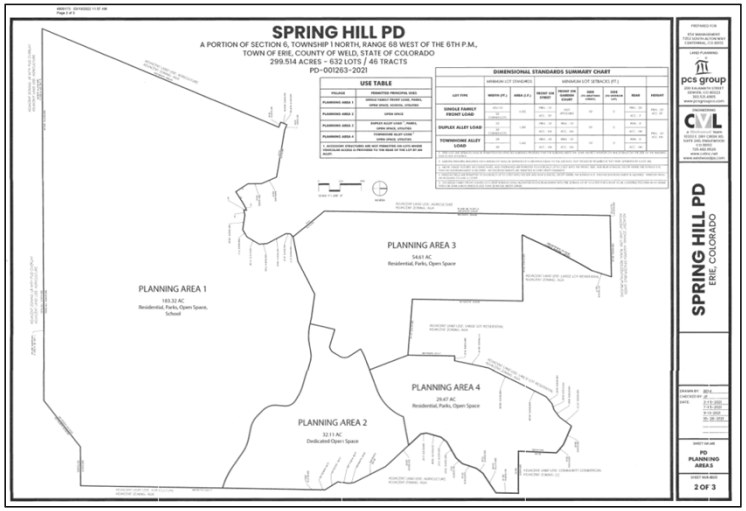
Comprehensive Plan

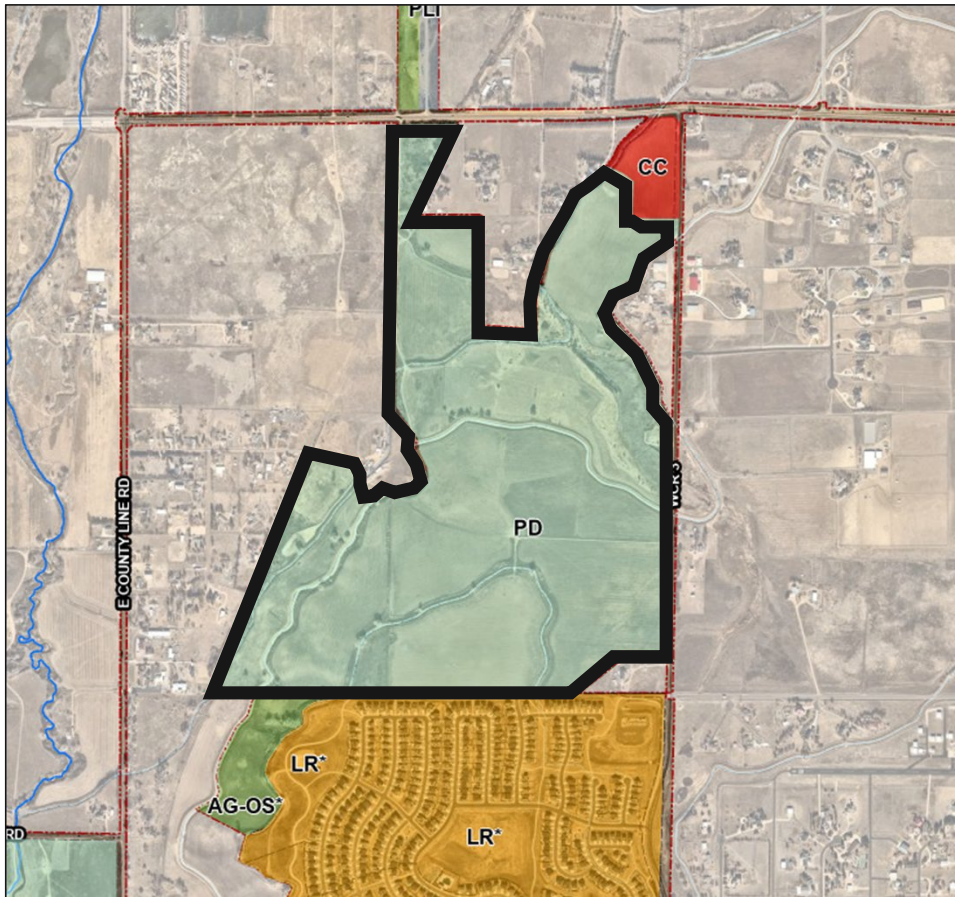
- Low Density Residential (2-8 DU/Acre)
  - C.1.1 Encourage a variety of housing types in neighborhoods to provide a more diverse selection of lifestyles and housing pricing for Erie residents.
  - C.5.1 Ensure new development meets Comprehensive Plan vision, priorities, and resource management.
  - L.1.2 Connect the community through a network of public and private parks, open space, greenways, and trails.
  - L.3.1 Promote the adaptability of neighborhoods to meet the needs of the changing community.
  - H.1.2 Increase housing options.



Zoning

- Spring Hill PD – Planning areas for residential and parks, open space for future dedication



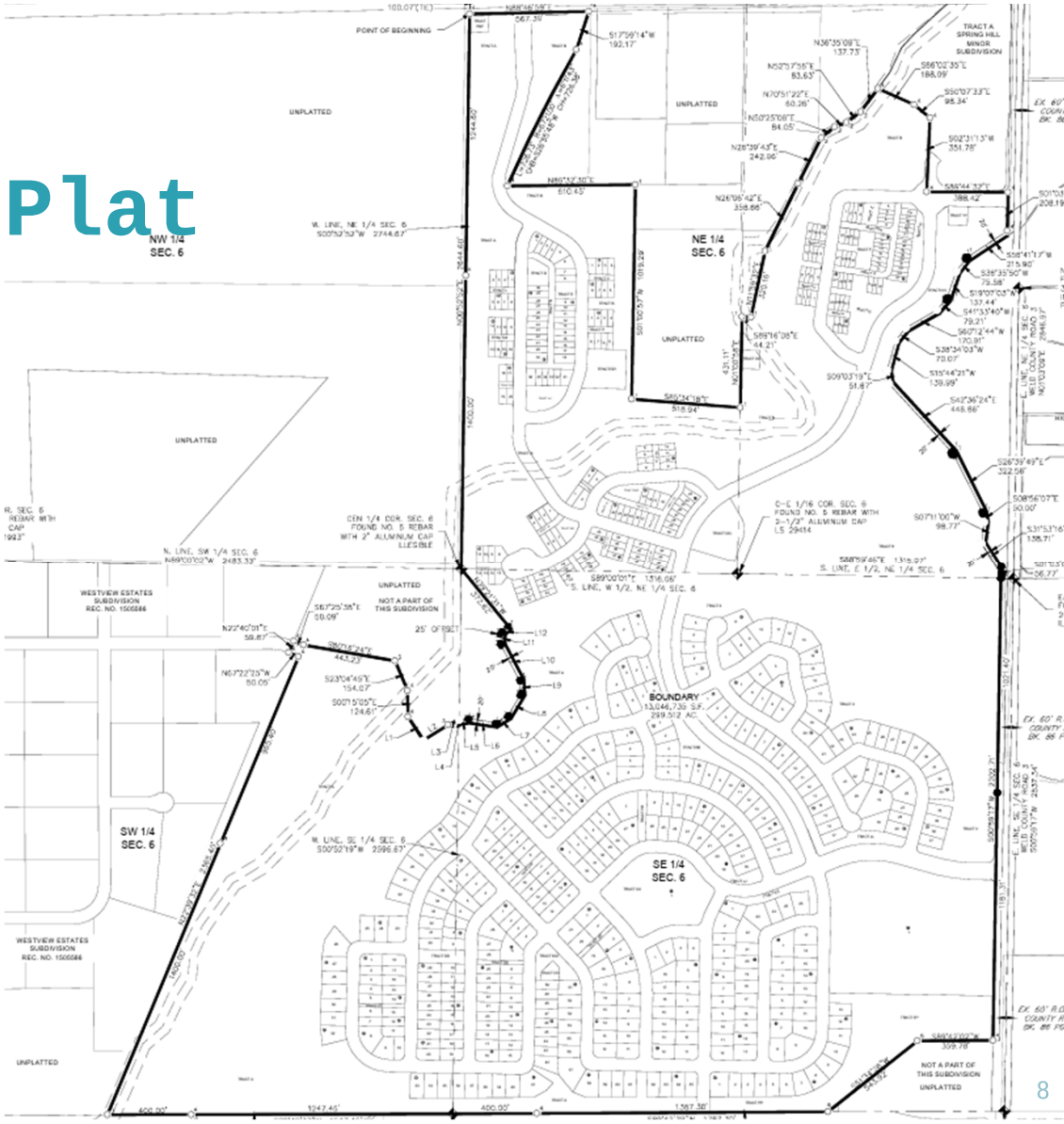


Overview

- ✓ Background
- Proposal
- Decision

Preliminary Plat

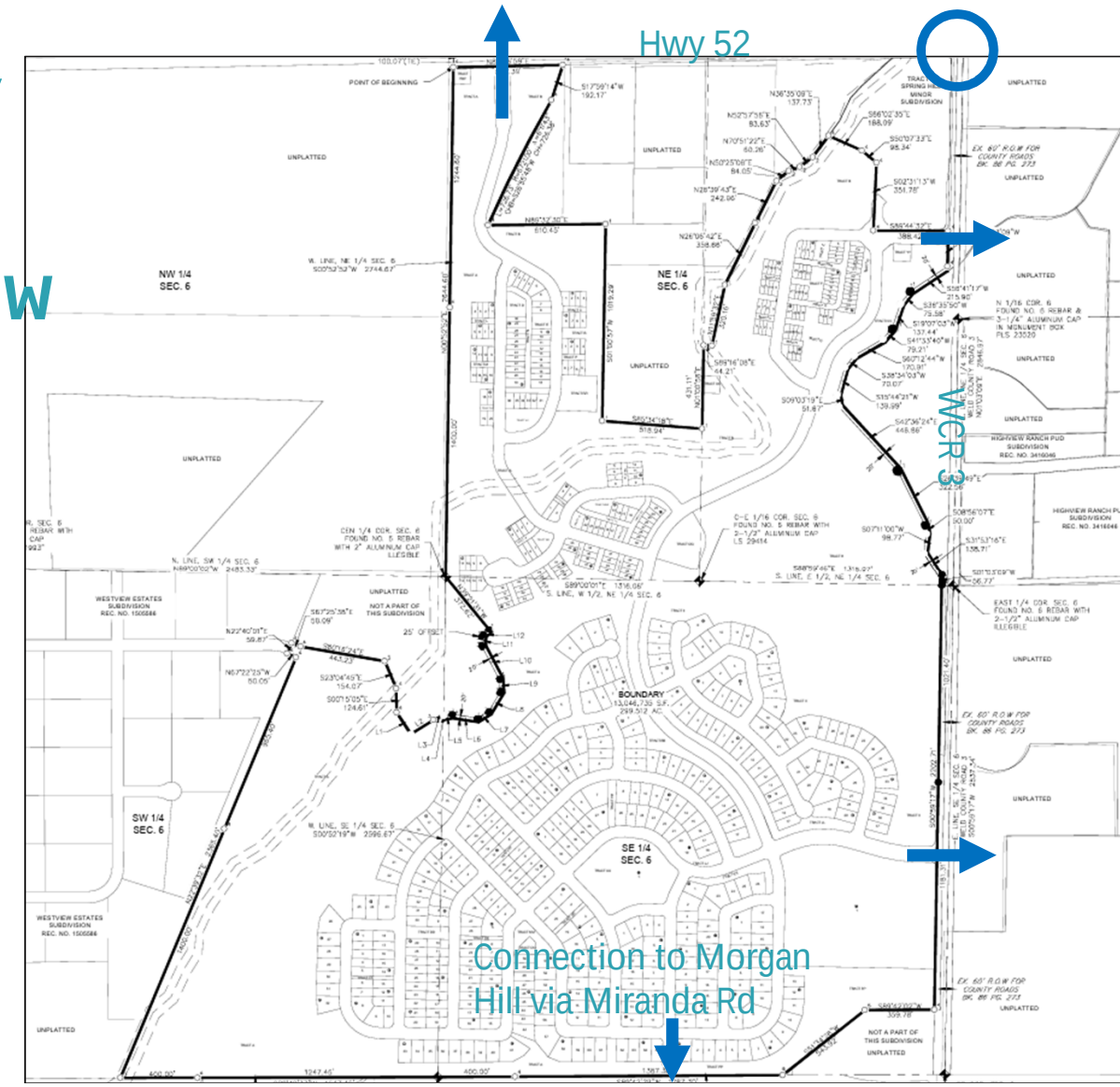
Area	300 acres total
Number of Lots - Proposed	632 lots • 414 SFD • 148 Duplex Lots • 70 Townhome Lots
Minimum Lot Size Permitted by Spring Hill PD	• 4950 SF for SFD • 1900 SF for Duplex • 1460 SF for Townhomes
Gross Density	2.1 DU/Acre
Number of Tracts	49 tracts (166 acres)
Public Right-of-Way (ROW)	43.8 acres
Future School Site Dedication	10.66 acres
Public Open Space	35 acres
Total Open Space (Including Private)	162 acres



Preliminary Plat - Access/Roadways

- New internal network of public streets through ROW dedication
- Overall access from two points on WCR 3 (east side) and one point on Hwy 52 (north side)
  - Hwy 52- New traffic signal or roundabout may be required – coordination with CDOT to occur at Final Plat.
  - WCR 3 – Stop sign controlled full movement access intersections
- Regional Intersections – Hwy 52 & WCR 3 is currently stop sign controlled. A new roundabout will be required. Developer contribution to be finalized at Final Plat.
- Connection at Miranda Rd to Morgan Hill

Preliminary Plat - Access/Roadways



Preliminary Plat – Parks, Trails, OS

- Dedications meet the requirements for Pocket Parks and Open Space; Will pay fee-in-lieu for Neighborhood and Community Parks

Type	Required	Provided
Pocket Parks (.5 ac/1000 residents)	0.83 acres	3.99 acres
Neighborhood Parks (3 ac/1000 residents)	4.97 acres	Fee in Lieu
Community Parks (5 ac/1000 residents)	8.29 acres	Collected via Impact Fees
Open Space (17 ac/1000 residents)	28.2 acres	35.16 acres

- Approximately 162 total acres of open space including private, Metro district maintained

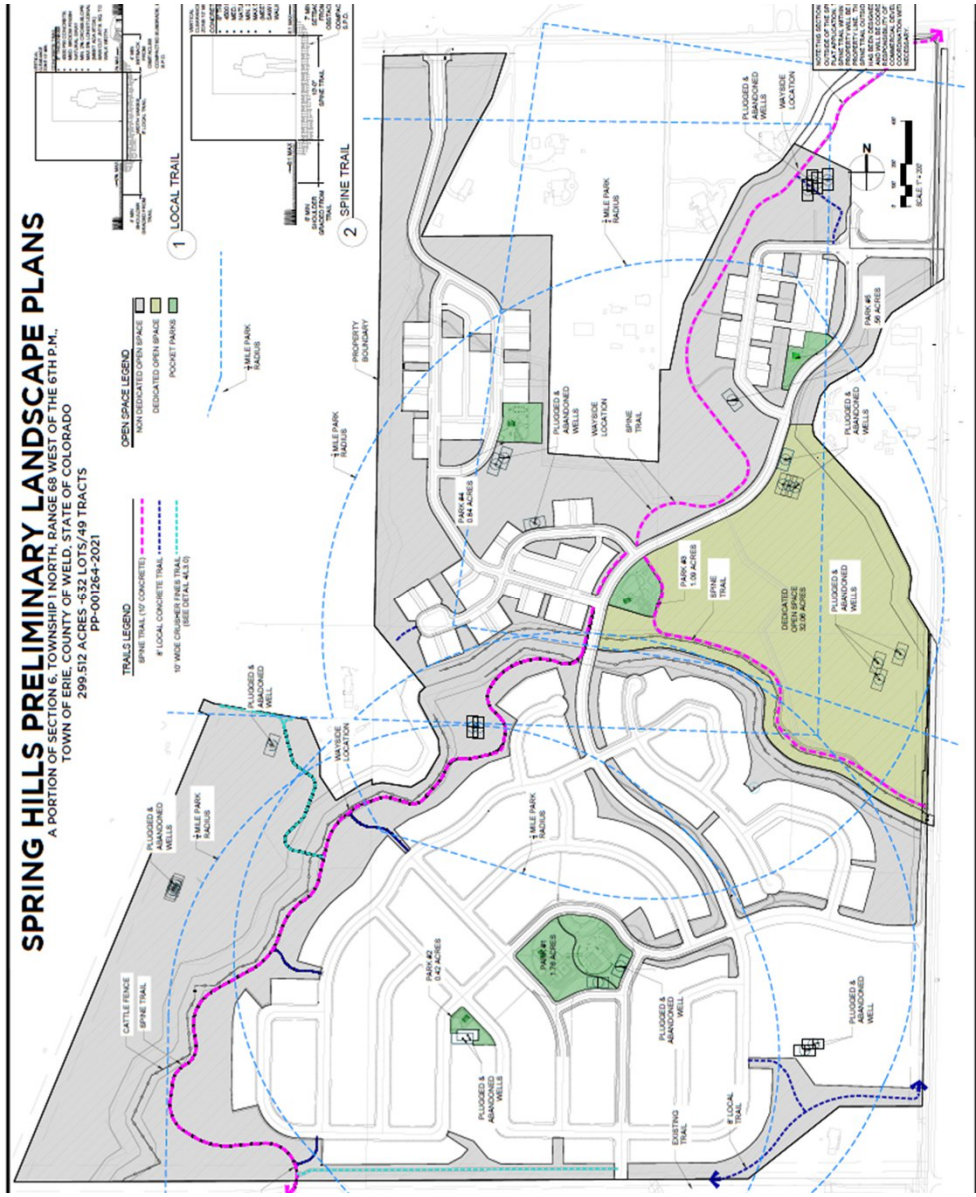
Preliminary Plat – Parks, Trails, OS

TRAILS LEGEND

- SPINE TRAIL (10' CONCRETE)
- 8' LOCAL CONCRETE TRAIL
- 10' WIDE CRUSHER FINES TRAIL (SEE DETAIL 4/L3.0)

OPEN SPACE LEGEND

- NON DEDICATED OPEN SPACE
- DEDICATED OPEN SPACE
- POCKET PARKS

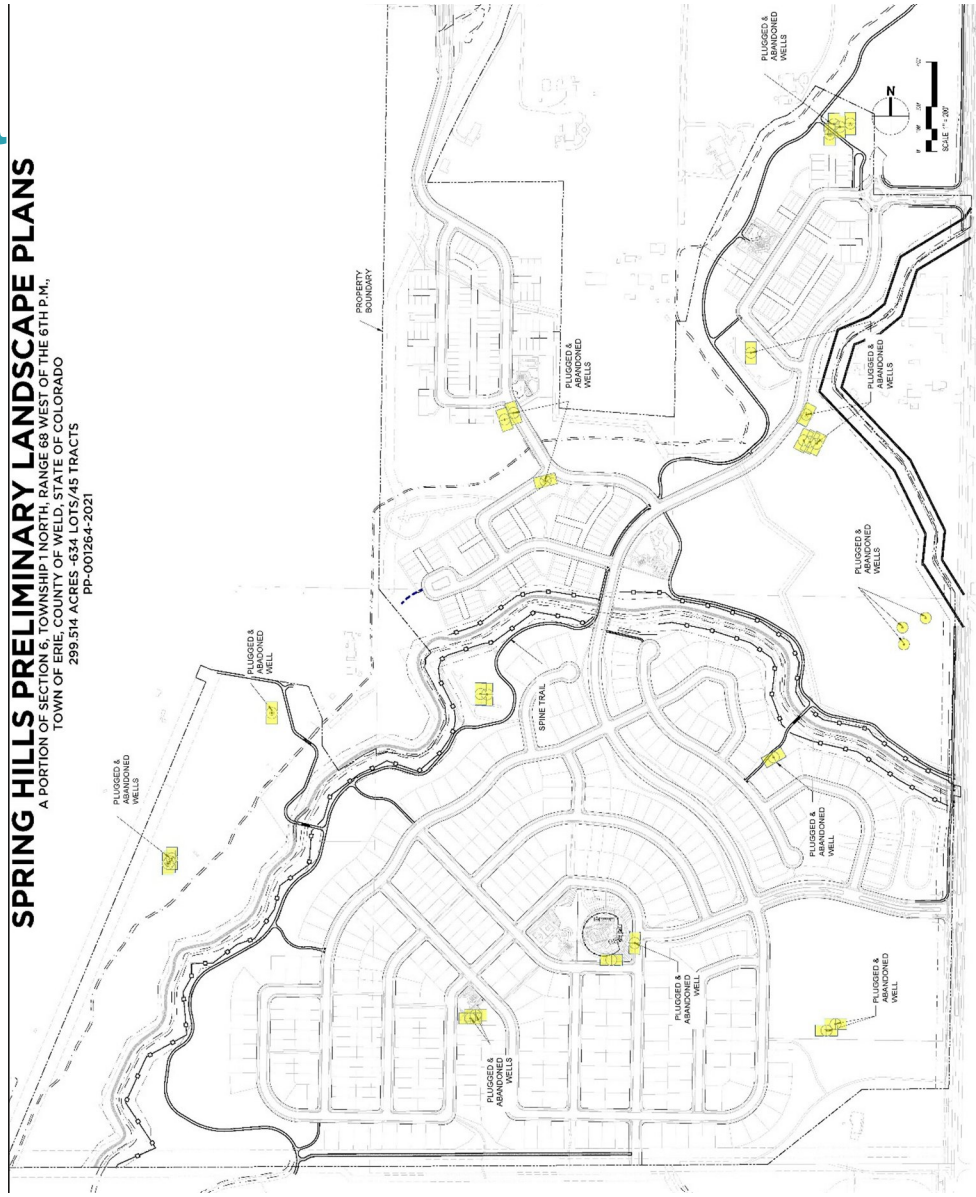


Preliminary Pla - Oil & Gas

2021 Oil & Gas Regulations Apply

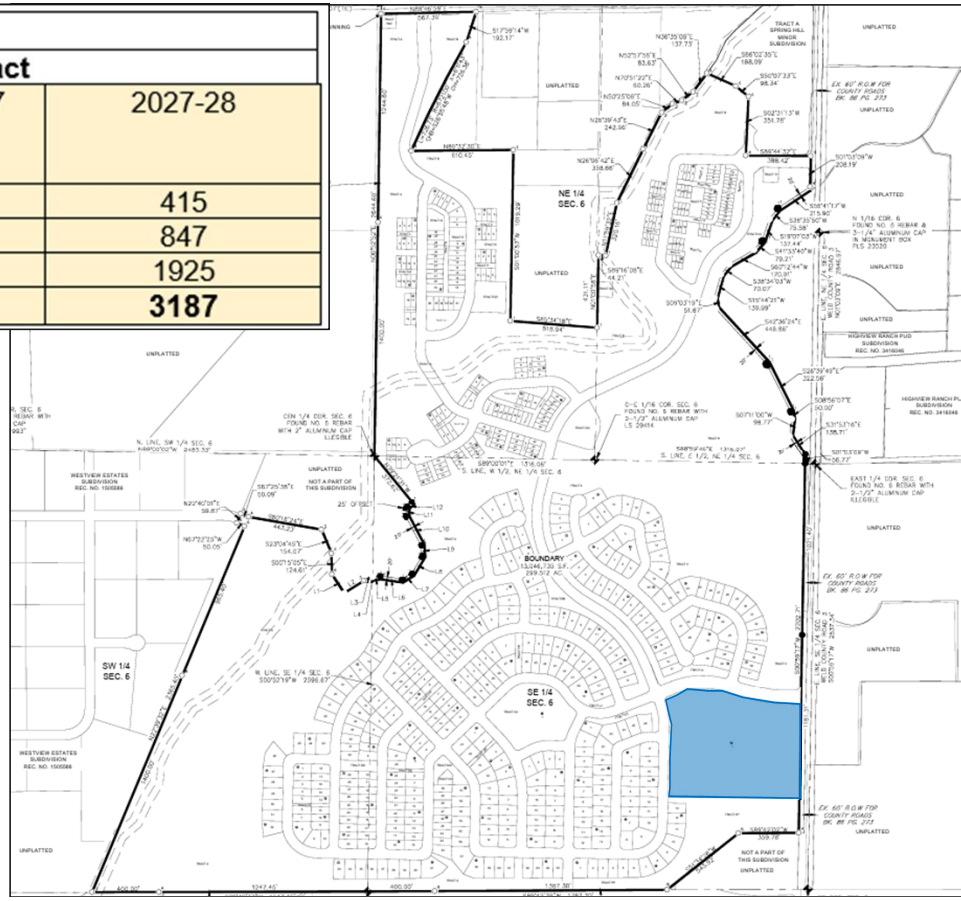
- 25’ setback from Plugged & Abandoned facilities

- Ongoing work with COGCC to mitigate soil in a portion of the northeast corner



Preliminary Plat - Schools

CAPACITY INFORMATION						
	Current Capacity		With Project Impact			
School Level	Building Capacity	Actual Enrollment Oct-24	Proposed Development Impact	2025-26	2026-27	2027-28
Elementary	539	436	126	348	378	415
Middle (SH 6-8)	810	763	58	777	811	847
High (EHS)	1456	1728	62	1815	1874	1925
Total	**2496**	**2927**	**246**	**2940**	**3063**	**3187**



- 10.6 acre school site to be dedicated to SVVSD at Final Plat (in blue, to the right)
- Will benefit from new high school in Frederick

Overview

- ✓ Background
- ✓ Proposal
- Decision

Approval Criteria UDC Section 10.7.7.D.2

a. The subdivision is generally consistent with the Town's Comprehensive Master Plan.
b. The subdivision is generally consistent with and implements the intent of the specific zoning district in which it is located.

Staff: The Preliminary Plat is generally consistent with the Town's Comprehensive Plan and the Spring Hill PD. The proposed lots meet the dimensional standards in the zoning.

Approval Criteria

c. The general layout of lots, streets, driveways, utilities, drainage facilities, and other services within the proposed subdivision is designed to meet the Town's standards related to health and safety and in a way that minimizes the amount of land disturbance, maximizes the amount of open space in the development, preserves existing trees/vegetation and riparian areas, protects critical wildlife habitat, and otherwise accomplishes the purposes and intent of this UDC.

d. The subdivision complies with all applicable use, development, and design standards set forth in Chapters 3, 5 and 6 of this UDC that have not otherwise been modified or waived pursuant to this Chapter or this UDC. Applicants shall refer to the Development Standards in Chapter 5 of this UDC and shall consider them in the layout of the subdivision in order to avoid creating lots or patterns of lots in the subdivision that will make compliance with such development and design standards difficult or infeasible.

Staff: The Preliminary Plat meets the applicable Town standards. High value wetland and open space areas will remain undeveloped under the development plan. The subdivision meets design standards contained in the UDC and will allow for orderly development.

Approval Criteria

e. The subdivision complies with all applicable regulations, standards, requirements, or plans of the Federal or State governments and other relevant jurisdictions, including but not limited to wetlands, water quality, erosion control, and wastewater regulations.

f. The subdivision will not result in significant adverse impacts on the natural environment, including air, water, noise, storm water management, wildlife, and vegetation, or such impacts will be substantially mitigated.

Staff: Provisions are in place to protect water quality, erosion control, and wastewater. Construction documents as part of the Final Plat process will require Best Management Practices (BMP's) for water quality, stormwater management and erosion control in accordance with the Town of Erie standards.

This subdivision is not anticipated to create any significant or unmitigated adverse impacts on the environment. The plan calls for setting aside wetland areas and existing irrigation ditches to retain habitat and vegetation.

Approval Criteria

g. The subdivision shall be integrated and connected, where appropriate, with adjacent development through street connections, sidewalks, trails, and similar features.

h. Adequate and sufficient public safety, transportation, utility facilities and services, recreation facilities, parks, and schools are available to serve the subject property, while maintaining sufficient levels of service to existing development.

Staff: Pedestrian and vehicular access is adequately provided throughout the subdivision. Sidewalk and trail connections are provided at key locations and extend the Spine Trail and also to Morgan Hill to the south.

As part of the Preliminary Plat review, drainage and erosion, traffic impact, environmental, and cultural studies were reviewed. All oil and gas facilities are now plugged and abandoned, and additional clean up/mitigation in one specific location will be completed in the future

Approval Criteria

i. The subdivision will not result in significant adverse impacts on adjacent properties, or such impacts will be substantially mitigated.

j. As applicable, the proposed phasing plan for development of the subdivision is rational in terms of available infrastructure capacity.

Staff: Adequate services and facilities currently exist or will be enhanced by the Preliminary Plat that will provide service to the development, adjacent neighborhoods, and the community at large. SVVSD is supportive of the plan to dedicate the new school site for future needs.

Phasing is not contemplated at this time. The future Final Plat(s) and Development Agreement(s) may include phasing.

Neighborhood Meetings

- October 11, 2021 – Virtual Meeting
- January 4, 2022 – In Person Meeting
- January 13, 2022 – On-site tour with some adjacent property owners
- January 25, 2022 – In Person Meeting
- March 2, 2026 – In Person Meeting

Public Notice

Public Notice of Planning Commission Hearing

- Published in the Colorado Hometown Weekly: 3/11/26
- Property Posted: 3/13/26
- Letters to Adjacent Property Owners: 3/13/26

Staff Recommendation

Staff finds the Spring Hill Preliminary Plat complies with the Approval Criteria and recommends the Planning Commission recommend approval of the Preliminary Plat, with the following condition:

- The Applicant shall make all necessary technical corrections as directed by staff prior to the public hearing on the Application by the Town Council.

Spring Hill
Preliminary Plat

Planning Commission

Harry Brennan, Senior Planner

April 1, 2026

TOWN OF ERIE
PLANNING COMMISSION AGENDA ITEM
April 1, 2026

SUBJECT:	**PUBLIC HEARING: Spring Hill Preliminary Plat** A Resolution of the Planning Commission of the Town of Erie Recommending Approval of the Spring Hill Preliminary Plat with Conditions
CODE REVIEW:	Erie Municipal Code, Title 10
PURPOSE:	Consideration of a Preliminary Plat to subdivide 300 acres into 632 residential lots and 49 tracts for future residential development.
DEPARTMENT:	Planning and Development
PRESENTER:	Harry Brennan, Senior Planner

STAFF RECOMMENDATION:
Staff finds the Spring Hill Preliminary Plat complies with the Approval Criteria and recommends the Planning Commission recommend approval of the Preliminary Plat, with the following condition: the Applicant shall make all necessary technical corrections as directed by staff prior to the public hearing on the Application by the Town Council.

ATTACHMENT(S):
1. Planning Commission Resolution
2. Staff Presentation
3. Staff Report
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5. Proposed Preliminary Plat
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11. Neighborhood Meeting Summaries
12. Public Notice Postings

Note - DRT Comments from all seven rounds of DRT review are available, here: https://portal.laserfiche.com/Portal/Browse.aspx?id=346530&repo=r-a69d230a

SUMMARY AND BACKGROUND OF SUBJECT MATTER:

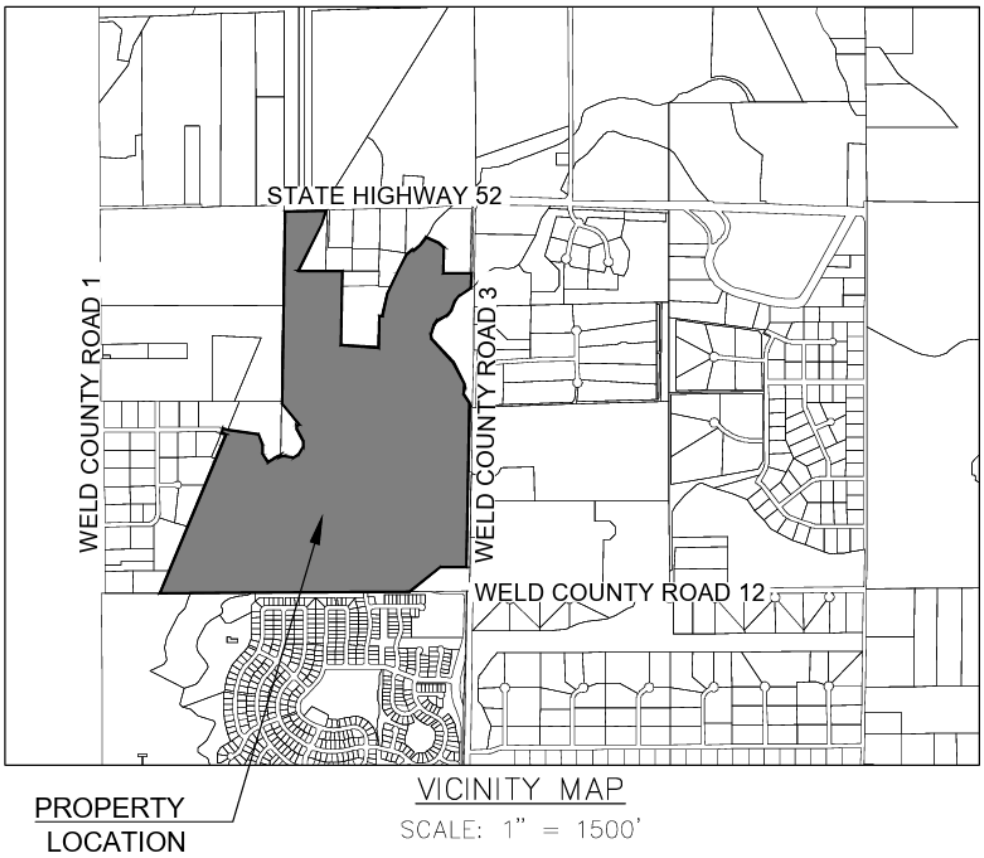
Applicant: ME, LLC
7353 South Alton Way
Centennial, CO 80112

Existing Conditions:

Zoning:	Spring Hill Planned Development (PD)
Project Size:	300 Acres
Existing Use:	Undeveloped/Agricultural
Future Land Use:	Residential

Location Map:

Below is a map that depicts the site (shaded) and surrounding area:

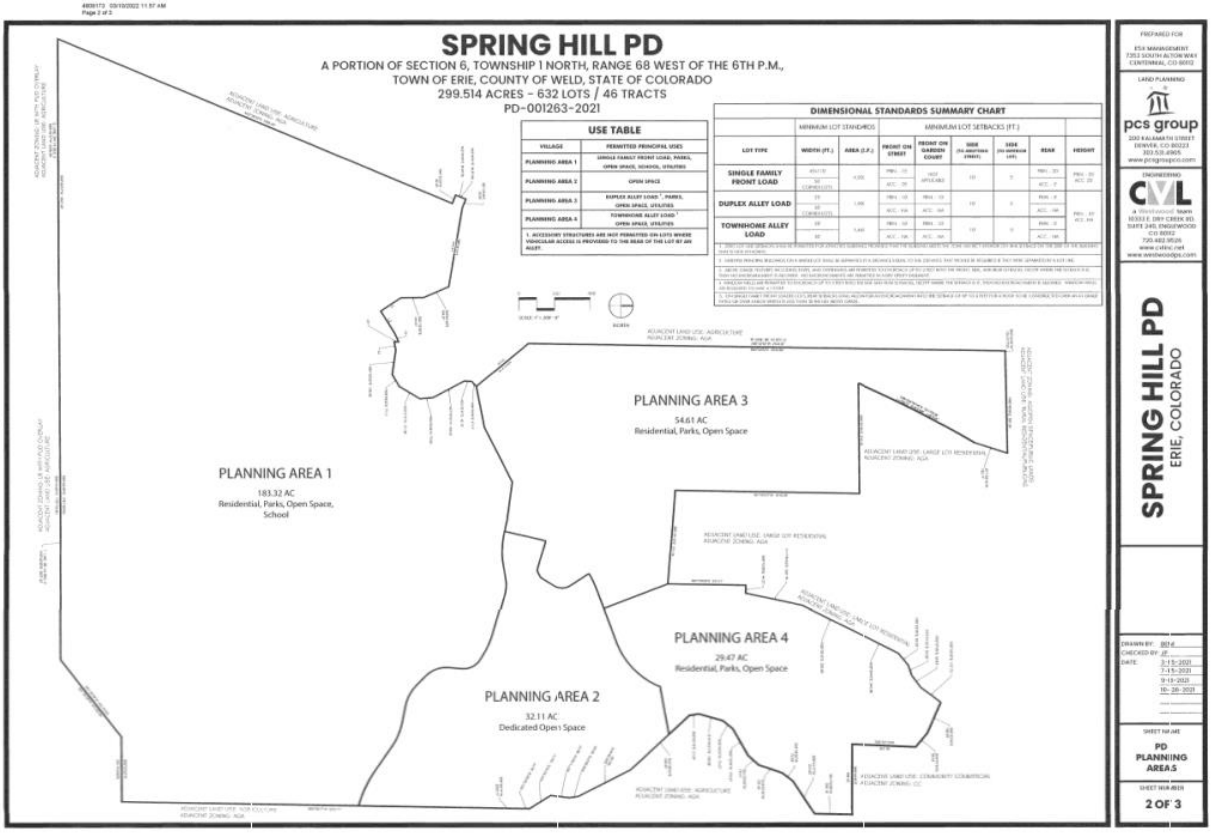


Adjacent Land-Use/Zoning:

	ZONING	LAND USE
NORTH	Unincorporated Boulder County; Public Lands & Institutions (PLI), Agriculture and Open Space (AG-OS)	Agriculture, Town water treatment facility
SOUTH	Low Density Residential (LR) & PUD Overlay	Morgan Hill Residential
EAST	Unincorporated Boulder County	Agriculture, Residential
WEST	Unincorporated Boulder County	Agriculture, Residential

Site History:

The Town annexed the Spring Hill area in 2013, originally zoning the property Low Density Residential (LR). The annexation agreement capped the total number of dwelling units for the Spring Hill area to be no more than 632. In 2019, the applicant completed a minor subdivision plat to divide the property into residential areas, a future open space area, and a commercial area at the corner of Highway 52 and Weld County Road 3. The commercial area is not a part of this preliminary plat. The Town approved a re-zoning in 2022 for the residential portions from LR to the Spring Hill Planned Development (PD). This PD created four planning areas that reflected the plan for open space, future school land dedication, and residential areas.



Future Required Applications:

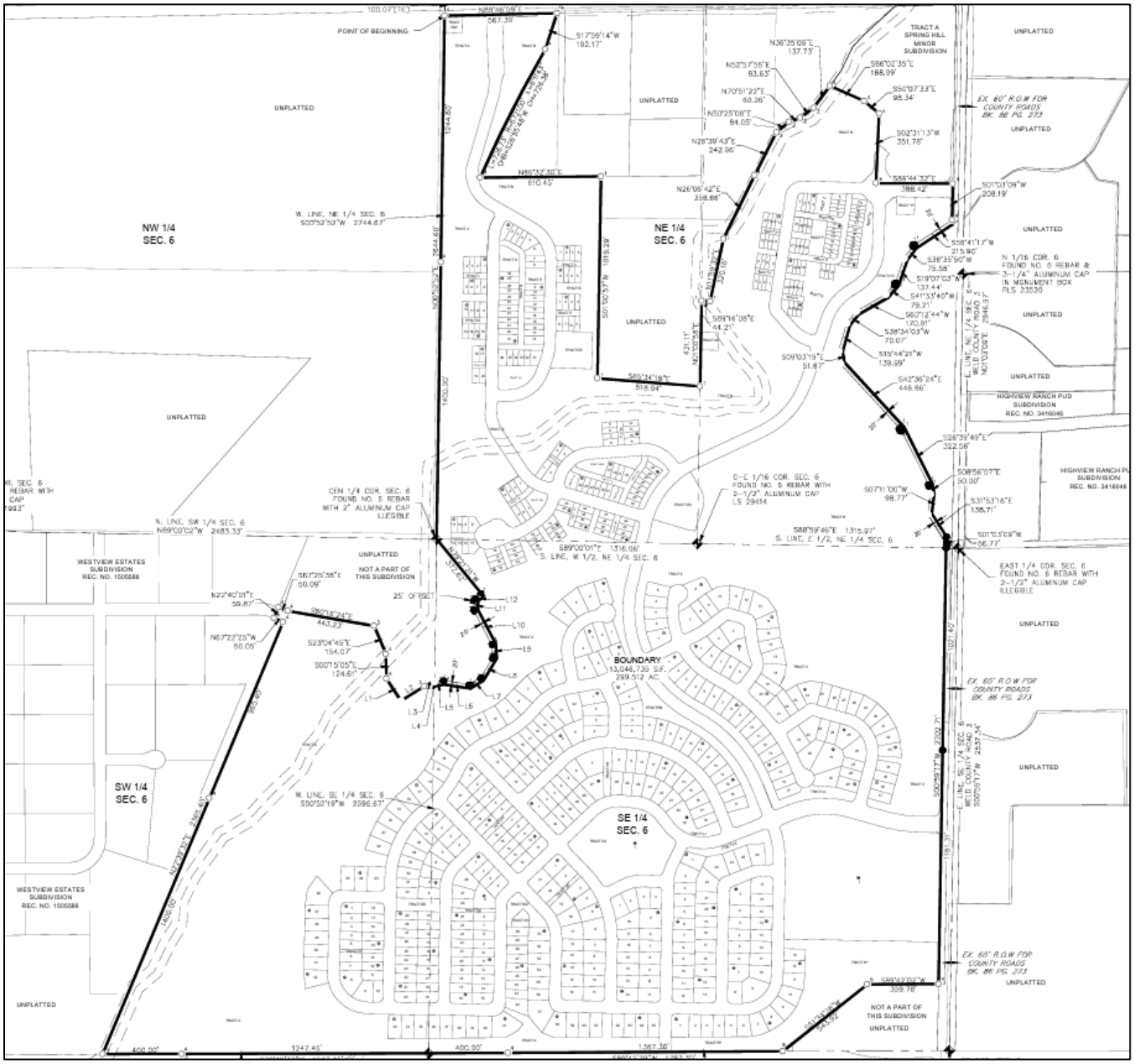
If approved, the next steps for development of the subject site will include a Development Agreement(s), and Final Plat(s) application that will be reviewed by staff with final acceptance by the Town Council. A Site Plan is also required for the townhome areas.

Proposed Preliminary Plat:

The applicant proposes a Preliminary Plat with 632 lots and for future residential development and 49 tracts. The applicant anticipates that these lots would develop with single family detached, duplex, and townhome residential units. The proposed tracts will accommodate public open space and parks, site drainage, private open spaces and alleys, utilities, and trails. The preliminary plat proposes access from Highway 52, and Weld County Road 3, as well as a connection to the existing Morgan Hill subdivision to the south.

Preliminary Plat Development Data:

Area	300 acres total
Number of Lots - Proposed	632 lots • 414 SFD • 148 Duplex Lots • 70 Townhome Lots
Minimum Lot Size Permitted by Spring Hill PD	• 4950 SF for SFD • 1900 SF for Duplex • 1460 SF for Townhomes
Gross Density	2.1 DU/Acre
Number of Tracts	49 tracts (166 acres)
Public Right-of-Way (ROW)	43.8 acres
Future School Site Dedication	10.66 acres
Public Open Space	35 acres
Total Open Space (Including Private)	162 acres

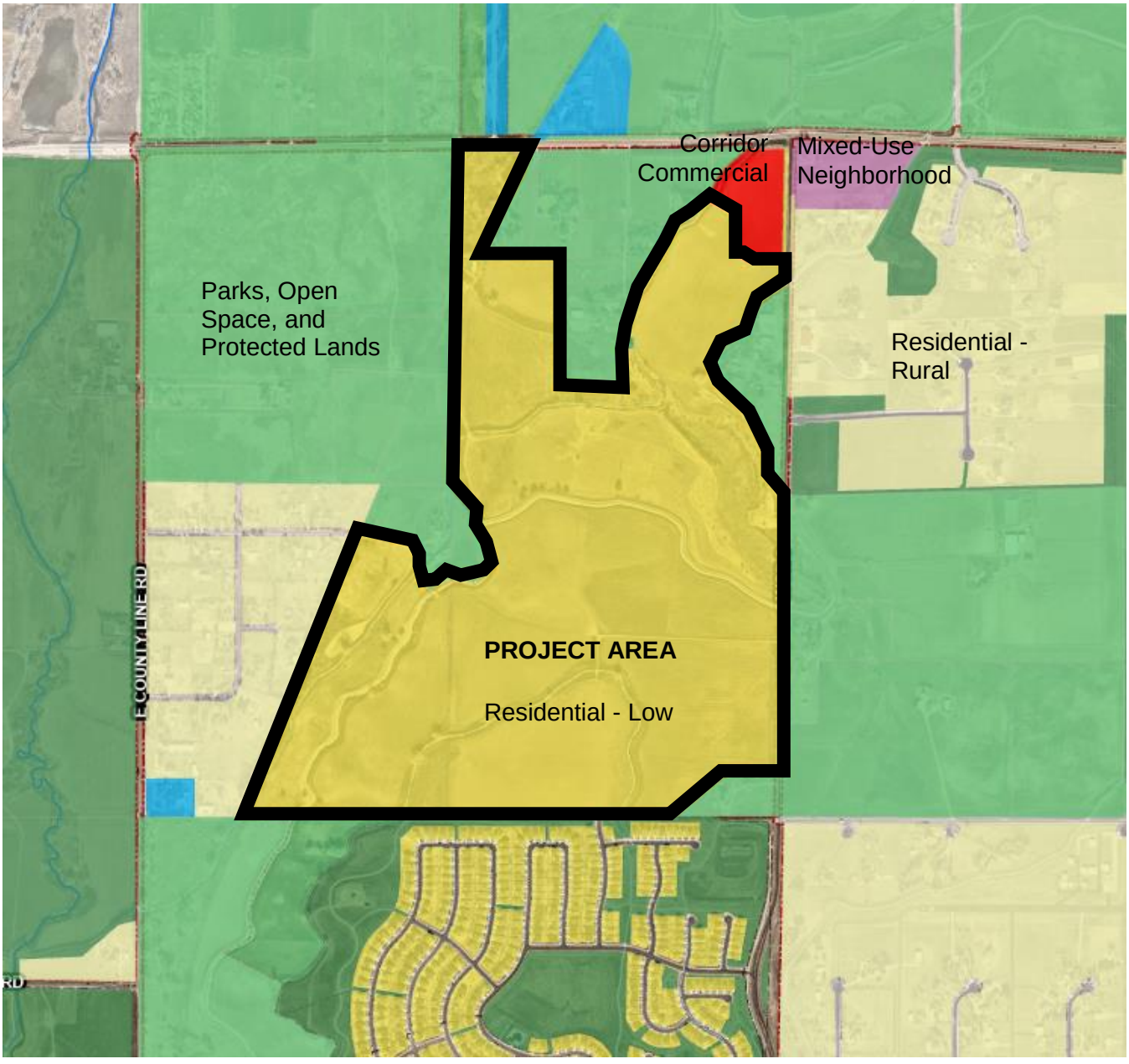


Compliance with Town of Erie Comprehensive Plan:

The Preliminary Plat application is in general compliance with the land use designations on the 2024 Comprehensive Plan Future Land Use Map. The Future Land Use Map designates this project area as Residential, Low which has a density of 2 to 8 dwelling units per acre. The overall gross density of the proposed Preliminary Plat is 2.1 dwellings per acre, which places it in a range consistent with the Comprehensive Plan. The subject site is outlined in black on the Future Land Use map, below.

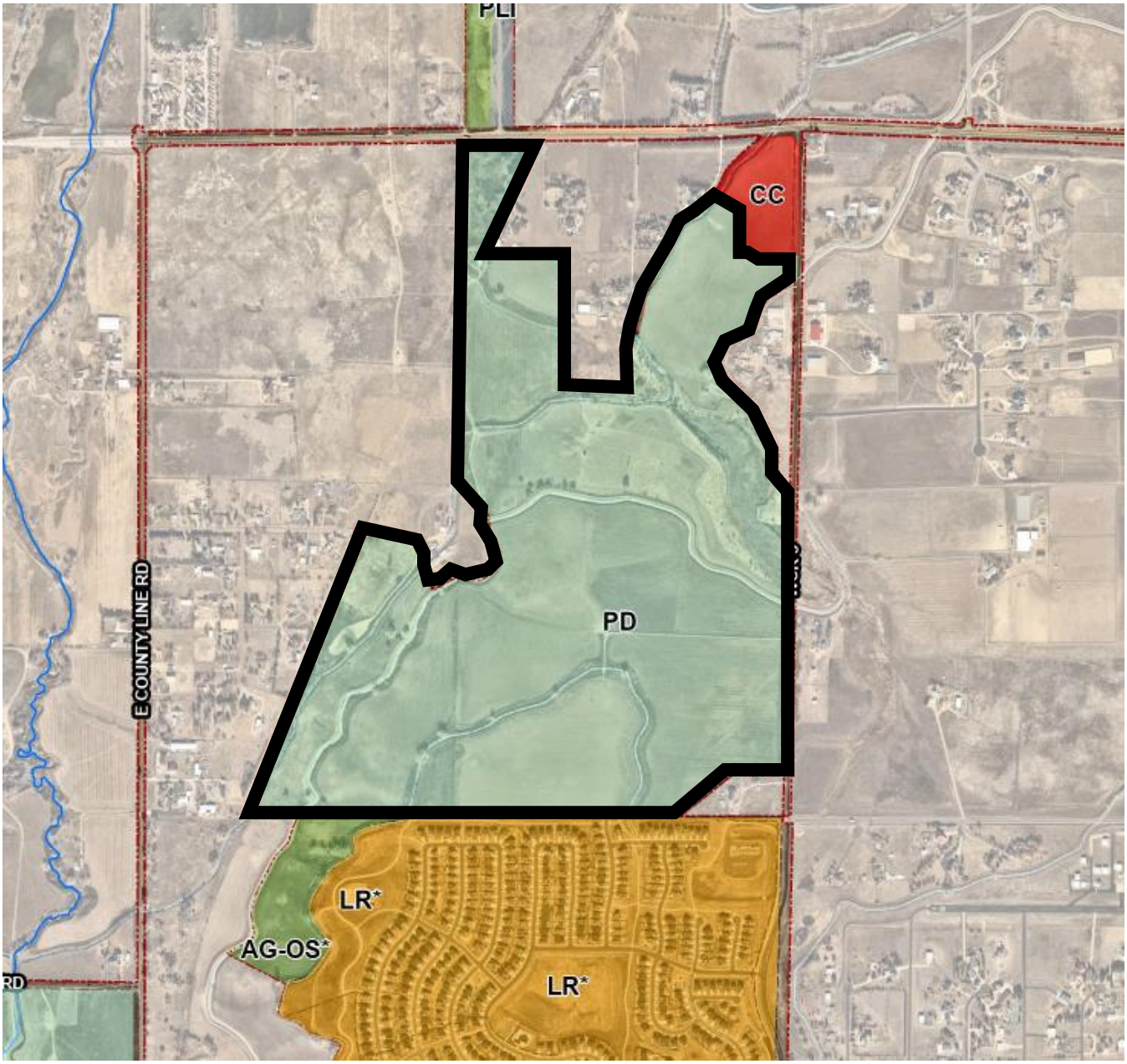
Overall, staff find that this application complies with the Comprehensive Plan, and aligns with the following policies:

- C.1.1 Encourage a variety of housing types in neighborhoods to provide a more diverse selection of lifestyles and housing pricing for Erie residents.
- C.5.1 Ensure new development meets Comprehensive Plan vision, priorities, and resource management.
- L.1.2 Connect the community through a network of public and private parks, open space, greenways, and trails.
- L.3.1 Promote the adaptability of neighborhoods to meet the needs of the changing community.
- H.1.2 Increase housing options.



Compliance with Town of Erie Zoning Map:

The subject property is zoned Spring Hill PD. The property is outlined in black on the zoning map below. Staff find that this application is consistent with PD zoning. The proposed lots will comply with the minimum lot size, lot width, and other development standards in the PD. Staff evaluated the lot layout in relation to the dimensional standards (setbacks, etc.) and find that the lots are configured in a way that will allow compliance with the standards.



Access/Roadways:

The applicant submitted a Traffic Impact Study with the Preliminary Plat application materials and has provided an update to the study with recent traffic counts. The Study evaluated levels of service for nearby major intersections and the contribution to traffic volume by the proposed Spring Hill development. New traffic improvements are needed and expected to accommodate the anticipated traffic volumes. These recommended traffic improvements will be specified in the Development Agreement(s) included with the forthcoming Final Plat(s) and will include the improvements listed below. Additionally, the Town will continue to evaluate levels of service with future land use applications in the Spring Hill development to determine any necessary additional improvements.

Major Intersections

- Highway 52 & Future Connection (Boysenberry Trail)
    - The new intersection at Highway 52 with Boysenberry Trail and the access driveway to the water treatment facility may require a traffic signal to provide adequate levels of service. Coordination with CDOT and the Town will be required at time of Final Plat to determine whether and when a traffic signal is required.
- Highway 52 & WCR3
    - This intersection is currently stop sign controlled. This intersection is planned to be rebuilt as a two-lane roundabout.
- Additional WCR3 Intersections
    - Currently the proposed intersections on WCR3 are expected to operate at acceptable levels of service with stop sign control.

Internal Street Network

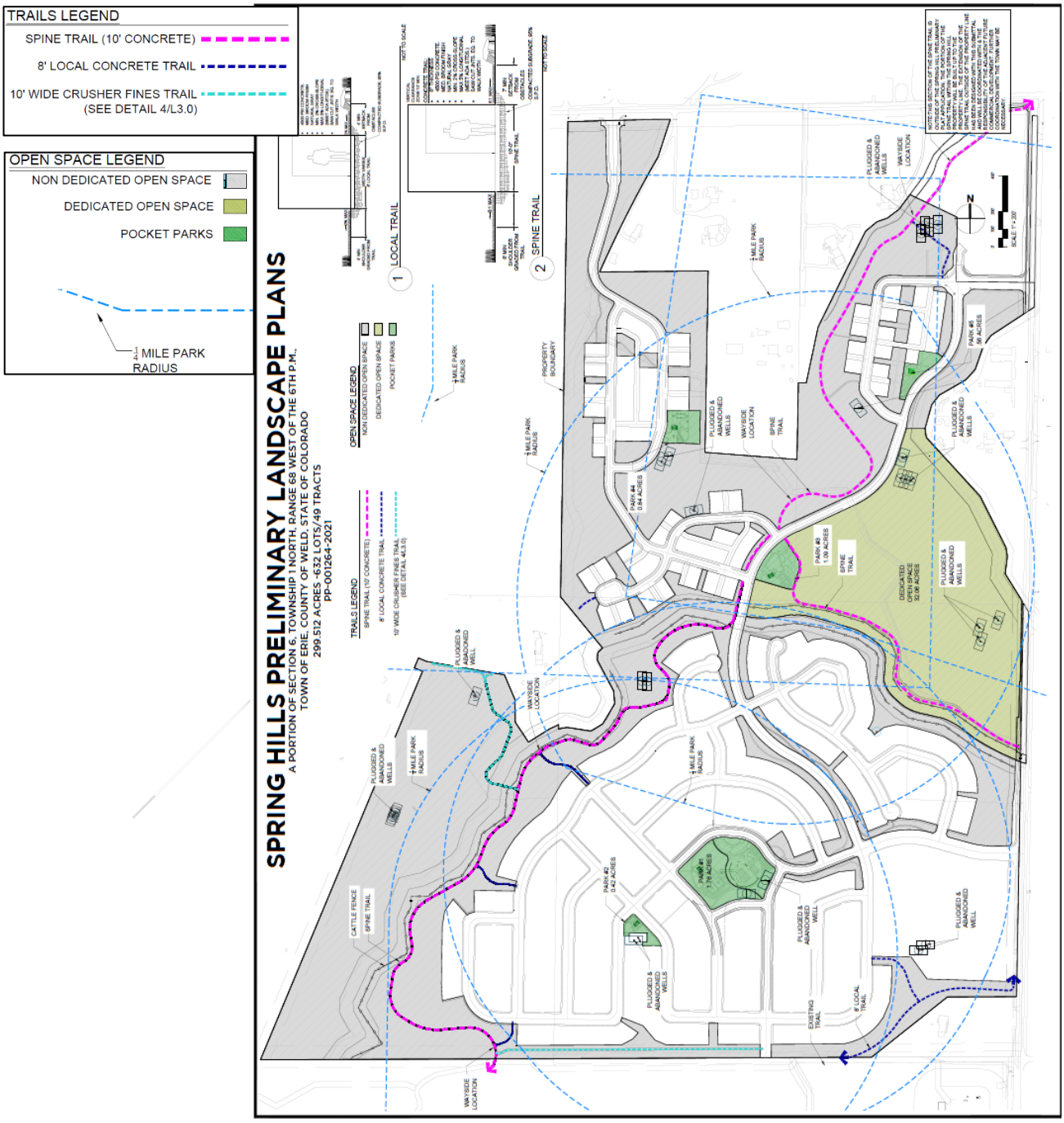
- The Spring Hill street grid is planned to connect to the Morgan Hill neighborhood at Miranda Road.

Parks, Open Space, and Trails:

The Preliminary Plat includes trail connections and public open space dedications and pocket parks dedications. Fee-in-lieu will also be collected for the Neighborhood Parks requirements as well as impact fees for the Community Parks requirements. The proposal includes new trail connections through the development. Spine trail is shown in pink, and additional local trail connections are shown in dark blue and teal.

Park and Open Space Dedication Requirements

Type	Required	Provided
Pocket Parks (.5 ac/1000 residents)	0.83 acres	3.99 acres
Neighborhood Parks (3 ac/1000 residents)	4.97 acres	Fee in Lieu
Community Parks (5 ac/1000 residents)	8.29 acres	Collected via Impact Fees
Open Space (17 ac/1000 residents)	28.2 acres	35.16 acres



Natural Areas and Tree Inventory:

The Preliminary Plat application included a Threatened-Endangered Species and General Wildlife Screening. This report did not locate any threatened or endangered species or endangered habitat in the project area. The report did note that it was likely that migratory birds and raptors use the area during certain times of the year. Most of the existing wetland area is dedicated open space in the Preliminary Plat. Areas around the irrigation ditches would remain undeveloped, preserving key habitat areas.

The Tree Inventory noted hundreds of existing trees in the project area, 445 of which are in good health. However, Russian Olive trees account for more than 85% of these trees. Russian Olives are a thorny invasive and noxious species in Colorado that threaten wetland areas by outcompeting native species and consuming large amounts of water. These are not recommended for retention. The Preliminary Landscape plans note healthy trees for retention and mitigation and replacement of those removed. The Tree Inventory and Preliminary Landscape plans together satisfy the 'Native and specimen tree and vegetation survey and protection plan' required by code.

Drainage and Stormwater:

The applicant submitted a Phase II drainage study with this Preliminary Plat application. Final Phase III drainage plans will be reviewed with the Final Plat. The applicant has coordinated extensively with CDOT, Town, and other interested agencies to determine the best course forward for stormwater drainage. The plan calls for a series of stormwater detention areas throughout the development which all flow northwards, where a channel will take water through a culvert under Highway 52 and through a private property on the north side of Highway 52.

Fire Protection:

Mountain View Fire Protection District (MVFR) provides fire and emergency medical services. The project area is closest to Station 8, at 400 Bonanza Drive. MVFR is a referral partner on development review applications and would continue to be involved in the review of this project moving forward.

Police Services:

The Erie Police Department will provide and plan for service to the property.

Schools:

This project falls within the SVVSD boundary. This project will dedicate just over 10 acres to the school district for future school construction. Dedication would occur at the time of Final Plat, once property lines have been established.

SVVSD plans to construct a new elementary school in Colliers Hill, which would alleviate pressure on existing elementary schools and free up space for future students from Spring Hill. Additionally, the new high school under construction in Frederick will help alleviate overcrowding at Erie High School.

The land dedication proposed for SVVSD would allow the district to use this land

dedication for a future elementary school, though there are no imminent plans to build the school right now.

CAPACITY INFORMATION						
	Current Capacity		With Project Impact			
School Level	Building Capacity	Actual Enrollment Oct-24	Proposed Development Impact	2025-26	2026-27	2027-28
Elementary	539	436	126	348	378	415
Middle (SH 6-8)	810	763	58	777	811	847
High (EHS)	1456	1728	62	1815	1874	1925
Total	**2496**	**2927**	**246**	**2940**	**3063**	**3187**

Utilities:

The Town of Erie would provide both water and wastewater services to the property. The utility service provider for the property is Xcel Energy for gas and electric, Century Link Communications for telephone services and Comcast for cable television. Utility easements for these providers will be established at the time of Final Plat but are adequately shown on the Preliminary Plat.

Oil & Gas Facilities:

There are several plugged & abandoned oil and gas facilities within the overall project area. The applicant originally submitted this Preliminary Plat application in 2021, under the Town's old setback requirements which mandated a 25' setback from plugged & abandoned facilities. Legally, the applicant is obliged to comply with the regulations that were in place at the time when the application is first filed. The proposed Preliminary Plat accommodates the required 25' setback but in many cases provides a greater setback because most of the facilities occur in open space areas that will not be disturbed by development.

Soils and Geology:

The Geotechnical Report examined potential geological risks in the area. The report found no evidence of undermining, consistent with Town records related to historic mining extents.

There are soft and loose soils, as well as shallow groundwater in some locations within the Spring Hill project area. The report indicates specific excavation techniques and limiting basements or basement depths in some areas may be necessary. These aspects will need further evaluation at future project stages to determine what mitigation will be necessary.

Environmental Hazards:

The Environmental assessment notes impacts from the oil and gas facilities that previously operated in the northeast, near a former well. The applicant adjusted site layout accordingly. Existing soil and groundwater contamination is not expected to migrate towards the development area. The applicant is aware of this finding and is working with the Colorado Oil and Gas Conservation Commission (COGCC) to clean up and mitigate impacts.

Remediation will to be complete prior to Final Plat approval.

Cultural Resources:

The Cultural Resources Report noted the importance of the irrigation ditches as contributing to the existing rural/agricultural character of the area. It notes that the proposal mitigates impacts by preserving ditches and adjacent areas as open space.

STAFF REVIEW AND ANALYSIS

Staff finds the application is consistent with the Preliminary Plat approval criteria in the UDC, Section 10.7.7.D.2, as outlined below.

a. The subdivision is generally consistent with the Town's Comprehensive Master Plan.

   Staff: The subdivision is generally consistent with the Comprehensive Plan. The proposed Preliminary Plat meets the intent of the Residential-Low land use designations in overall density and provides a range of housing types.

b. The subdivision is generally consistent with and implements the intent of the specific zoning district in which it is located.

   Staff: The proposal is consistent with the Spring Hill PD in terms of uses, lot dimensions, layout, open space and parks, and circulation.

c. The general layout of lots, streets, driveways, utilities, drainage facilities, and other services within the proposed subdivision is designed to meet the Town's standards related to health and safety and in a way that minimizes the amount of land disturbance, maximizes the amount of open space in the development, preserves existing trees/vegetation and riparian areas, protects critical wildlife habitat, and otherwise accomplishes the purposes and intent of this UDC.

   Staff: The Preliminary Plat meets the applicable Town standards. High value wetland and open space areas will remain undeveloped under the development plan. Lots and streets are arranged in a layout that will allow a Final Plat to meet the Town's design criteria.

d. The subdivision complies with all applicable use, development, and design standards set forth in Chapters 3, 5 and 6 of this UDC that have not otherwise been modified or waived pursuant to this Chapter or this UDC. Applicants shall refer to the Development Standards in Chapter 5 of this UDC and shall consider them in the layout of the subdivision in order to avoid creating lots or patterns of lots in the subdivision that will make compliance with such development and design standards difficult or infeasible.

   Staff: The design of the Preliminary Plat considers applicable use, development, and design standards of Chapters 3, 5, and 6 of the Code. The layout and design of the subdivision is appropriate and consistent with the general provisions of the UDC. Streets and trail connections are appropriate and will benefit future residents and provide continuity to external developments and trails. Utility easements are provided on the Preliminary Plat. Appropriate provisions are in place for storm water, water, and wastewater lines.

e. The subdivision complies with all applicable regulations, standards, requirements, or plans of the Federal or State governments and other relevant jurisdictions, including but not limited to wetlands, water quality, erosion control, and wastewater regulations.

Staff: Significant adverse impacts are not anticipated. The site is not impacted by a designated floodplain. Provisions are in place to protect existing wetlands, water quality, erosion control, and wastewater. Appropriate studies were reviewed and no concerns are outstanding. Construction documents as part of the Final Plat process will require Best Management Practices (BMP's) for water quality, stormwater management and erosion control in accordance with the Town of Erie - Standards and Specifications for Design and Construction of Public Improvements.

f. The subdivision will not result in significant adverse impacts on the natural environment, including air, water, noise, storm water management, wildlife, and vegetation, or such impacts will be substantially mitigated.

Staff: All new developments have impacts on the natural environment. This subdivision is not anticipated to create any significant or unmitigated adverse impacts on the environment. Appropriate studies were reviewed and no concerns are outstanding. The plan calls for setting aside wetland areas and existing irrigation ditches to retain habitat and vegetation.

g. The subdivision shall be integrated and connected, where appropriate, with adjacent development through street connections, sidewalks, trails, and similar features.

Staff: Pedestrian and vehicular access is adequately provided throughout the subdivision. Sidewalk and trail connections are provided at key locations and extend the Spine Trail and to Morgan Hill to the south.

h. The subdivision will not result in significant adverse impacts on adjacent properties, or such impacts will be substantially mitigated.

Staff: Significant adverse impacts are not anticipated. As part of the Preliminary Plat review, drainage and erosion, traffic impact, environmental, and cultural studies were reviewed. All oil and gas facilities are now plugged and abandoned, and additional cleanup/mitigation in one specific location will be completed in the future.

i. Adequate and sufficient public safety, transportation, utility facilities and services, recreation facilities, parks, and schools are available to serve the subject property, while maintaining sufficient levels of service to existing development.

Staff: Adequate services and facilities currently exist or will be enhanced by the Preliminary Plat that will provide service to the development, adjacent neighborhoods, and the community at large. The school district is supportive of the plan to dedicate the new school site for future needs.

j. As applicable, the proposed phasing plan for development of the subdivision is rational in terms of available infrastructure capacity.

Staff: A phasing plan is not contemplated for the Preliminary Plat. A Development Agreement between the applicant and the Town will be reviewed by the Town Council as part of Final Plat approvals which may include a phasing plan.

NEIGHBORHOOD MEETING

This application is subject to the rules that were in place when the applicant originally submitted. Thus, the Town's more recent requirement that neighborhood meetings take place no more than six months prior to the first public hearing does not apply.

However, the applicant has maintained contact with individual neighbors throughout the process and has also held three formal neighborhood meetings as well as a site tour. The applicant's outreach efforts are summarized and provided as an attachment. Staff find that the applicant has met the neighborhood meeting requirement.

- October 11, 2021 – Initial virtual neighborhood meeting
- October 17, 2021 – Follow up conference call, with additional correspondence with property owners through
- January 4, 2022 – Neighborhood meeting
- January 13, 2022 – On-site meeting with some adjacent property owners
- January 25, 2022 – Neighborhood meeting
- March 2, 2026 – Neighborhood meeting

PUBLIC NOTICE

Notice of this Public Hearing has been provided as follows:

Published in the Colorado Hometown Weekly: 3/11/26

Property Posted: 3/13/26

Letters to adjacent property owners within 500': 3/13/26


SPRING HILL
PLANNING COMMISSION
PRESENTATION
APRIL - 2026

PROJECT TEAM

SPRING HILL

01 PROPERTY OWNERSHIP
ME Erie, LLC

02 PLANNING & LANDSCAPE ARCHITECTURE
PCS Group, Inc.

03 CIVIL ENGINEERING
Westwood, Inc.

04 TRAFFIC CONSULTANT
LSC Transportation Consultants, Inc.

05 ENVIRONMENTAL CONSULTANT
Western Environment & Ecology, Inc.

06 ENVIRONMENTAL CONSULTANT
Ecological Resource Consultants, Inc.

07 GEOLOGIC CONSULTANT
CTL Thompson, Inc.

08 CULTURAL RESOURCE CONSULTANT
James Enterprises, Inc.

09 RESTORATION SPECIALIST
Duraroot, LLC

10 LEGAL CONSULTANT
Davis & Ceriani, PC.

PROPERTY HISTORY

MARCH - 2014

Annexation and Zoning

Following a process that started in 2006, in March of 2014 the property was Annexed to the Town of Erie, and Zoned as Low Density Residential.

APRIL - 2014

Andalusia Sketch Plan

After the Annexation and Zoning a Sketch Plan Submittal was processed with the Town of Erie.

AUGUST - 2014

Andalusia Preliminary Plat

Our team has reviewed the comments that were made on the Preliminary Plat submittal that was made in August of 2014, and has incorporated the comments into this new Sketch Plan submittal.

APRIL - 2019

Spring Hill Sketch Plan

Our team has addressed the previous project comments with this new Sketch Plan submittal, and has met with OSTAB specifically on this project to solicit early feedback.

MARCH 2021 - FEBRUARY 2022

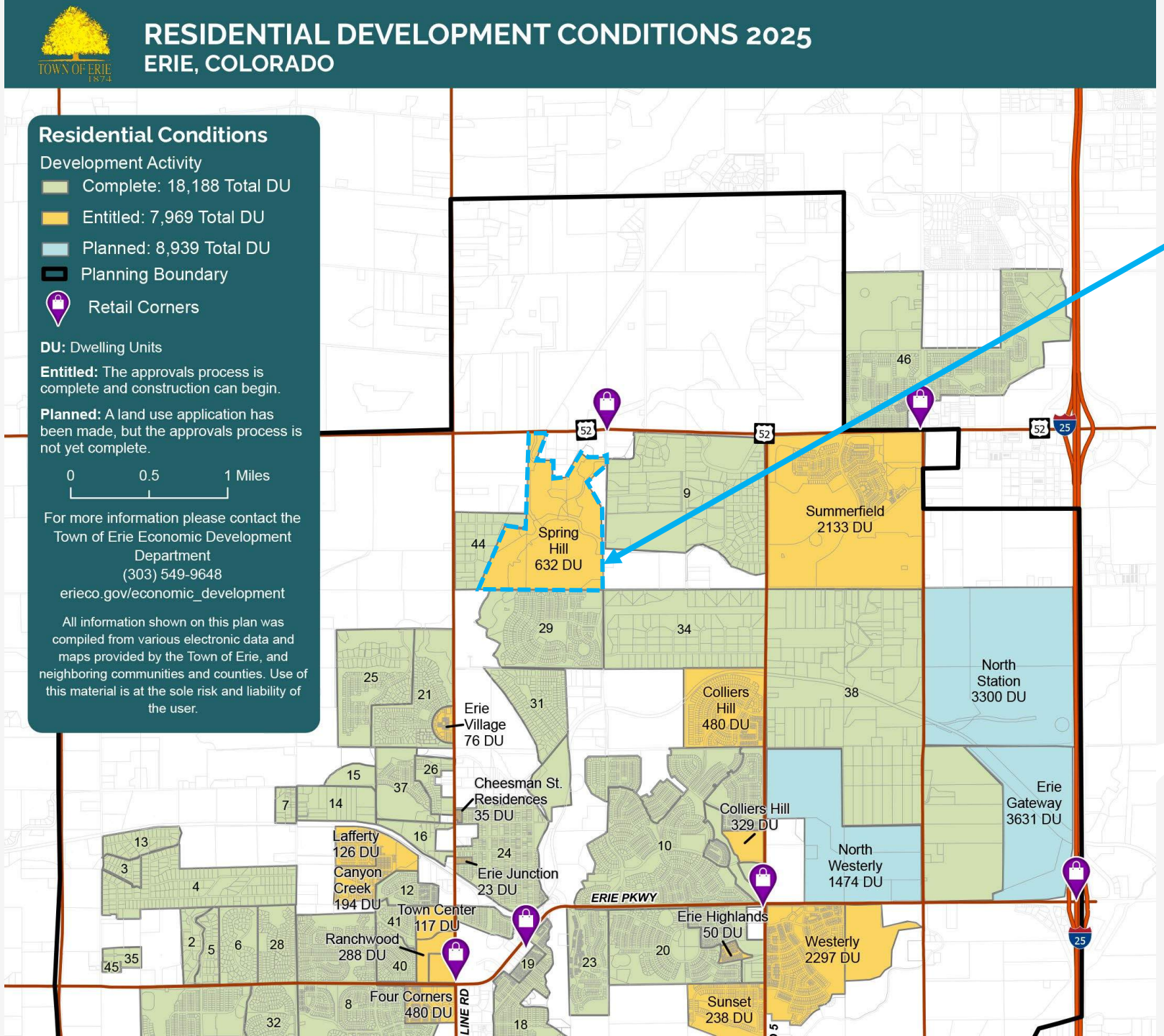
Spring Hill PD

A PD Zoning was reviewed by Planning Commission in December of 2021, and by the Board of Trustees in February of 2022, the proposal was approved and recorded in February of 2022.

MARCH 2021 - MARCH 2026

Spring Hill Preliminary Plat

For over 5 years our team, with significant collaboration with the Town of Erie, has been refining and modifying the Preliminary Plat application to get to this point. Significant issues that we have worked through include plugging and abandoning all Oil and Gas on the property, revising the site design to accommodate new Oil and Gas standards, working out a design solution that solves Regional drainage issues through the development of this property, continuing to work with the adjacent neighbors on site design, incorporating an offsite roundabout design at the intersection of Hwy 52 and County Road 3.



Property Location

Recognized community: Spring Hill is shown on the Town of Erie Development Project Map, recognizing this future community.

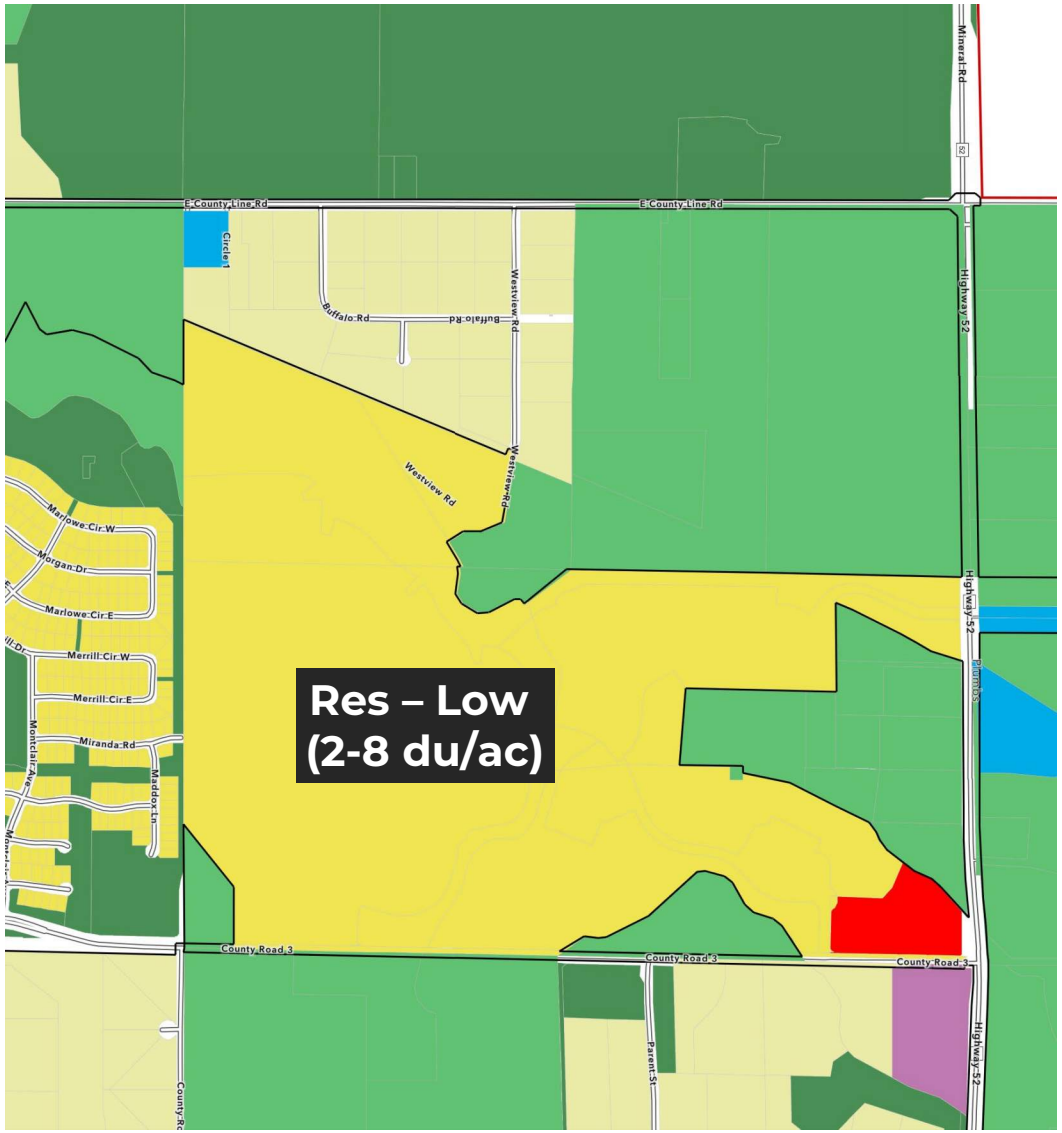
Planned growth: Annexed in 2014 with an anticipated build-out of 632 homes — this proposal fulfills an established community vision.

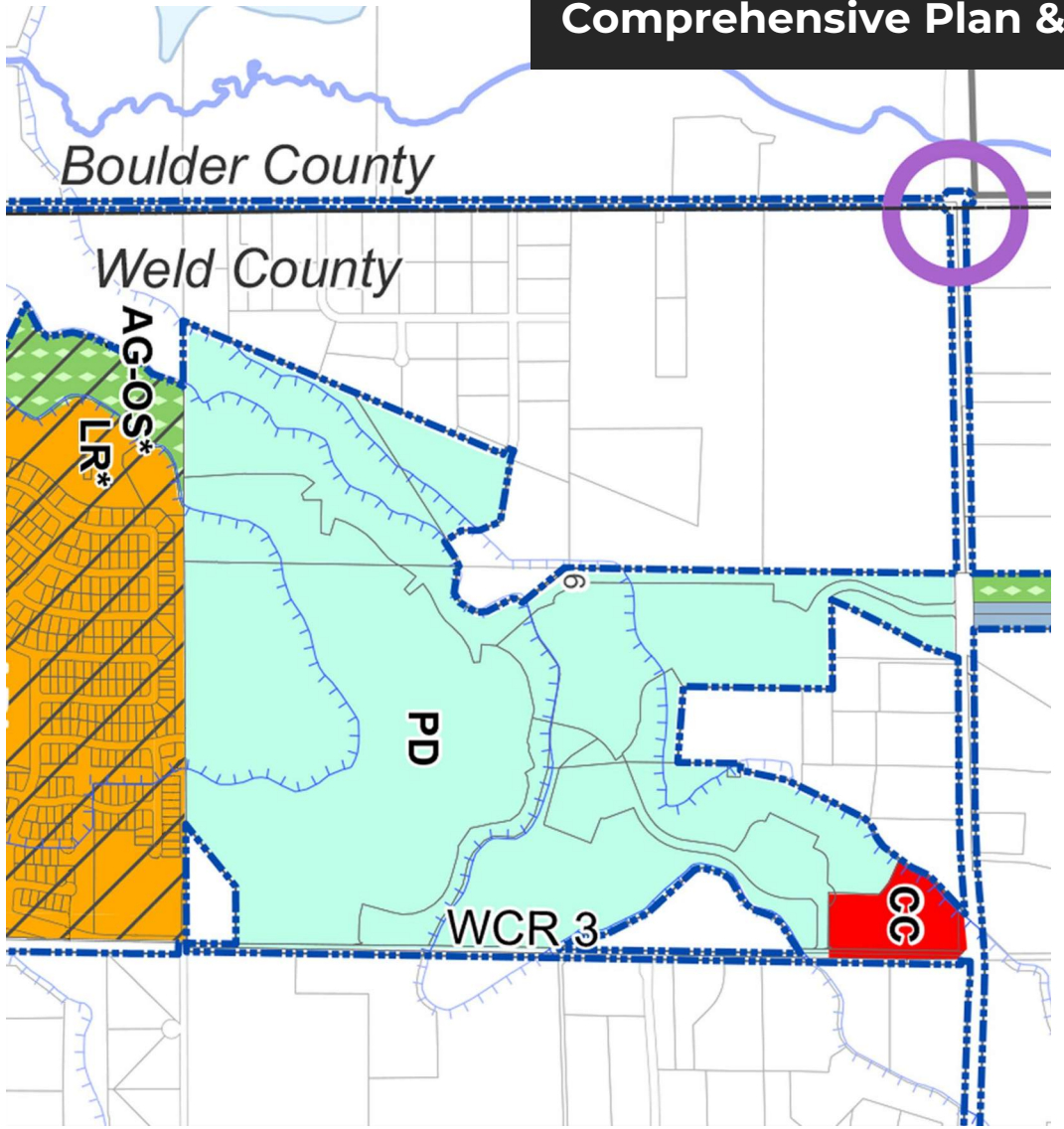
Prime, well-defined site: Hwy 52 forms the northern edge and County Road 3 the eastern boundary, providing clear, accessible frontage.

Seamless neighborhood context: Adjacent to Morgan Hill to the south and Westview/Broomfield County lands to the west, Spring Hill complements and strengthens the existing residential fabric.

Strategic opportunity: This location and history make Spring Hill a ready, responsible next step in Erie's planned growth—bringing homes, connectivity, and civic value to the town.

Comprehensive Plan & Zoning





Comprehensive Plan

North

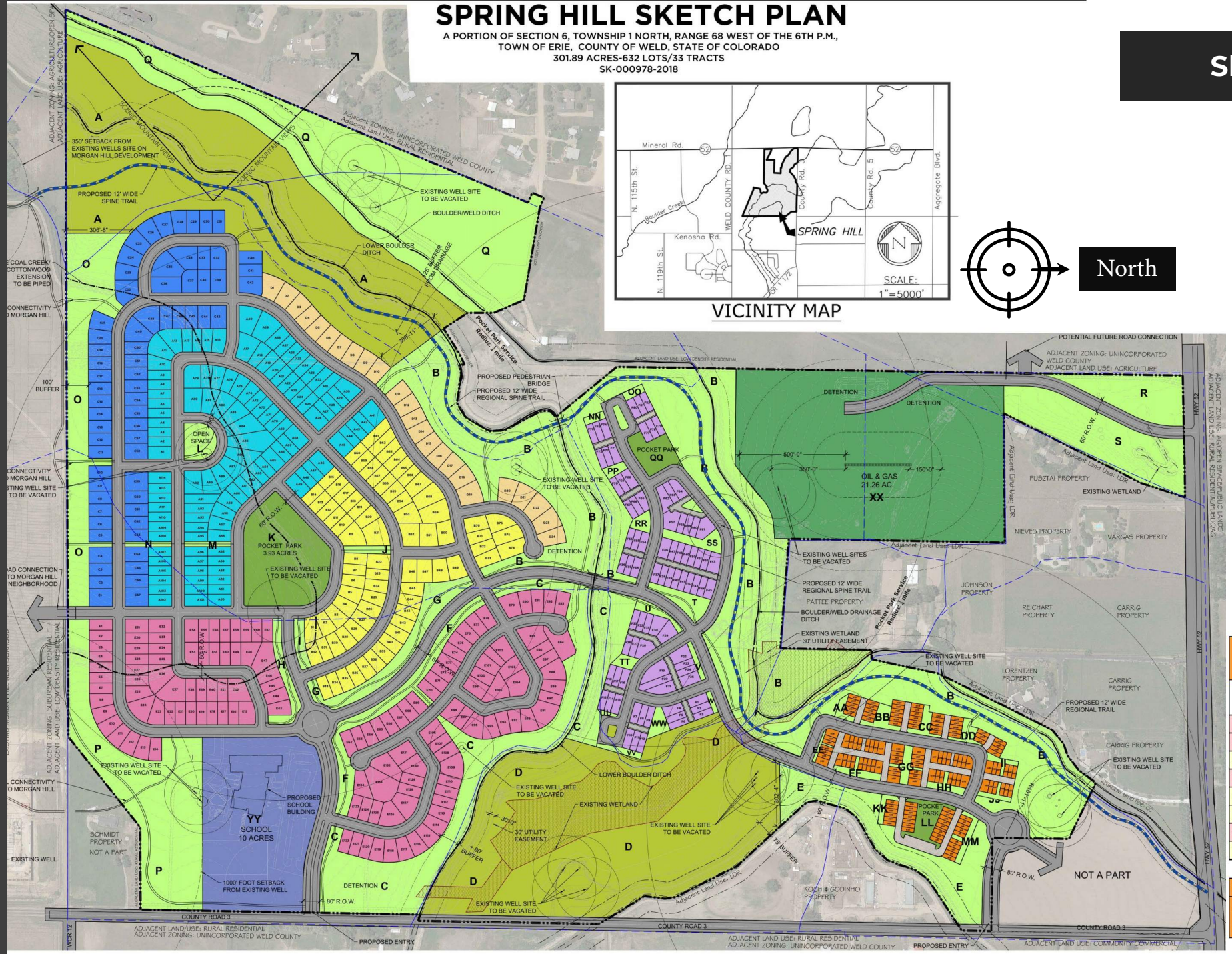
Zoning

SKETCH PLAN

SPRING HILL SKETCH PLAN

A PORTION OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M.,
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO
301.89 ACRES-632 LOTS/33 TRACTS
SK-000978-2018

Sketch Plan Concept



LOT SUMMARY CHART

	TYPICAL DEPTH	TOTAL UNITS
	LOT TYPE	
	A-45'x110'	114
	B-50'x110'	76
	C-60'x110'	67
	D-65'x115'	24
	E-50'x110'	134
	F-32'x95' (ALLEY LOAD)	82
	TOWNHOMES	
	H-20'x60'	135
	TOTAL	**632**

OPEN SPACE KEY
GENERAL OPEN SPACE
PARKS
TOWN DEDICATED OPEN SPACE
OIL AND GAS

NOTES:
1. PER THE PRELIMINARY GEOTECHNICAL SUBSURFACE EXPLORATION REPORT THERE ARE NO KNOWN HAZARD AREAS, INCLUDING GEOLOGIC HAZARDS, UNDERMINED AND SUBSIDENCE AREAS & EXPANSIVE SOILS.

LAND SUMMARY CHART

Type	Area (in Acres)	% of Total Area
Residential Lots	76.23	25.25%
Oil and Gas	21.26	7.04%
Public Right-Of-Way	43.84	14.52%
Private Alley Right-Of-Way	2.69	0.89%
Open Space Tracts	142.70	47.27%
Pocket Park	5.17	1.71%
School	10.00	3.31%
Total Subdivision Area:	301.89	100.00%

Dedicated Open Space	49.61	16.43%
Non-Dedicated Park and Open Space	98.26	32.55%

PD ZONING AREAS

SPRING HILL PD

A PORTION OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M.,
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO
299.514 ACRES - 632 LOTS / 46 TRACTS
PD-001263-2021

USE TABLE	
VILLAGE	PERMITTED PRINCIPAL USES
PLANNING AREA 1	SINGLE FAMILY FRONT LOAD, PARKS, OPEN SPACE, SCHOOL, UTILITIES
PLANNING AREA 2	OPEN SPACE
PLANNING AREA 3	DUPLEX ALLEY LOAD [1], PARKS, OPEN SPACE, UTILITIES
PLANNING AREA 4	TOWNHOME ALLEY LOAD [1] OPEN SPACE, UTILITIES
1. ACCESSORY STRUCTURES ARE NOT PERMITTED ON LOTS WHERE VEHICULAR ACCESS IS PROVIDED TO THE REAR OF THE LOT BY AN ALLEY.	

DIMENSIONAL STANDARDS SUMMARY CHART

LOT TYPE	MINIMUM LOT STANDARDS: WIDTH (FT.)	MINIMUM LOT STANDARDS: AREA (S.F.)	MINIMUM LOT SETBACKS (FT.): FRONT ON STREET	FRONT ON GARDEN COURT	SIDE (TO ABUTTING STREET)	SIDE (TO INTERIOR LOT)	REAR	HEIGHT
SINGLE FAMILY FRONT LOAD	45'x110' 50' CORNER LOTS	4,950	PRIN. - 15' ACC. - 25'	NOT APPLICABLE	10'	5'	PRIN. - 20' ACC. - 5	PRIN. - 35' ACC. 25'
DUPLEX ALLEY LOAD	25' 30' CORNER LOTS	1,900	PRIN. - 10' ACC. - NA	PRIN. - 10' ACC. - NA	10'	5'	PRIN. - 0' ACC. - NA	PRIN. 35' ACC. NA
TOWNHOME ALLEY LOAD	20' 30'	1,460	PRIN. - 10' ACC. NA	PRIN. - 10' ACC. NA	10'	5'	PRIN. - 0' ACC. NA	

1. ZERO LOT LINE SETBACKS SHALL BE PERMITTED FOR ATTACHED BUILDINGS PROVIDED THAT THE BUILDING MEETS THE ZONE DISTRICT INTERIOR LOT LINE SETBACK ON THE SIDE OF THE BUILDING THAT IS NOT ATTACHED.
2. MULTIPLE PRINCIPAL BUILDINGS ON A SINGLE LOT SHALL BE SEPARATED BY A DISTANCE EQUAL TO THE DISTANCE THAT WOULD BE REQUIRED IF THEY WERE SEPARATED BY A LOT LINE.
3. ABOVE-GRADE FEATURES INCLUDING EAVES, AND OVERHANGS ARE PERMITTED TO ENCROACH UP TO 2 FEET INTO THE FRONT, SIDE, AND REAR SETBACKS, EXCEPT WHERE THE SETBACK IS 0, THEN NO ENCROACHMENT IS ALLOWED. NO ENCROACHMENTS ARE PERMITTED IN A DRY UTILITY EASEMENT.
4. WINDOW WELLS ARE PERMITTED TO ENCROACH UP TO 3 FEET INTO THE SIDE AND REAR SETBACKS, EXCEPT WHERE THE SETBACK IS 0', THEN NO ENCROACHMENT IS ALLOWED. WINDOW WELLS ARE REQUIRED TO HAVE A COVER.
5. ON SINGLE FAMILY FRONT LOADED LOTS, REAR SETBACKS SHALL ALLOW FOR AN ENCROACHMENT INTO THE SETBACK OF UP TO 6 FEET FOR A ROOF TO BE CONSTRUCTED OVER AN AT GRADE PATIO OR OVER A DECK WHICH IS LESS THAN 30 INCHES ABOVE GRADE.

SCALE: 1" = 200' - 0"

NORTH

PLANNING AREA 1
184.23 AC
Residential, Parks, Open Space, School
SINGLE FAMILY

PLANNING AREA 2
32.49 AC
Dedicated Open Space

PLANNING AREA 3
55.06 AC
Residential, Parks, Open Space
DUPLEX

PLANNING AREA 4
29.25 AC
Residential, Parks, Open Space
TOWNHOME

COMMERCIAL

ADJACENT LAND USE: AGRICULTURE
ADJACENT ZONING: AGA

ADJACENT ZONING: LR WITH PUD OVERLAY
ADJACENT LAND USE: AGRICULTURE

ADJACENT LAND USE: LARGE LOT RESIDENTIAL
ADJACENT ZONING: AGA

ADJACENT ZONING: AG/OPEN SPACE/PUBLIC/AG
ADJACENT LAND USE: RURAL RESIDENTIAL/PUBLIC/AG

ADJACENT LAND USE: COMMUNITY COMMERCIAL
ADJACENT ZONING: CC

PREPARED FOR
E5X MANAGEMENT
7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112

LAND PLANNING
pcs group
200 KALAMATH STREET
DENVER, CO 80223
303.531.4905
www.pcsgroupco.com

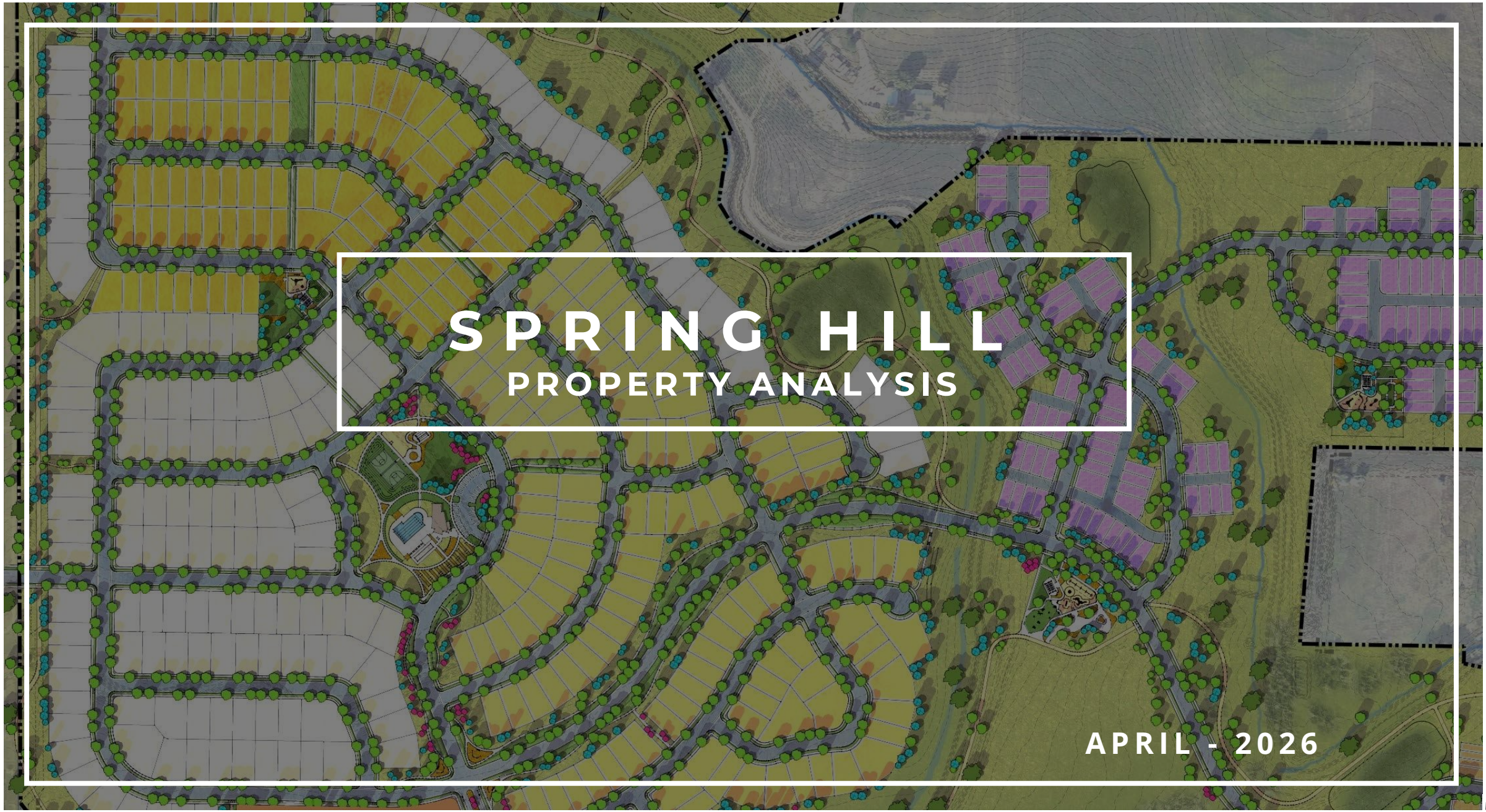
ENGINEERING
CVL
a Westwood team
10333 E. DRY CREEK RD.
SUITE 240, ENGLEWOOD
CO 80112
720.482.9526
www.cvlinc.net
www.westwoodps.com

SPRING HILL PD
ERIE, COLORADO

DRAWN BY: BEM
CHECKED BY: JP
DATE: 3-15-2021
7-15-2021
9-8-2021
10-28-2021

SHEET NAME
PD PLANNING AREAS

SHEET NUMBER
2 OF 3

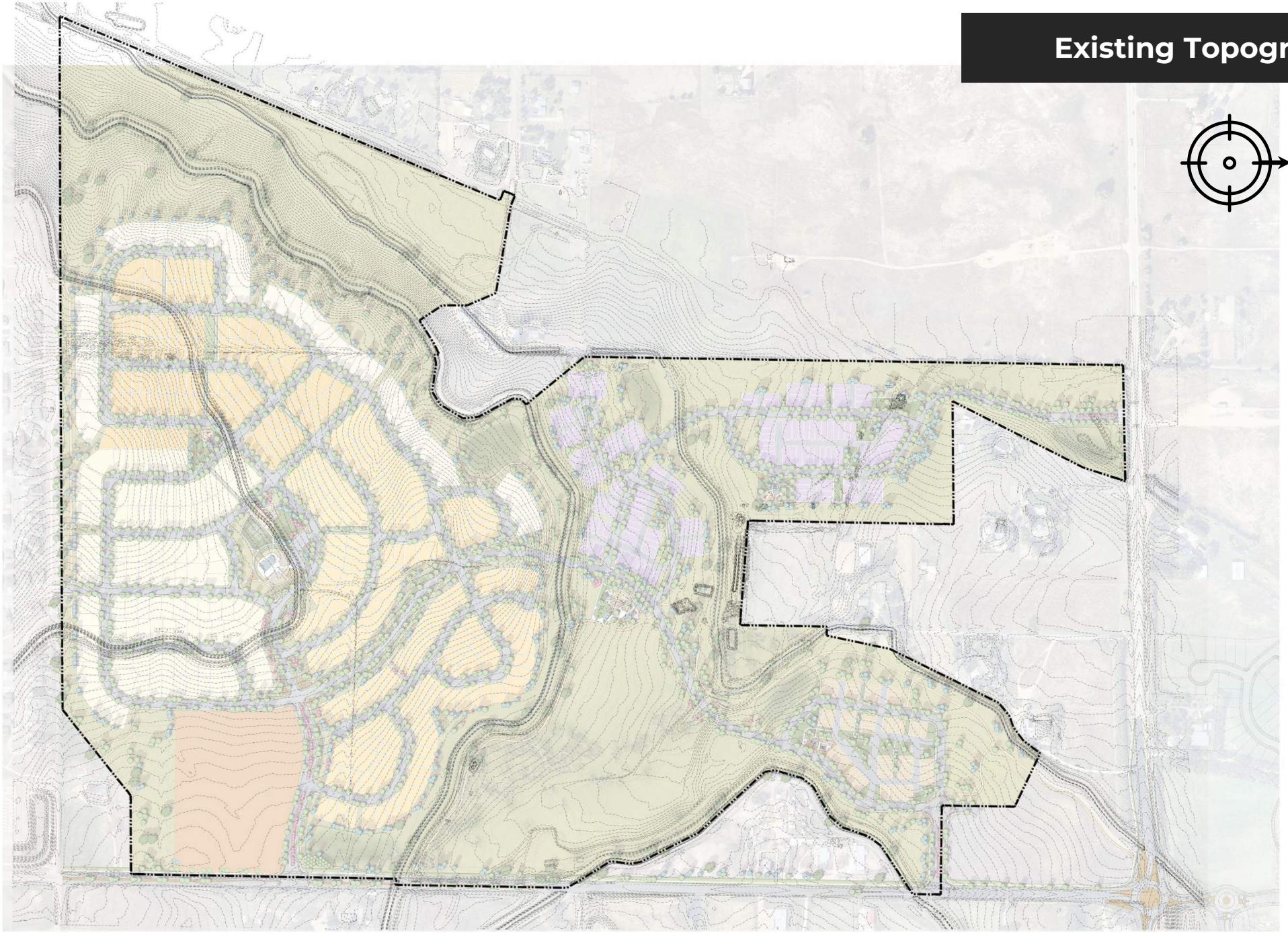


SPRING HILL

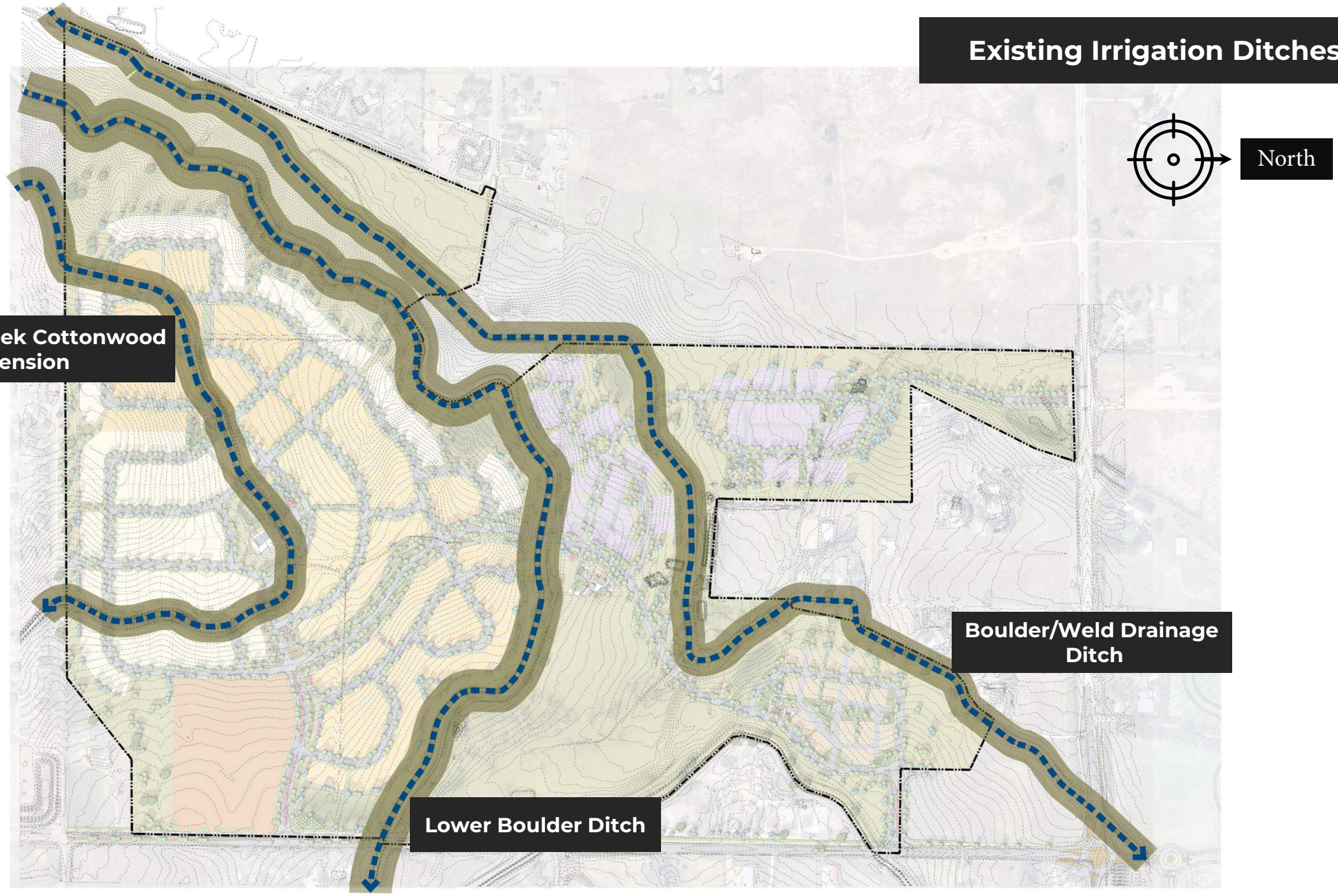
PROPERTY ANALYSIS

APRIL - 2026

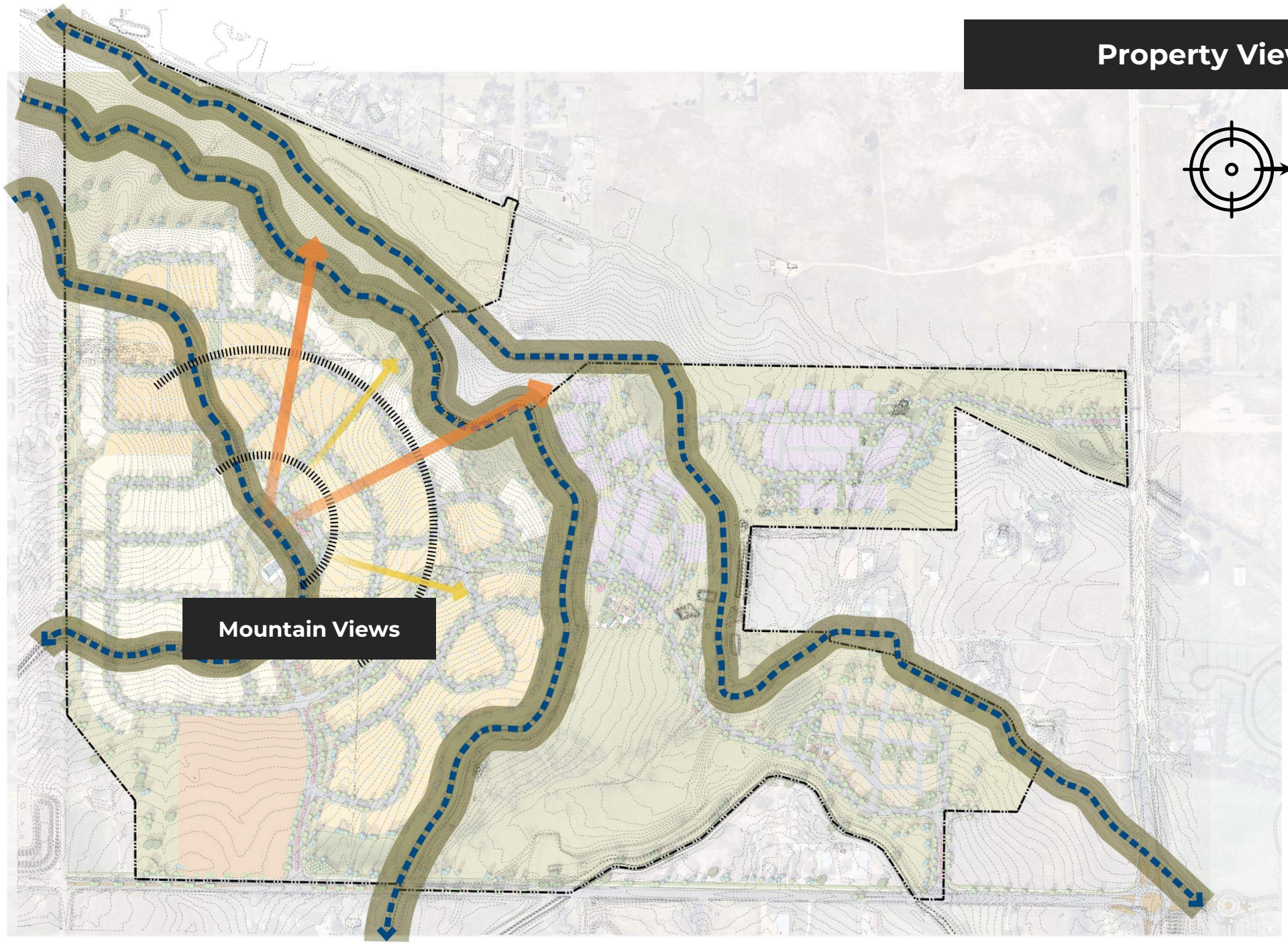
Existing Topography



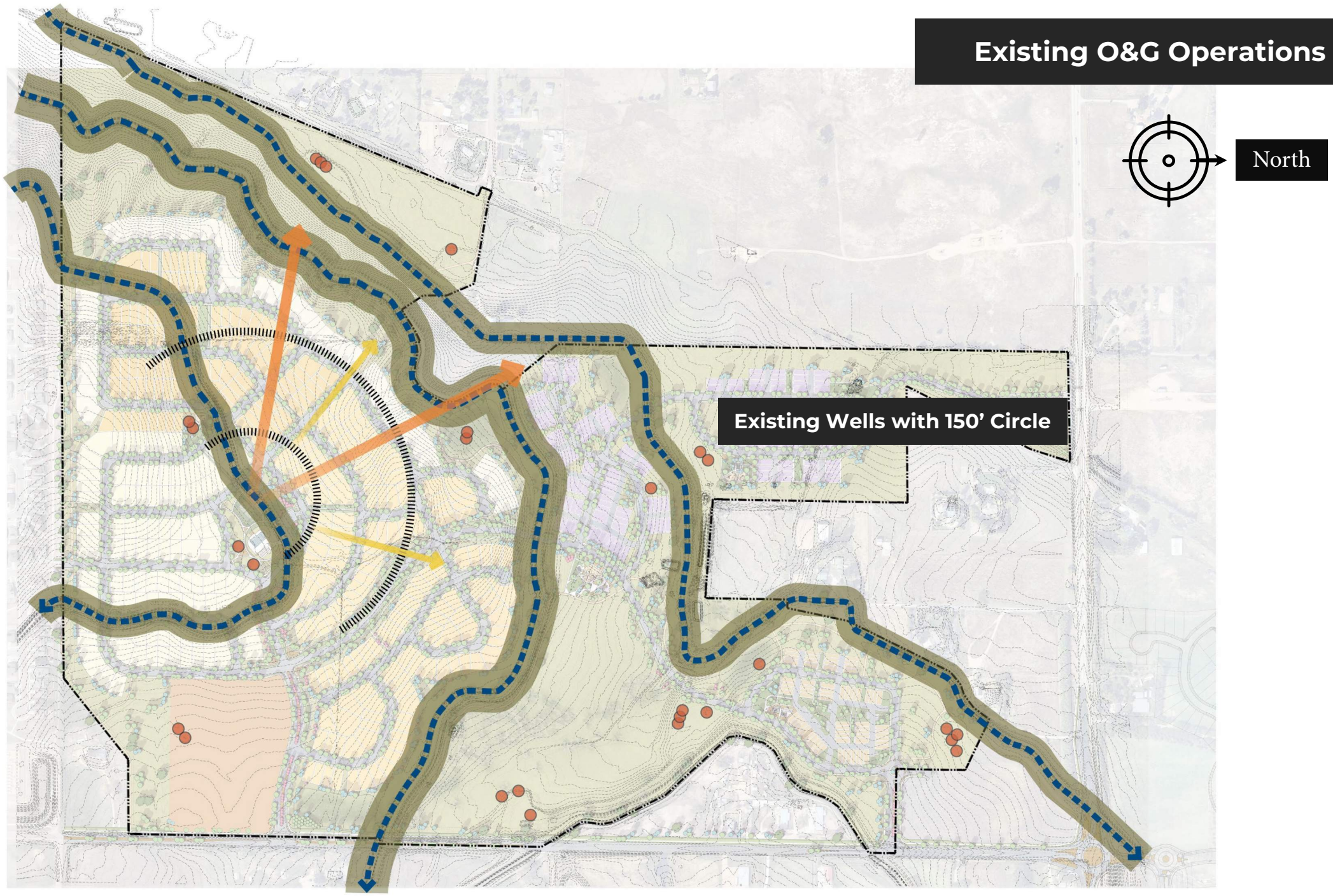
Existing Irrigation Ditches



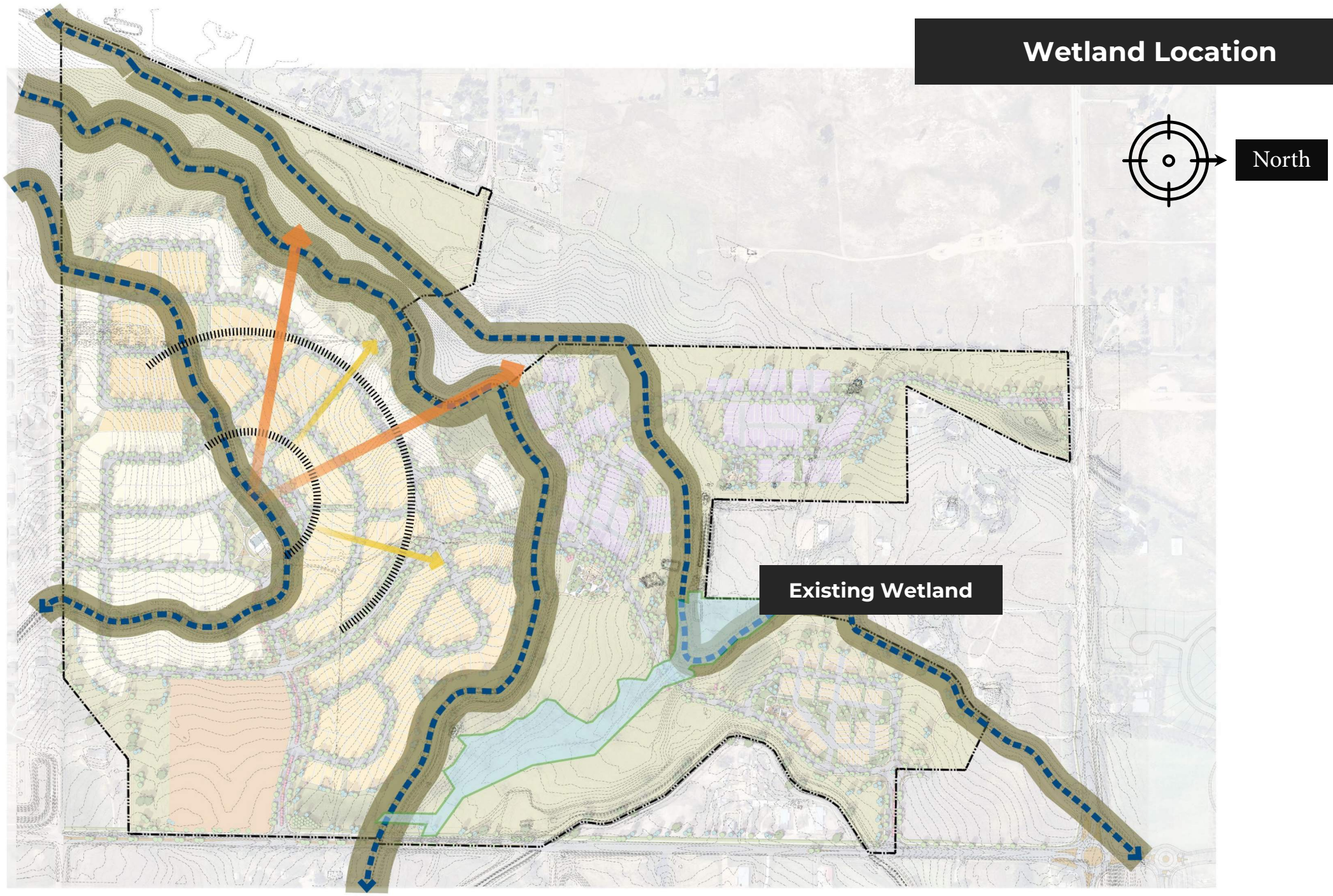
Property Views



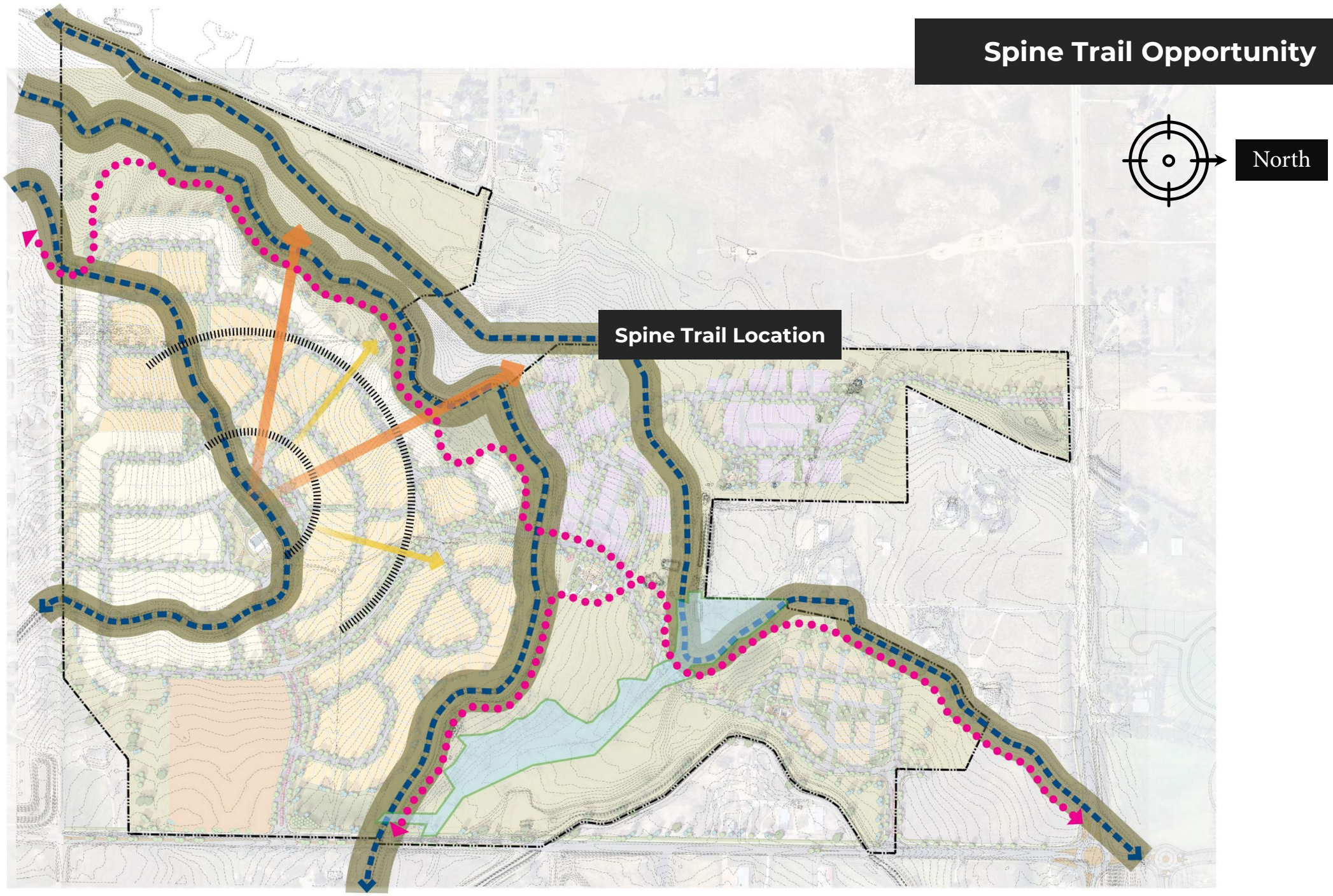
Existing O&G Operations



Wetland Location



Spine Trail Opportunity




SPRING HILL
COMMUNITY CONCEPT
APRIL - 2026

SUBMITTAL HISTORY

MARCH - 2020

Initial Submittal

Major comments related to requesting that the Traffic Study provide analysis of more intersections and warrant analysis for Hwy 52 and County Rd 3. Comments related to Drainage through the property and off the property. The design team spent more than a year working on these comments.

SEPT. - 2021

Second Submittal

Comments related to obtaining offsite approvals for drainage channel and outfall location, also additional comments related to Oil & Gas locations. Also provide preliminary approvals from ditch companies for crossings and relocations.

DEC. - 2021

Third Submittal

Comments were primarily related to making sure CDOT is agreeable to the access location on Hwy 52 that aligns with the Town's Facility on the north side of Hwy 52, as well as culvert widenings under Hwy 52. Continue working with Broomfield and Boulder County on approvals for offsite drainage. The Town requests a Regional Pond on the Spring Hill property.

MARCH - 2022

Fourth Submittal

The Town agrees a Regional Pond is not required, but the applicant still needs agreements on the channel alignment outside of the property. The client team is actively working with the Oil & Gas operators to plug the wells on site.

JANUARY - 2023

Fifth Submittal

The design team has started working with property owners to the north to take drainage across Hwy 52 instead of through Broomfield and Boulder County. All Oil & Gas has been plugged on site and David Frank has suggested looking at how to best meet current code requirements.

SUBMITTAL HISTORY

AUGUST - 2024

Sixth Submittal

Very minor comments; however, in discussion with the Town engineering department they have requested that we include the adjacent property design for a roundabout at the intersection of Hwy 52 and County Road 3. Further, in discussions with the Town the design team prepared an alternative design that modestly moved roads and adjusted lots to more closely align with the current Oil & Gas code requirements. The design team worked closely with David Franks on this re-design and we anticipated that we would make these revisions during the Final Plat process. We continued having conversations with CDOT and adjacent property owners and incorporated the roundabout into our base files, in addition the client team suggested that we go ahead and submit the revised design incorporating the revisions to accommodate as best we can the new Oil & Gas standards.

JULY - 2025

Seventh Submittal

This submittal triggered new Transportation comments with new Town staff. An updated Traffic Study was requested and submitted. We worked with staff to address these comments without being required to have another submittal because they are minor comments that can be addressed with the Final design. In addition, the client team, Town of Erie Engineering, the client's dedicated Drainage Engineer, and CDOT have been coordinating for several years to satisfy all parties that the Regional drainage solution can move forward past the preliminary plat stage at this time.

In Summary, while this has been a very long process the primary delays were related to offsite design and agreements that solve regional issues.

Oil & Gas

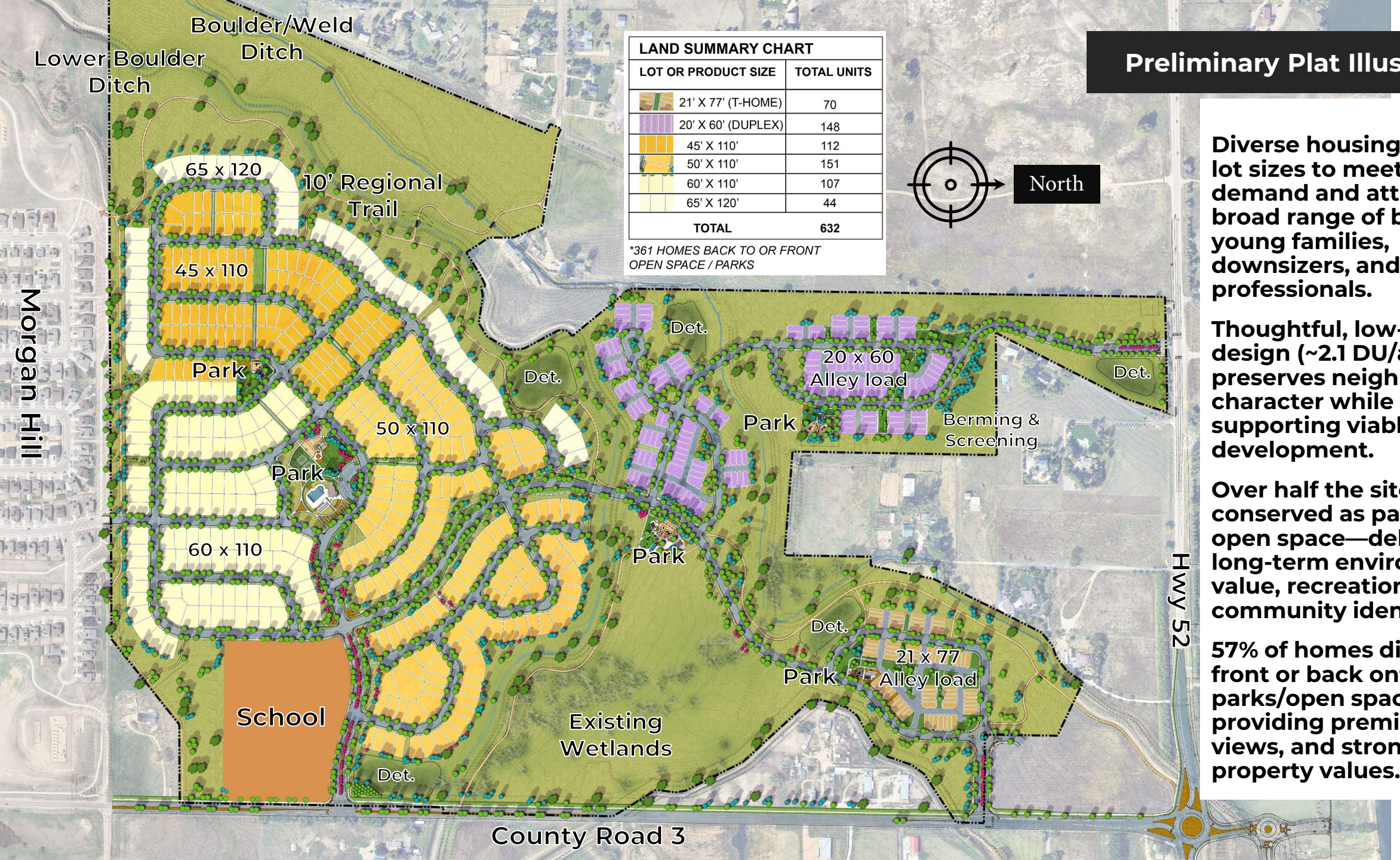
- **Safety-first approach:** all existing on-site wells have been fully plugged and abandoned to eliminate risk and liability.
- **No future wells:** with this preliminary plat, the property will be protected by a commitment that no new wells will be permitted.
- **We're compliant:** the project adheres to the Oil & Gas setbacks established in the 2014 annexation agreement.
- **Going above and beyond:** recognizing community concerns, the team voluntarily updated the Preliminary Plat after the 6th submittal to enhance protections and responsiveness.
- **Community-first outcome:** these measures reduce risk, increase public confidence, and help move a safe, well-considered project forward for the benefit of the community.

Spring Hill Regional Outfall Channel

- On-site detention pond reduces 100-year peak flows by approximately 40%, significantly lowering peak runoff leaving the property.
- Proposed culvert at SH 52 replaces undersized infrastructure and is designed for the 100-year storm, reducing the likelihood of roadway overtopping.
- Historically widespread, shallow flooding will be directed into a defined, engineered channel with a clear path to Boulder Creek.
- Lower peak flows and a formalized drainage corridor improve downstream drainage conditions.
- Project provides a coordinated regional drainage improvement in partnership with CDOT, Erie, and Weld County.


Regional Drainage
North
Boulder Creek
8' Wide, 6' Tall
Double Box
Culvert
Morgan Hill
Det.
Det.
Det.
Det.
Det.
Existing
Wetlands
Hwy 52
County Road 3

Preliminary Plat Illustrative



LAND SUMMARY CHART	
LOT OR PRODUCT SIZE	TOTAL UNITS
21' X 77' (T-HOME)	70
20' X 60' (DUPLEX)	148
45' X 110'	112
50' X 110'	151
60' X 110'	107
65' X 120'	44
TOTAL	632

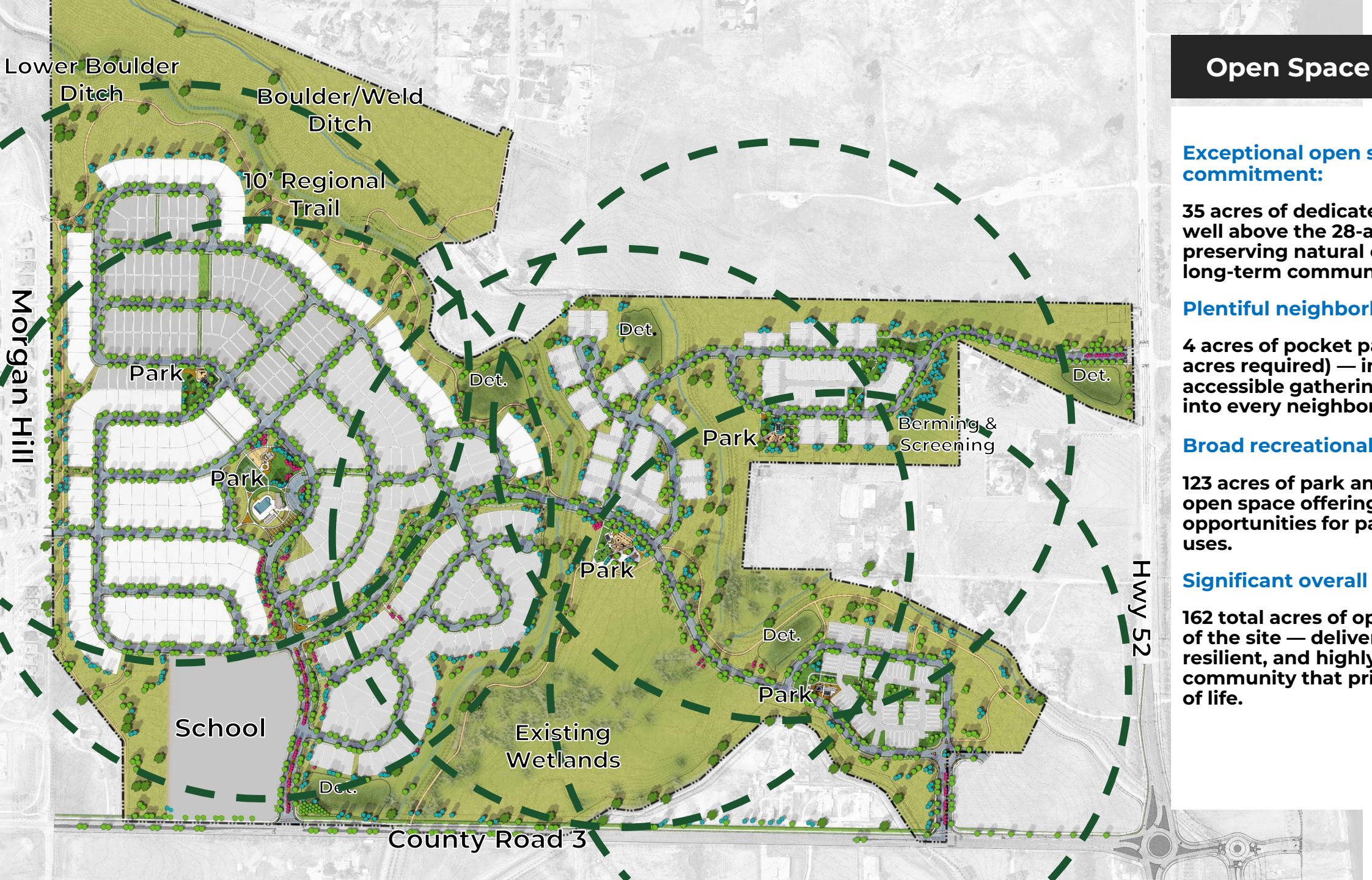
*361 HOMES BACK TO OR FRONT OPEN SPACE / PARKS

Diverse housing mix and lot sizes to meet market demand and attract a broad range of buyers—young families, downsizers, and professionals.

Thoughtful, low-density design (~2.1 DU/acre) that preserves neighborhood character while supporting viable development.

Over half the site conserved as parks and open space—delivering long-term environmental value, recreation, and community identity.

57% of homes directly front or back onto parks/open space, providing premium yards, views, and stronger property values.



Open Space and Parks

Exceptional open space commitment:

35 acres of dedicated open space — well above the 28-acre requirement, preserving natural character and long-term community value.

Plentiful neighborhood amenities:

4 acres of pocket parks (vs. 0.8 acres required) — intimate, accessible gathering places woven into every neighborhood.

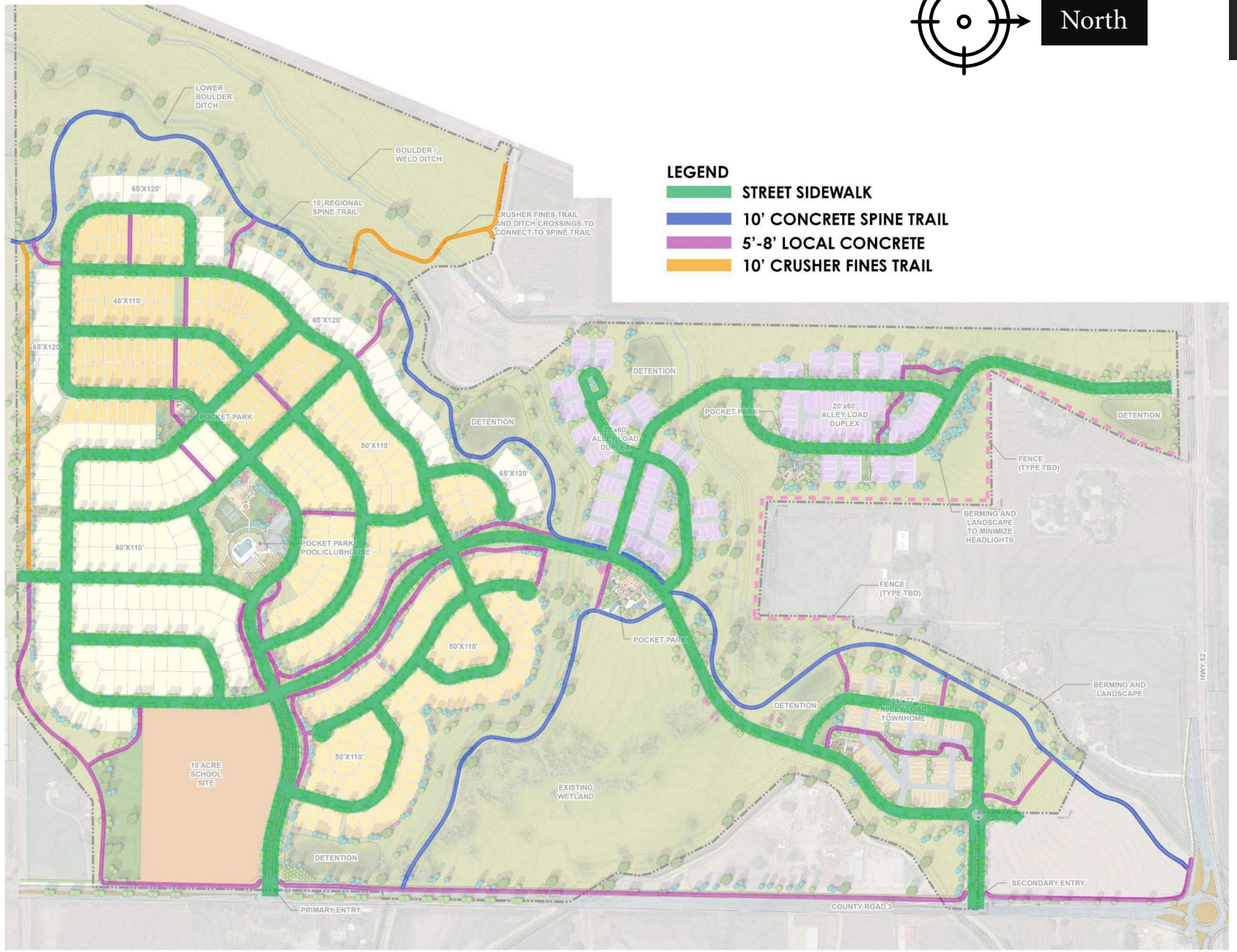
Broad recreational resource:

123 acres of park and non-dedicated open space offering flexible opportunities for passive and active uses.

Significant overall preservation:

162 total acres of open space — 54% of the site — delivering a healthy, resilient, and highly marketable community that prioritizes quality of life.

Trail Connections



Signature spine trail:

1.9 miles of scenic, multi-use spine trail — a community-defining amenity that boosts recreation, connectivity, and property appeal.

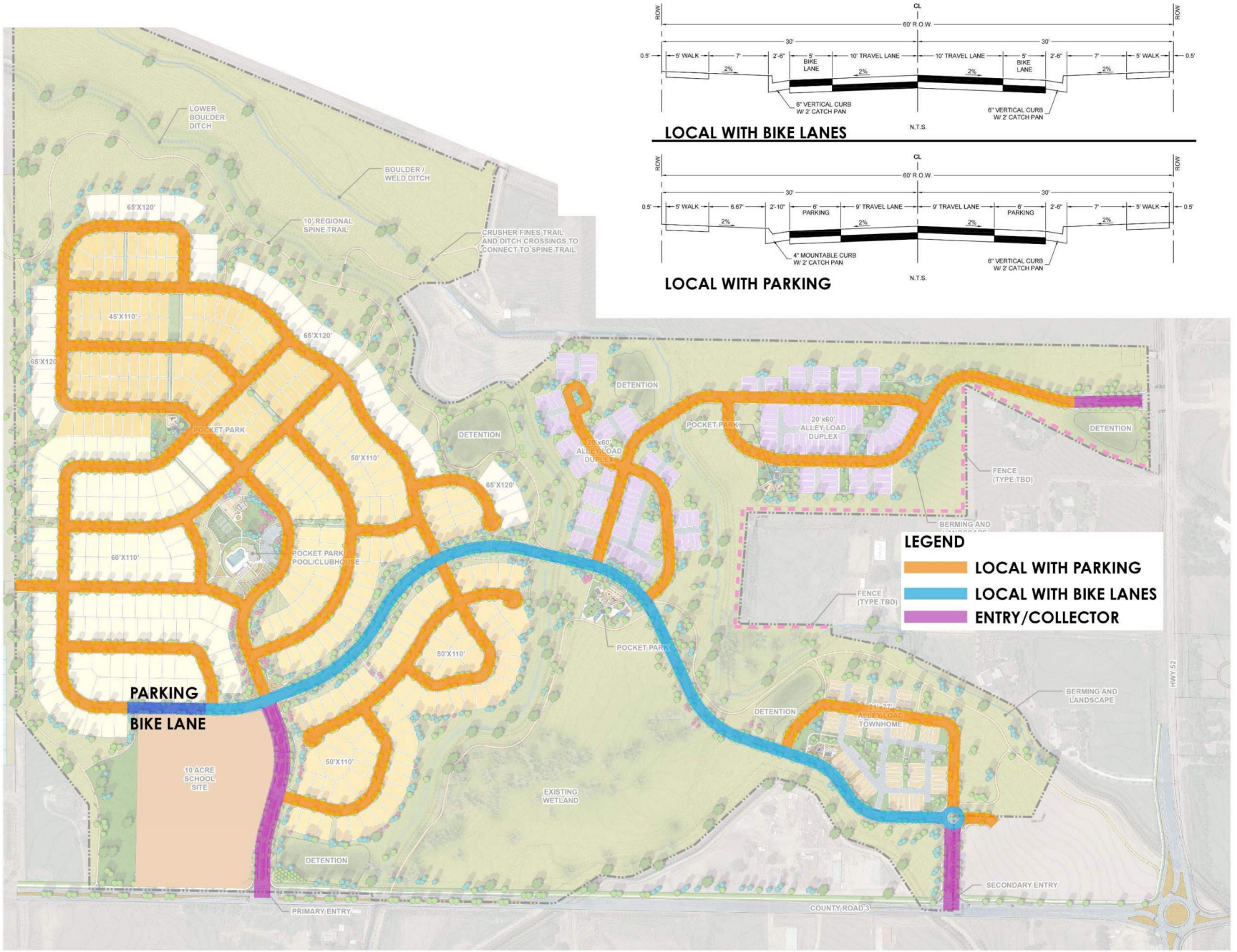
Neighborhood-first connections:

3.6 miles of local trails weaving through neighborhoods to promote walking, biking, and safer routes to parks and schools.

Best-in-class access:

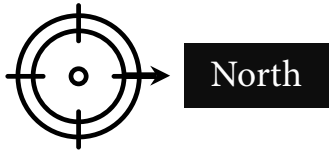
nearly 5.5 miles of total trails across the site — extensive, marketable outdoor infrastructure that enhances quality of life and increases long-term value.

Road Classifications



LOCAL WITH BIKE LANES

LOCAL WITH PARKING



Partnering with the Town's transportation team to deliver safe, connected bike lanes that link neighborhoods, parks, and trails.

Enhances multimodal access and reduces car trips—supporting healthier, more sustainable mobility.

An investment in active transportation that boosts community appeal and supports long-term town goals.

Offsite Roundabout



Collaborative solution: Spring Hill coordinated with CDOT and neighboring developers to deliver a roundabout design instead of a traffic signal, demonstrating proactive interagency teamwork.

Improved safety and traffic flow: roundabouts reduce conflict points and delay, calming speeds and minimizing long-term accident risk.

Cost-effective and durable: lower long-term operations and maintenance compared with signalized intersections.

Enhances circulation: smoother vehicle movement at Hwy 52 & County Road 3 improves ingress/egress for residents and emergency response times.

Thoughtful regional planning: this coordinated approach aligns with broader transportation goals while adding tangible value to the project and community.

North

ANIMATION

PROJECT SUMMARY

Overall Project

The Property is a little over 300 acres and proposes a maximum number of 632 homes, approximately 2 units per acre.

Open Space

The Community Concept proposes approximately 162 acres of Open Space uses, about 54% of the property.

Trails

The Community Concept depicts almost 5.5 miles of trails throughout the Community, including 1.9 miles of Spine Trail for the Town of Erie.

Comprehensive Plan

The property is identified as Residential-Low, which is intended to include a variety of housing with a density range of 2 to 8 dwelling units per acre. The proposal for Spring Hill meets the requirements of the Comprehensive Plan.

Zoning Compliance

While the Preliminary Plat has lagged the PD Zoning, we were ultimately preparing both documents at the same time to ensure compliance. The proposal for Spring Hill meets the requirements of the PD Zoning.

Review

This preliminary plat has been through a rigorous review with staff and outside referral agencies; all issues have been resolved for the Preliminary Plat and staff has recommended approval based on their analysis of the approval criteria.

SPRING HILL PRELIMINARY PLAT

A PORTION OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6th PRINCIPAL MERIDIAN,
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO
299.512 ACRES – 632 LOTS / 49 TRACTS
PP–001264–2021

DEDICATION STATEMENT:

THE UNDERSIGNED, BEING ALL THE OWNERS, MORTGAGEES OR LINEHOLDERS OF CERTAIN LANDS IN THE TOWN OF ERIE, COUNTY OF WELD, COLORADO, DESCRIBED AS FOLLOWS:

TRACT B, SPRING HILL MINOR SUBDIVISION
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

SUBORDINATELY DESCRIBED AS:

A PARCEL OF LAND BEING A PART OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTH QUARTER CORNER OF SAID SECTION 6, BEING MONUMENTED BY A FOUND NO. 6 REBAR WITH A 3-1/4 INCH DIAMETER ALUMINUM CAP SET BY PLS 36053, WHENCE THE NORTHEAST CORNER OF SAID SECTION 6 BEING MONUMENTED BY A FOUND NO. 6 REBAR WITH A 2-1/2 INCH DIAMETER ALUMINUM CAP SET BY PLS 25937 IS ASSUMED TO BEAR NORTH 88°46'59" EAST, A DISTANCE OF 2642.32 FEET, WITH ALL BEARINGS CONTAINED HEREIN BEING RELATIVE THERETO;

THENCE SOUTH 00°52'52" WEST, A DISTANCE OF 100.07 FEET ALONG THE WEST LINE OF THE NORTHEAST QUARTER OF SAID SECTION 6, TO THE POINT OF BEGINNING;

THENCE NORTH 88°46'59" EAST, A DISTANCE OF 567.39 FEET;

THENCE SOUTH 17°59'14" WEST, A DISTANCE OF 192.17 FEET, TO A POINT OF CURVATURE;

THENCE ALONG THE ARC OF A CURVE TO THE LEFT HAVING A RADIUS OF 6721.00 FEET, A CENTRAL ANGLE OF 06°11'43", AN ARC LENGTH OF 726.73 FEET, THE CHORD OF WHICH BEARS SOUTH 26°55'48" WEST, A DISTANCE OF 726.38 FEET, TO A POINT OF NON-TANGENCY;

THENCE NORTH 89°32'30" EAST, A DISTANCE OF 610.45 FEET;

THENCE SOUTH 01°00'57" WEST, A DISTANCE OF 1019.29 FEET;

THENCE SOUTH 85°34'18" EAST, A DISTANCE OF 518.94 FEET;

THENCE NORTH 01°00'58" EAST, A DISTANCE OF 431.11 FEET;

THENCE SOUTH 89°16'08" EAST, A DISTANCE OF 44.21 FEET;

THENCE NORTH 11°59'32" EAST, A DISTANCE OF 320.16 FEET;

THENCE NORTH 26°06'42" EAST, A DISTANCE OF 358.66 FEET;

THENCE NORTH 26°39'43" EAST, A DISTANCE OF 242.96 FEET;

THENCE NORTH 50°25'08" EAST, A DISTANCE OF 84.05 FEET;

THENCE NORTH 70°51'22" EAST, A DISTANCE OF 60.26 FEET;

THENCE NORTH 52°57'56" EAST, A DISTANCE OF 83.63 FEET;

THENCE NORTH 36°35'09" EAST, A DISTANCE OF 137.73 FEET;

THENCE SOUTH 66°02'35" EAST, A DISTANCE OF 188.09 FEET;

THENCE SOUTH 50°07'33" EAST, A DISTANCE OF 98.34 FEET;

THENCE SOUTH 02°31'13" WEST, A DISTANCE OF 351.78 FEET;

THENCE SOUTH 89°44'32" EAST, A DISTANCE OF 388.42 FEET;

THENCE SOUTH 01°03'09" WEST, A DISTANCE OF 208.19 FEET;

THENCE SOUTH 56°41'17" WEST, A DISTANCE OF 215.90 FEET;

THENCE SOUTH 36°35'50" WEST, A DISTANCE OF 75.58 FEET;

THENCE SOUTH 19°07'03" WEST, A DISTANCE OF 137.44 FEET;

THENCE SOUTH 41°33'40" WEST, A DISTANCE OF 79.21 FEET;

THENCE SOUTH 60°12'44" WEST, A DISTANCE OF 170.91 FEET;

THENCE SOUTH 38°34'03" WEST, A DISTANCE OF 70.07 FEET;

THENCE SOUTH 15°44'21" WEST, A DISTANCE OF 139.99 FEET;

THENCE SOUTH 09°03'19" EAST, A DISTANCE OF 51.67 FEET;

THENCE SOUTH 42°36'24" EAST, A DISTANCE OF 446.86 FEET;

THENCE SOUTH 26°39'49" EAST, A DISTANCE OF 322.56 FEET;

THENCE SOUTH 08°56'07" EAST, A DISTANCE OF 50.00 FEET;

THENCE SOUTH 07°10'60" WEST, A DISTANCE OF 98.77 FEET;

THENCE SOUTH 31°53'16" EAST, A DISTANCE OF 138.71 FEET;

THENCE SOUTH 01°03'09" WEST, A DISTANCE OF 56.77 FEET;

THENCE SOUTH 00°59'17" WEST, A DISTANCE OF 2202.71 FEET;

THENCE SOUTH 89°42'02" WEST, A DISTANCE OF 359.78 FEET;

THENCE SOUTH 51°34'28" WEST, A DISTANCE OF 543.92 FEET;

THENCE SOUTH 89°42'29" WEST, A DISTANCE OF 1787.30 FEET;

THENCE SOUTH 89°49'37" WEST, A DISTANCE OF 1647.46 FEET;

THENCE NORTH 22°39'32" EAST, A DISTANCE OF 2365.40 FEET;

THENCE NORTH 67°22'25" WEST, A DISTANCE OF 50.05 FEET;

THENCE NORTH 22°40'00" EAST, A DISTANCE OF 59.87 FEET;

THENCE SOUTH 67°25'38" EAST, A DISTANCE OF 50.09 FEET;

THENCE NORTH 80°16'24" EAST, A DISTANCE OF 443.23 FEET;

THENCE SOUTH 23°04'45" EAST, A DISTANCE OF 154.07 FEET;

THENCE SOUTH 00°15'05" EAST, A DISTANCE OF 124.61 FEET;

DEDICATION STATEMENT (CONTINUED):

THENCE SOUTH 33°30'03" EAST, A DISTANCE OF 134.90 FEET;

THENCE NORTH 57°53'03" EAST, A DISTANCE OF 139.02 FEET;

THENCE NORTH 64°37'40" EAST, A DISTANCE OF 57.31 FEET;

THENCE SOUTH 00°56'44" WEST, A DISTANCE OF 24.33 FEET;

THENCE NORTH 79°47'08" EAST, A DISTANCE OF 47.71 FEET;

THENCE SOUTH 81°35'52" EAST, A DISTANCE OF 136.58 FEET;

THENCE NORTH 58°49'22" EAST, A DISTANCE OF 77.11 FEET;

THENCE NORTH 30°51'37" EAST, A DISTANCE OF 131.96 FEET;

THENCE NORTH 04°53'46" WEST, A DISTANCE OF 73.50 FEET;

THENCE NORTH 27°55'32" WEST, A DISTANCE OF 195.02 FEET;

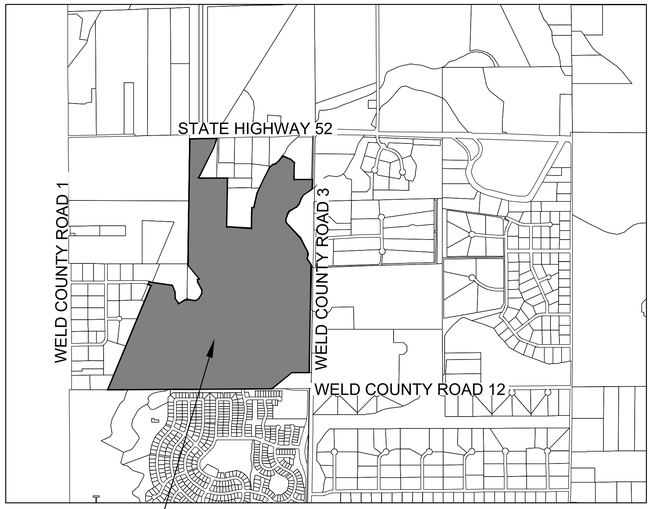
THENCE NORTH 03°00'47" EAST, A DISTANCE OF 42.18 FEET;

THENCE NORTH 46°58'00" EAST, A DISTANCE OF 37.17 FEET;

THENCE NORTH 39°21'31" WEST, A DISTANCE OF 372.62 FEET;

THENCE NORTH 00°52'52" EAST, A DISTANCE OF 2644.60 FEET, TO THE POINT OF BEGINNING.

DESCRIBED PARCEL CONTAINS A CALCULATED AREA OF 13,046,735 SQUARE FEET OR 299.512 ACRES, MORE OR LESS.



VICINITY MAP
SCALE: 1" = 1500'

NOTES:

1. BASIS OF BEARINGS: BEARINGS ARE BASED ON THE NORTH LINE OF THE NORTHEAST QUARTER OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, BEING MONUMENTED AT THE NORTH QUARTER CORNER OF SECTION 6 BY A FOUND NO. 6 REBAR WITH A 3-1/4 INCH DIAMETER ALUMINUM CAP STAMPED "COLO DEPT OF TRANSPORTATION 1/4 T2N S31/T1N S6 2005 PLS 36053" IN A RANGE BOX, WHENCE THE NORTHEAST CORNER OF SAID SECTION 6 BEING MONUMENTED BY A FOUND NO. 6 REBAR WITH A 2-1/2 INCH DIAMETER ALUMINUM CAP STAMPED "T2N R68W 31/32/6/5 T1N 1993 LS 25937" IN A RANGE BOX IS ASSUMED TO BEAR NORTH 88°46'59" EAST, A DISTANCE OF 2642.32 FEET, WITH ALL BEARINGS CONTAINED HEREIN BEING RELATIVE THERETO.
2. ANY PERSON WHO KNOWINGLY REMOVES, ALTERS OR DEFACES ANY PUBLIC LAND SURVEY MONUMENT OR LAND BOUNDARY MONUMENT OR ACCESSORY, COMMITS A CLASS TWO (2) MISDEMEANOR PURSUANT TO STATE STATUTE 18-4-508, C.R.S.
3. THIS SURVEY DOES NOT CONSTITUTE A TITLE SEARCH BY WESTWOOD PROFESSIONAL SERVICES, INC. TO DETERMINE OWNERSHIP OR EASEMENTS OF RECORD. FOR ALL INFORMATION REGARDING EASEMENTS, RIGHTS-OF-WAY, AND TITLE OF RECORD, WESTWOOD PROFESSIONAL SERVICES, INC. RELIED UPON COMMONWEALTH LAND TITLE INSURANCE COMPANY REPORT NUMBER H0642742-023-CN4-CN, HAVING AN EFFECTIVE DATE OF APRIL 16, 2021 AT 8:00 A.M.
4. BENCHMARK - THE SOUTHWEST CORNER OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, BEING A 2-1/2" ALUMINUM CAP STAMPED "LS 23501 POWERS ELEV CO" HAVING A PUBLISHED ELEVATION OF 4983.02 FEET, NAVD 1988 DATUM, PER THE TOWN OF ERIE CONTROL MAP (JANUARY 25, 2004 REVISION)
5. THE PROPERTY IS LOCATED WITHIN FLOOD HAZARD AREAS HAVING ZONE DESIGNATION "X" BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA), ON FLOOD INSURANCE RATE MAP (FIRM) PANEL 08123C2060E, EFFECTIVE JANUARY 20, 2016, PANEL 0850730025F EFFECTIVE AUGUST 18, 2004 AND ALSO LOCATED WITHIN FLOOD HAZARD AREAS HAVING ZONE DESIGNATION "A."
   ZONE "X" IS DEFINED AS BEING "AREAS OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN"
   ZONE "A" IS DEFINED 1% ANNUAL CHANCE FLOOD HAZARD.
6. 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.
7. THE LINEAL UNIT USED IN THE PREPARATION OF THIS PLAT IS THE U.S. SURVEY FOOT AS DEFINED BY THE UNITED STATES DEPARTMENT OF COMMERCE, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY.
8. ENCUMBRANCES TO RECORDED LOTS AND ASSOCIATED HOUSE CONSTRUCTION PERMITS RELATED TO FUTURE OIL AND GAS FACILITIES SHALL BE MANAGED PER THE EXECUTED SURFACE USE AGREEMENTS.
9. DUE TO THE PROXIMITY OF THE PROPERTY TO THE PARKLAND ESTATES AIRPORT, THERE WILL BE AIRCRAFT PASSING OVER THE PROPERTY. AIRCRAFT PASSAGE MAY RESULT IN NOISE AND OTHER IMPACTS ON THE PROPERTY. AIRCRAFT MAY CROSS PROPERTY AT LOW ALTITUDE IN ACCORDANCE WITH FAA REGULATIONS. THE FREQUENCY OF AIRCRAFT PASSING OVER THE PROPERTY MAY INCREASE IN THE FUTURE. THE OWNERS, THEIR HEIRS, SUCCESSORS AND ASSIGNS SPECIFICALLY ACKNOWLEDGE THE RIGHT OF PASSAGE OVER THE PROPERTY FOR AIRCRAFT AND AGREE TO HOLD HARMLESS THE TOWN OF ERIE FOR AIRCRAFT OPERATIONS.
10. BLANKET UTILITY EASEMENTS ARE ARE HEREBY DEDICATED OVER AND ACROSS ALL TRACTS FOR THE THE PURPOSE OF UNITED POWER.
11. BLANKET PUBLIC ACCESS EASEMENTS ARE HEREBY DEDICATED OVER AND ACROSS ALL TRACTS FOR THE PURPOSE OF ACCESS AND MAINTENANCE OF SIDEWALK.
12. BLANKET DRAINAGE EASEMENTS ARE HEREBY DEDICATED TO THE TOWN OF ERIE OVER AND ACROSS ALL TRACTS.

OIL AND GAS NOTES:

1. OIL AND GAS WELLS AND PRODUCTION FACILITIES SHALL BE ABANDONED AND RECLAIMED BEFORE APPROVAL OF A FINAL PLAT. THE FOLLOWING SHALL BE COMPLETED BEFORE APPROVAL IS GRANTED BY THE TOWN:
   a. A LETTER OF CONFIRMATION FROM THE STATE SHALL BE SUBMITTED TO THE TOWN REGARDING THE COMPLETION OF THE ABANDONMENT AND RECLAMATION PROCESS IN ACCORDANCE WITH STATE LAW AND COGCC REGULATIONS.
   b. RECORDED DOCUMENTATION OF ABANDONMENT OF EASEMENTS ASSOCIATED WITH THE WELL SHALL BE SUBMITTED TO THE TOWN.
2. CAPPED WELLHEADS SHALL BE IDENTIFIED BY A CONCRETE AND BRASS MONUMENT THAT WILL BE RECORDED AND NOTED ON THE FINAL PLAT.
3. ALL SUBDIVISIONS WITH WELLHEADS ABANDONED AND RECLAIMED IN ACCORDANCE WITH STATE LAW AND COGCC REGULATIONS SHALL USE THE FOLLOWING STANDARDS TO PLAT LOTS AND STREETS:
   a. STREETS MAY BE PLATTED OVER ABANDONED WELLHEADS IF CONFLICTS DO NOT OCCUR WITH INFRASTRUCTURE REQUIREMENTS WITHIN THE STREET.
   b. A NON-RESIDENTIAL LOT MAY CONTAIN AN ABANDONED WELLHEAD. THE PLAT SHALL IDENTIFY A BUILDING SETBACK OF 25 FEET FROM THE MONUMENTED ABANDONED WELLHEAD.
   c. RESIDENTIAL LOTS 1 ACRE OR LARGER MAY PLAT OVER AN ABANDONED WELLHEAD. THE PLAT SHALL IDENTIFY A BUILDING SETBACK OF 25 FEET FROM THE MONUMENTED ABANDONED WELLHEAD.
   d. ABANDONED WELLHEADS, AND THE REQUIRED SETBACK SURROUNDING THE ABANDONED WELLHEAD, SHALL NOT BE LOCATED IN SINGLE-FAMILY LOTS UNDER 1 ACRE IN SIZE.
   e. ABANDONED WELLHEADS, AND THE REQUIRED SETBACK SURROUNDING THE ABANDONED WELLHEAD, SHALL NOT BE LOCATED IN MULTI-FAMILY LOTS.
   f. IN SUBDIVISIONS WHERE AN ABANDONED WELLHEAD CANNOT BE PLACED IN A STREET OR LOT MEETING THE STANDARDS OF THIS SUBSECTION; THE ABANDONED WELLHEAD SHALL BE PLACED IN A TRACT. THE ABANDONED WELLHEAD AND REQUIRED SETBACK SURROUNDING THE ABANDONED WELLHEAD MAY NOT BE LOCATED IN A PARK.

Westwood
10333 E DRY CREEK RD.
SUITE 400
ENGLEWOOD , CO 80112
Westwoodps.com
Westwood Professional Services, Inc.
TEL: 720.482.9526

SPRING HILL PRELIMINARY PLAT

A PORTION OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6th PRINCIPAL MERIDIAN,
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO
299.512 ACRES – 632 LOTS / 49 TRACTS
PP–001264–2021

LAND SUMMARY CHART		
TYPE	AREA	% OF TOTAL AREA
RESIDENTIAL LOTS	89.608 AC.	29.92%
TRACTS	166.035 AC.	55.44%
PUBLIC ROW	43.869 AC.	14.64%
TOTAL	299.512 AC.	100%

OPEN SPACE & PARK DEDICATION REQUIREMENTS		
PUBLIC DEDICATIONS	REQUIRED BY UDC (ACRES)	PROPOSED FOR SPRING HILL (ACRES)
POCKET PARKS (.5 AC/1000 RES)	0.83 AC.	3.987 AC.
NEIGHBORHOOD PARK (3 AC/1000 RES)	4.97 AC.	CASH-IN-LIEU
COMMUNITY PARK (5 AC/1000 RES)	8.29 AC.	COLLECTED VIA IMPACT FEES
OPEN SPACE (17 AC/1000 RES)	28.2 AC.	32.066 AC.

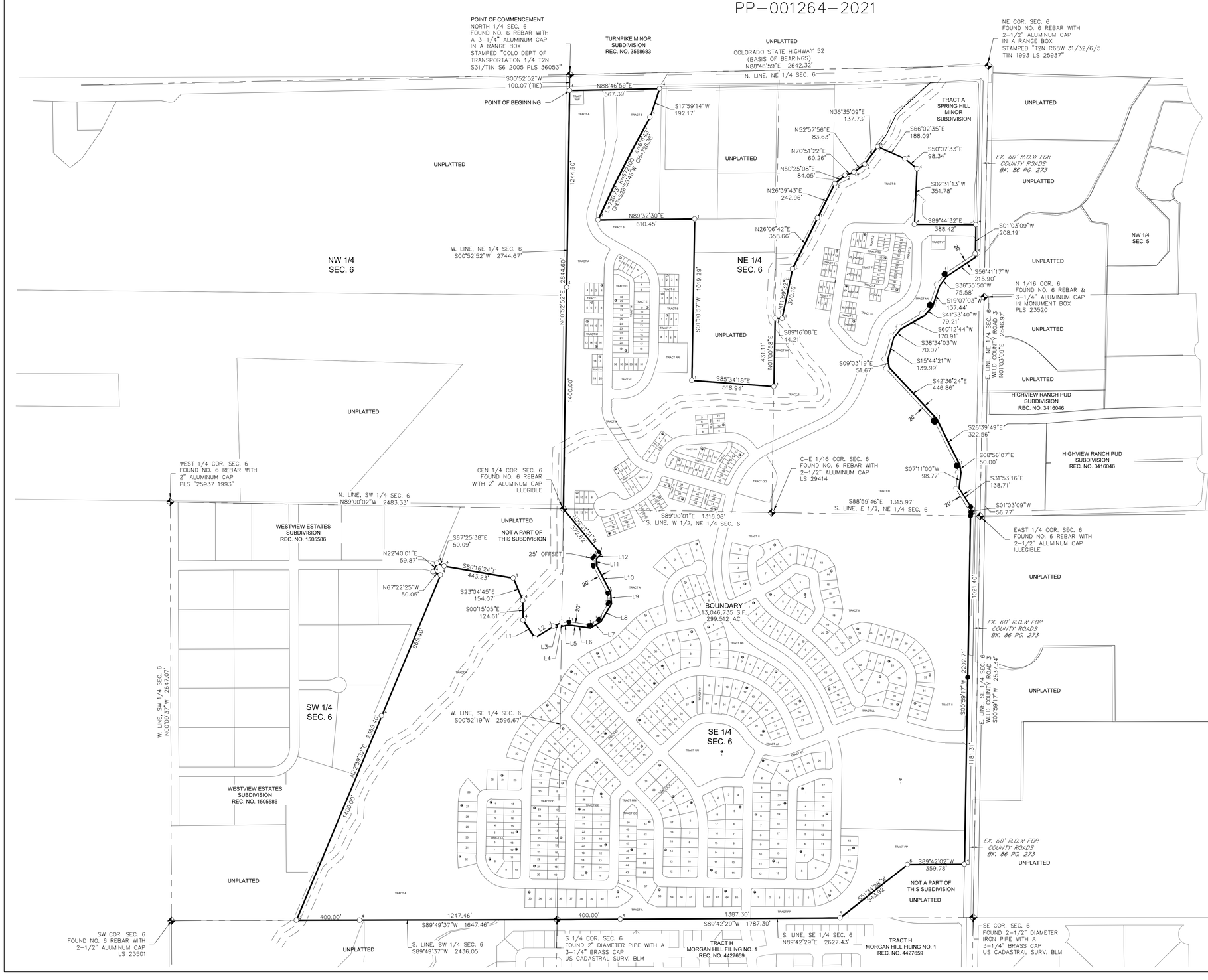
TRACT SUMMARY TABLE

TRACT	AREA	USE	OWNERSHIP	MAINTENANCE
A	71.059 AC	OPEN SPACE / UTILITIES / DRAINAGE / SPINE TRAIL	METRO DISTRICT	METRO DISTRICT
B	29.232 AC	OPEN SPACE / UTILITIES / DRAINAGE / SPINE TRAIL	METRO DISTRICT	METRO DISTRICT
C	0.083 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
D	0.258 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
E	0.190 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
F	0.384 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
G	1.821AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
H	36.433 AC	DEDICATED OPEN SPACE / SPINE TRAIL	TOWN OF ERIE	TOWN OF ERIE
I	0.074 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
J	0.562 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
K	0.238 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
L	0.083 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
M	0.083 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
N	0.0052 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
O	0.047 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
P	0.083 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
Q	0.117 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
R	0.083 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
S	0.100 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
T	0.077 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
AE	1.000 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
V	0.084 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
W	0.099 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
X	0.083 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
Y	0.065 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
Z	0.185 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
AA	0.083 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
BB	1.455 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
CC	0.084 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
DD	0.328 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
EE	0.101 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
FF	0.152 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
GG	0.101 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
HH	0.213 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
II	7.454 AC	OPEN SPACE / UTILITIES / DRAINAGE	METRO DISTRICT	METRO DISTRICT
JJ	0.514 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
KK	0.572 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
LL	1.593 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
MM	0.415 AC	POCKET PARK / UTILITIES	METRO DISTRICT	METRO DISTRICT
NN	0.047 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
OO	0.142 AC	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
PP	5.974 AC	OPEN SPACE / UTILITIES / DRAINAGE	METRO DISTRICT	METRO DISTRICT
QQ	1.088 AC	POCKET PARK / UTILITIES	METRO DISTRICT	METRO DISTRICT
RR	0.813 AC	POCKET PARK / UTILITIES	METRO DISTRICT	METRO DISTRICT
SS	0.083 AC	OPEN SPACE / LANDSCAPING	METRO DISTRICT	METRO DISTRICT
TT	0.065 AC	POCKET PARK / UTILITIES	METRO DISTRICT	METRO DISTRICT
UU	3.310 AC	POCKET PARK / UTILITIES	METRO DISTRICT	METRO DISTRICT
VV	0.463 AC	PRIVATE ACCESS / UTILITIES	METRO DISTRICT	METRO DISTRICT
WW	0.184	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
XX	0.184	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT
YY	0.184	OPEN SPACE / UTILITIES	METRO DISTRICT	METRO DISTRICT

Westwood
10333 E DRY CREEK RD.
SUITE 400
ENGLEWOOD , CO 80112
Westwoodps.com
Westwood Professional Services, Inc.
TEL: 720.482.9526

SPRING HILL PRELIMINARY PLAT

A PORTION OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6th PRINCIPAL MERIDIAN,
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO
299.512 ACRES – 632 LOTS / 49 TRACTS
PP–001264–2021



LEGEND

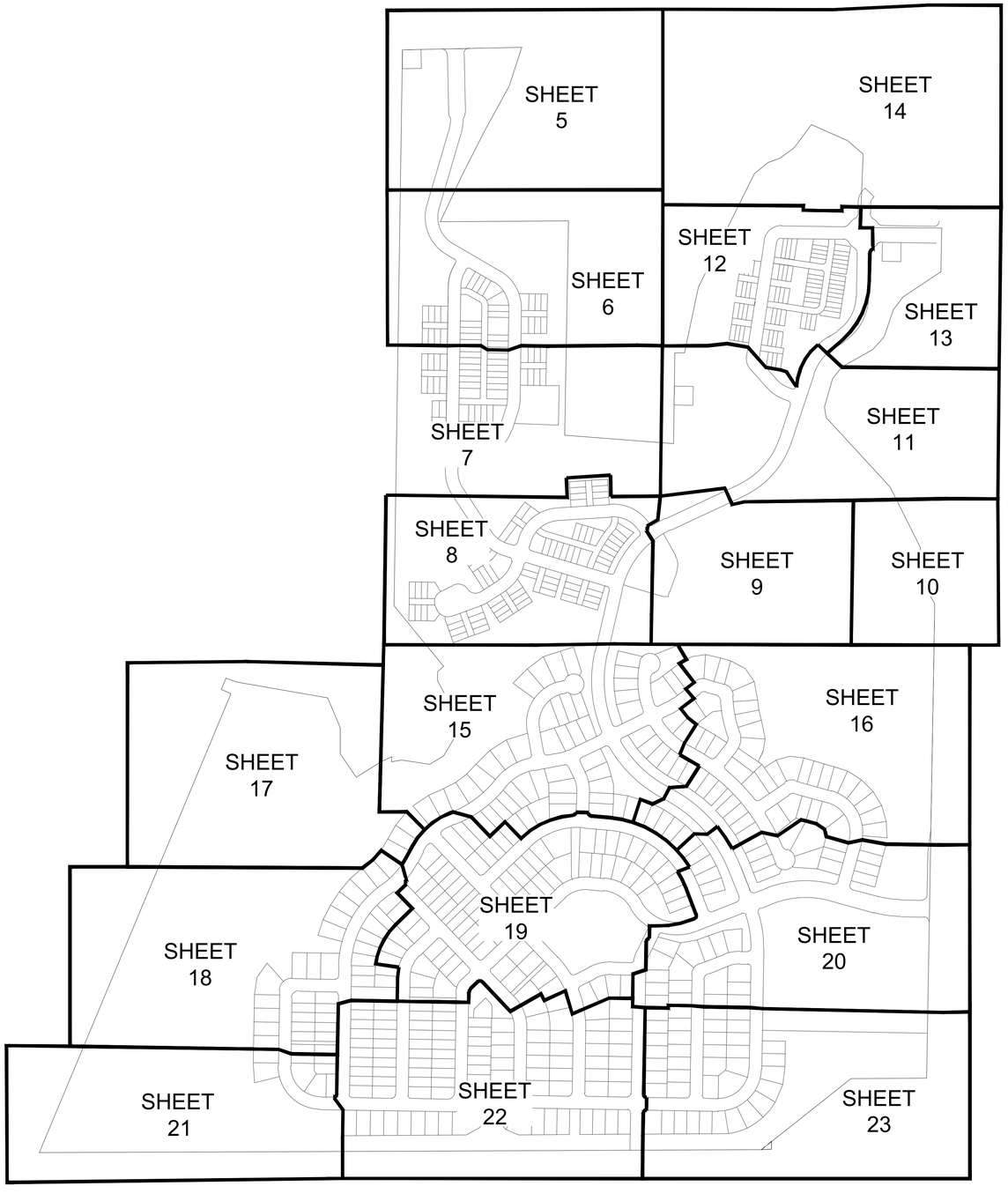
- FOUND SECTION CORNER (AS NOTED)
- SET NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP PLS 34591
- SET NO. 5 REBAR, WITH 2" DIAMETER ALUMINUM CAP STAMPED WESTWOOD PLS 34591 20FT WITNESS CORNER
- FOUND NO. 5 REBAR
- FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED EHRHART LS 29414
- FOUND NO. 5 REBAR WITH 1–1/2" ALUMINUM CAP STAMPED EHRHART LS 29414
- FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED HASCALL LS 23500
- FOUND NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP LS 34591
- FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER RED/PINK PLASTIC CAP STAMPED JR ENG. LS 38252
- FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER ORANGE PLASTIC CAP STAMPED ALPHA ENG. LS 25937
- SUBDIVISION BOUNDARY LINE

LINE TABLE		
LINE NO.	DIRECTION	LENGTH
L1	S33°30'03"E	134.90'
L2	N57°53'03"E	139.02'
L3	N64°37'40"E	57.31'
L4	S00°56'44"W	24.33'
L5	N79°47'08"E	47.71'
L6	S81°35'52"E	136.58'
L7	N58°49'22"E	77.11'
L8	N30°51'37"E	131.96'
L9	N04°53'46"W	73.50'
L10	N27°55'32"W	195.02'
L11	N03°00'47"E	42.18'
L12	N46°58'00"E	37.17'

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GRAPHIC SCALE
300 0 300 600
(IN FEET)
1 inch = 300 ft.

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POINT OF COMMENCEMENT
NORTH 1/4 SEC. 6
FOUND NO. 6 REBAR WITH
A 3–1/4" ALUMINUM CAP
IN A RANGE BOX
STAMPED "COLO DEPT OF TRANSPORTATION
1/4 T2N S31/T1N S6 2005 PLS 36053"

TURNPIKE MINOR
SUBDIVISION
REC. NO. 3558683

NE COR. SEC. 6
FOUND NO. 6 REBAR WITH
A 2–1/2" ALUMINUM CAP
IN A RANGE BOX
STAMPED "T2N R68W 31/32/6/5
T1N 1993 LS 25937"

COLORADO STATE HIGHWAY 52
(BASIS OF BEARINGS)
N88°46'59"E 2642.32'
N. LINE, NE 1/4 SEC. 6

S00°52'52"W 100.07' (TIE)

EX. PERMANENT EASEMENT
BK. 1643 PG. 428

100.00'

26' EX. RIGHT OF WAY
REC. NO. 4610088

POINT OF BEGINNING

N88°46'59"E 567.39'

87.81' | 99.87' | 130.00' | 249.70'

305.00'

89.50'

30' LANDSCAPE EASEMENT

TRACT WW
8,000 S.F.
0.184 AC.

S01°13'01"E 89.44'

N88°46'59"E 124.87'

5.00'

20.00'

202.00'

N88°46'59"E 124.87'

20' A.E.

30' LANDSCAPE EASEMENT

80' R.O.W.

40' | 40'

S88°46'59"W
91.09'

100 YEAR
FLOOD ZONE A

ZONING:
A (AGRICULTURAL)

TRACT A
3,078,625 S.F.
70.676 AC.

S01°13'01"E 256.52'

S01°13'01"E 414.02'

BOYSENBERRY TR

S01°13'01"E 281.52'

S17°59'14"W 192.17'

EX. VARIABLE WIDTH
NON–EXCLUSIVE ACCESS
& PIPELINE EASEMENT
REC. NO. 3615408

TRACT B
1,265,340 S.F.
29.048 AC.

W. LINE, NE 1/4 SEC. 6
S00°52'52"W 2744.67'
N00°52'52"E 2644.60'
100.07'

NW 1/4
SEC. 6

UNPLATTED

100 YEAR
FLOOD ZONE A

ZONING:
A (AGRICULTURAL)

TRACT A
3,078,625 S.F.
70.676 AC.

C2 C3 C4 C5 C6 C7

L=37°37'16"
L=492.28' R=300.00'

L=726.13' R=972.00' Δ=42°48'43"
CHB=N26°53'48"E CHL=726.38'

60' R.O.W.

30' | 30'

S16°24'14"W 362.23'

S16°24'14"W 362.23'

S16°24'14"W 362.23'

NE 1/4
SEC. 6

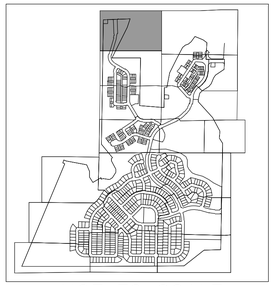
UNPLATTED

MATCH LINE SHEET 14

MATCH LINE SHEET 6

MATCH LINE SHEET 6

KEYMAP



NOT TO SCALE

LEGEND

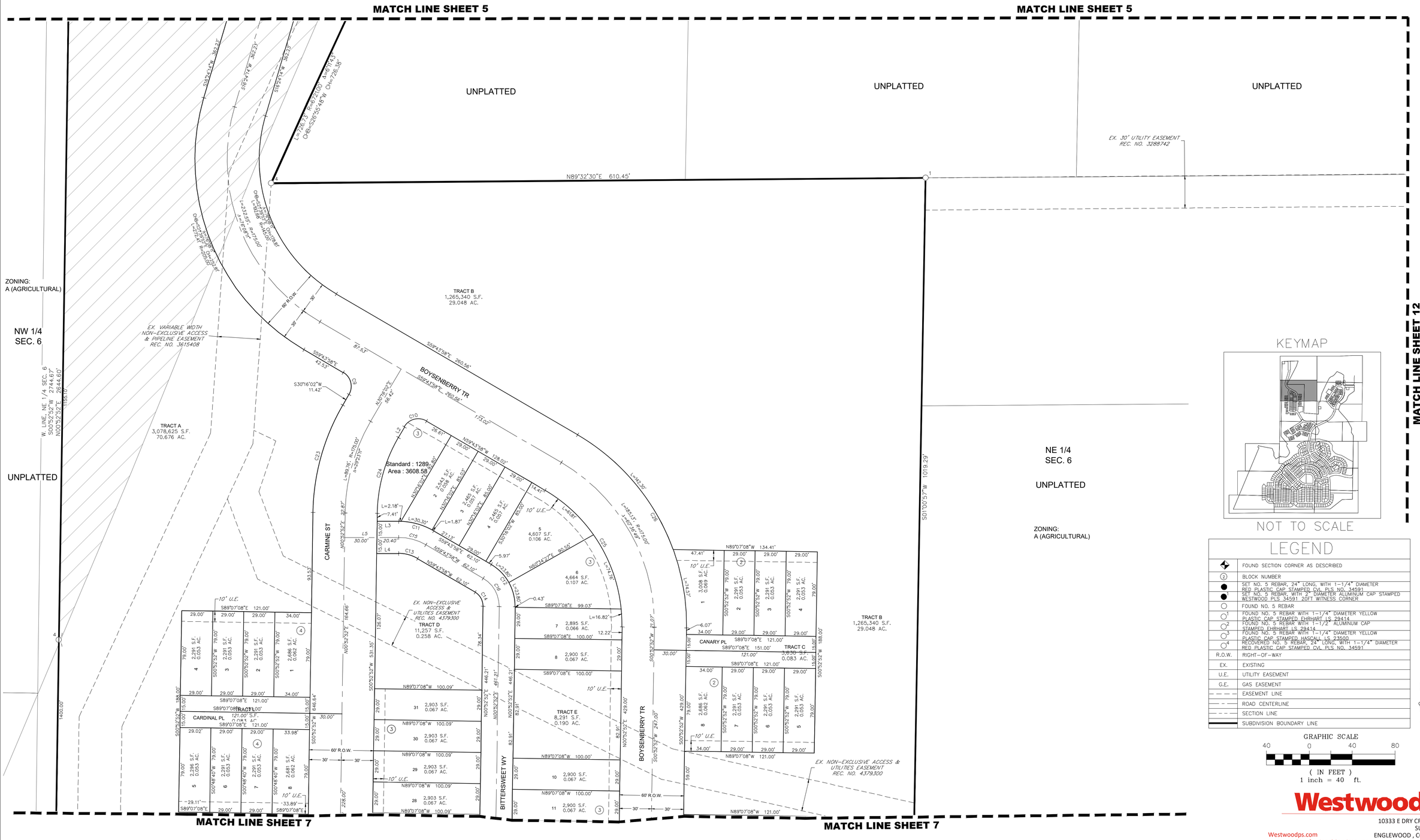
✦	FOUND SECTION CORNER AS DESCRIBED
(2)	BLOCK NUMBER
●	SET NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
● T	SET NO. 5 REBAR, WITH 2" DIAMETER ALUMINUM CAP STAMPED WESTWOOD PLS 34591 20FT WITNESS CORNER
○	FOUND NO. 5 REBAR
○ 1	FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED EHRHART LS 29414
○ 2	FOUND NO. 5 REBAR WITH 1–1/2" ALUMINUM CAP STAMPED EHRHART LS 29414
○ 3	FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED HASCALL LS 23501
○ 4	RECOVERED NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
R.O.W.	RIGHT–OF–WAY
EX.	EXISTING
U.E.	UTILITY EASEMENT
G.E.	GAS EASEMENT
— — —	EASEMENT LINE
—— — ——	ROAD CENTERLINE
— - — - —	SECTION LINE
▬▬▬	SUBDIVISION BOUNDARY LINE

GRAPHIC SCALE
40 0 40 80
(IN FEET)
1 inch = 40 ft.

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299.512 ACRES – 632 LOTS / 49 TRACTS
PP–001264–2021



KEYMAP

NOT TO SCALE

LEGEND

✦	FOUND SECTION CORNER AS DESCRIBED
(2)	BLOCK NUMBER
●	SET NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
●	SET NO. 5 REBAR, WITH 2" DIAMETER ALUMINUM CAP STAMPED WESTWOOD PLS 34591 2OFT WITNESS CORNER
○	FOUND NO. 5 REBAR
○1	FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED EHRHART LS 29414
○2	FOUND NO. 5 REBAR WITH 1–1/2" ALUMINUM CAP STAMPED EHRHART LS 29414
○3	FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED HASCALL LS 23500
○4	RECOVERED NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
R.O.W.	RIGHT–OF–WAY
EX.	EXISTING
U.E.	UTILITY EASEMENT
G.E.	GAS EASEMENT
	EASEMENT LINE
	ROAD CENTERLINE
	SECTION LINE
	SUBDIVISION BOUNDARY LINE

GRAPHIC SCALE
40 0 40 80
(IN FEET)
1 inch = 40 ft.

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MATCH LINE SHEET 6

MATCH LINE SHEET 6

ZONING:
A (AGRICULTURAL)

NW 1/4
SEC. 6

W. LINE NE 1/4 SEC. 6
S00°52'52"W 2744.67'
N00°52'52"E 2644.60'

UNPLATTED

ZONING:
A (AGRICULTURAL)

UNPLATTED

NE 1/4
SEC. 6

UNPLATTED

CARMINE ST

BOYSENBERRY TR

BITTERSWEET WY

BRASS PL

BLUSH PL

TRACT A
3,078,625 S.F.
70.676 AC.

TRACT J
24,477 S.F.
0.562 AC.

TRACT P
3,630 S.F.
0.083 AC.

TRACT RR
35,396 S.F.
0.813 AC.

TRACT VV
20,179 S.F.
0.463 AC.

TRACT B
1,265,340 S.F.
29.048 AC.

TRACT O
2,040 S.F.
0.047 AC.
AMETH

EX. VARIABLE WIDTH NON–EXCLUSIVE ACCESS & PIPELINE EASEMENT REC. NO. 3615408

EX. NON–EXCLUSIVE ACCESS & UTILITIES EASEMENT REC. NO. 4379300

WELL TO BE CAPPED AND ABANDONED 25' SETBACK

WELL TO BE CAPPED AND ABANDONED 25' SETBACK

N88°03'04"W 210.53'

S01°00'57"W 1019.29'

S01°14'05"W 187.70'

N85°34'18"W 698.66'

S85°34'18"E 518.94'

N85°34'18"W 705.73'

20' A.E.

20' A.E.

MATCH LINE SHEET 8

MATCH LINE SHEET 8

MATCH LINE SHEET 11

LEGEND

◆	FOUND SECTION CORNER AS DESCRIBED
②	BLOCK NUMBER
●	SET NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
●¹	SET NO. 5 REBAR, WITH 2" DIAMETER ALUMINUM CAP STAMPED WESTWOOD PLS 34591, 2OFT WITNESS CORNER
○	FOUND NO. 5 REBAR
○¹	FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED EHRHART LS 29414
○²	FOUND NO. 5 REBAR WITH 1–1/2" ALUMINUM CAP STAMPED EHRHART LS 29414
○³	FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED HASCALL LS 23500
○⁴	RECOVERED NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
R.O.W.	RIGHT–OF–WAY
EX.	EXISTING
U.E.	UTILITY EASEMENT
G.E.	GAS EASEMENT
– – –	EASEMENT LINE
– · – · –	ROAD CENTERLINE
– – –	SECTION LINE
———	SUBDIVISION BOUNDARY LINE

KEYMAP

NOT TO SCALE

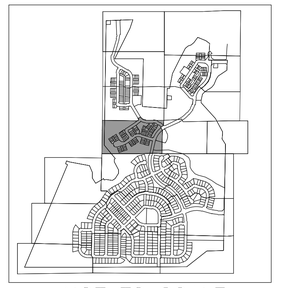
GRAPHIC SCALE
40 0 40 80
(IN FEET)
1 inch = 40 ft.

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KEYMAP



NOT TO SCALE

LEGEND

✦	FOUND SECTION CORNER AS DESCRIBED
(2)	BLOCK NUMBER
●	SET NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
● T	SET NO. 5 REBAR, WITH 2" DIAMETER ALUMINUM CAP STAMPED WESTWOOD PLS 34591 20FT WITNESS CORNER
○	FOUND NO. 5 REBAR
○ 1	FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED EHRHART LS 29414
○ 2	FOUND NO. 5 REBAR WITH 1–1/2" ALUMINUM CAP STAMPED EHRHART LS 29414
○ 3	FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED HASCALL LS 23500
○ 4	RECOVERED NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
R.O.W.	RIGHT–OF–WAY
EX.	EXISTING
U.E.	UTILITY EASEMENT
G.E.	GAS EASEMENT
	EASEMENT LINE
	ROAD CENTERLINE
	SECTION LINE
	SUBDIVISION BOUNDARY LINE

MATCH LINE SHEET 7

MATCH LINE SHEET 9

MATCH LINE SHEET 15

ZONING:
A (AGRICULTURAL)

UNPLATTED

NW 1/4
SEC. 6

NE 1/4
SEC. 6

SE 1/4
SEC. 6

W. LINE, NE 1/4 SEC. 6
S00°52'19"W 2644.67'

W. LINE, SE 1/4 SEC. 6
S00°52'19"W 2596.67'

E.X. VARIABLE WIDTH NON–EXCLUSIVE ACCESS & PIPELINE EASEMENT REC. NO. 3615408

CEN 1/4 COR. SEC. 6
FOUND NO. 6 REBAR WITH 2" ALUMINUM CAP ILLEGIBLE

WELL LOCATION PER COLORADO OIL & GAS CONSERVATION COMMISSION WEBSITE TO BE CAPPED AND ABANDONED 25' SETBACK

CARMINE ST

IRIS DR

CORAL DR

MAUVE CT.

JADE CT

MORGO ST

ALLEY X1

ALLEY X2

ALLEY X3

ALLEY X4

ALLEY X5

ALLEY X6

ALLEY X7

ALLEY X8

LAVENDAR BLVD

TRACT A
3,078,625 S.F.
70.676 AC.

TRACT B
1,265,340 S.F.
29.048 AC.

TRACT II
324,675 S.F.
7.454 AC.

TRACT H
1,531,478 S.F.
35.158 AC.

TRACT K
10,382 S.F.
0.238 AC.

TRACT Q
5,114 S.F.
0.117 AC.

TRACT S
16,799 S.F.
0.386 AC.

TRACT U
17,225 S.F.
0.395 AC.

TRACT V
3,651 S.F.
0.084 AC.

TRACT W
4,300 S.F.
0.099 AC.

TRACT X
3,630 S.F.
0.083 AC.

TRACT NN
2,033 S.F.
0.047 AC.

TRACT SS
3,630 S.F.
0.083 AC.

TRACT R2
3,630 S.F.
0.083 AC.

TRACT AA
3,630 S.F.
0.083 AC.

TRACT T
3,365 S.F.
0.077 AC.

TRACT AE
4,353 S.F.
0.100 AC.

TRACT QQ
47,389 S.F.
1.088 AC.

TRACT ZZ
8,342 S.F.
0.191 AC.

Standard : 1371
Area : 8699.97

E.X. EASEMENT FOR LOWER BOULDER CREEK PEAKVIEW CANAL BK 1493 PG 79

75' SETBACK FROM CENTERLINE DITCH

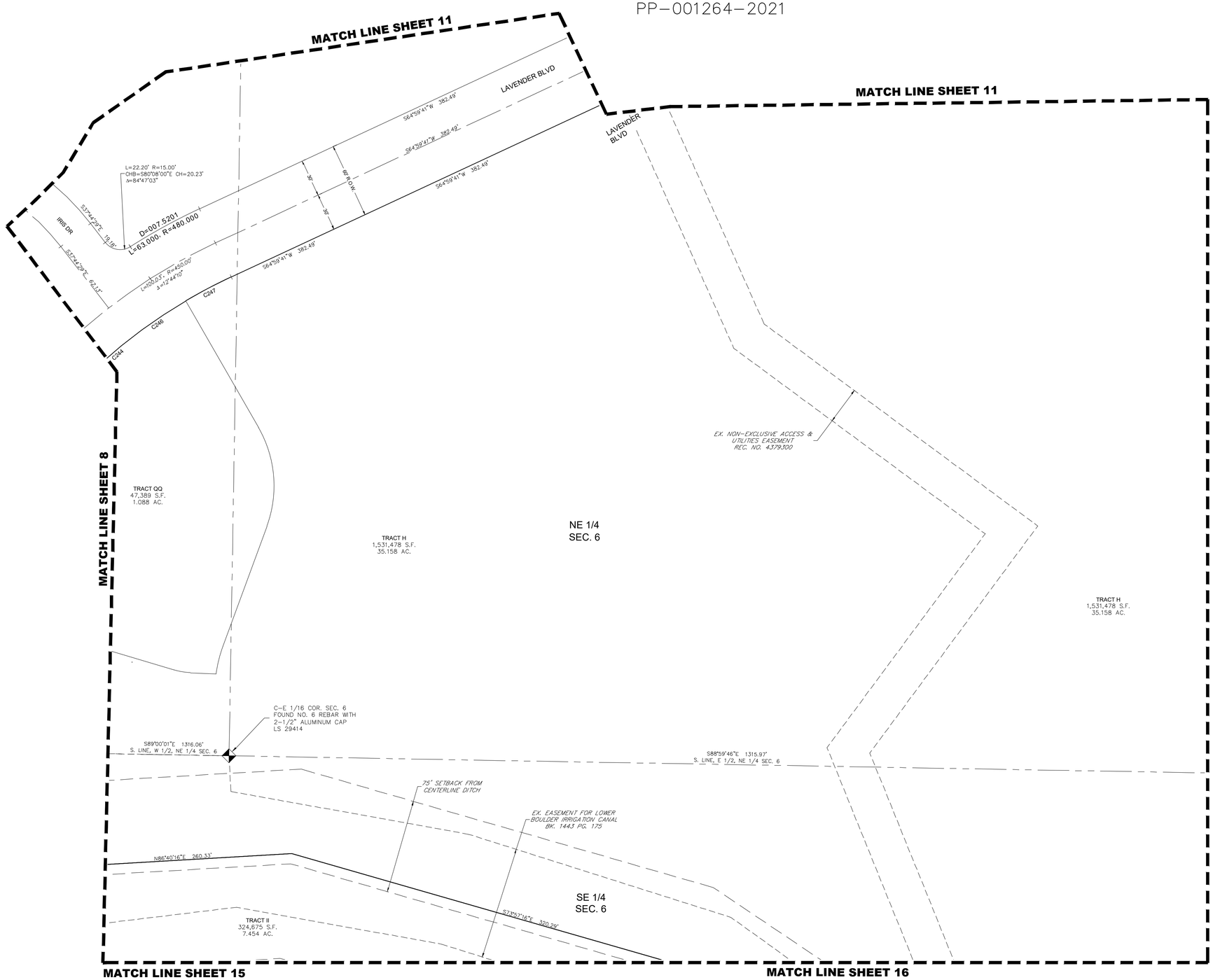
300' WELL SETBACK

GRAPHIC SCALE
40 0 40 80
(IN FEET)
1 inch = 40 ft.

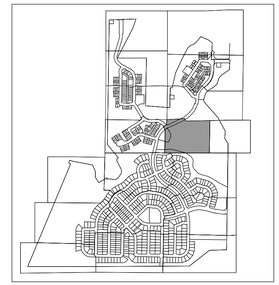
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KEYMAP



NOT TO SCALE

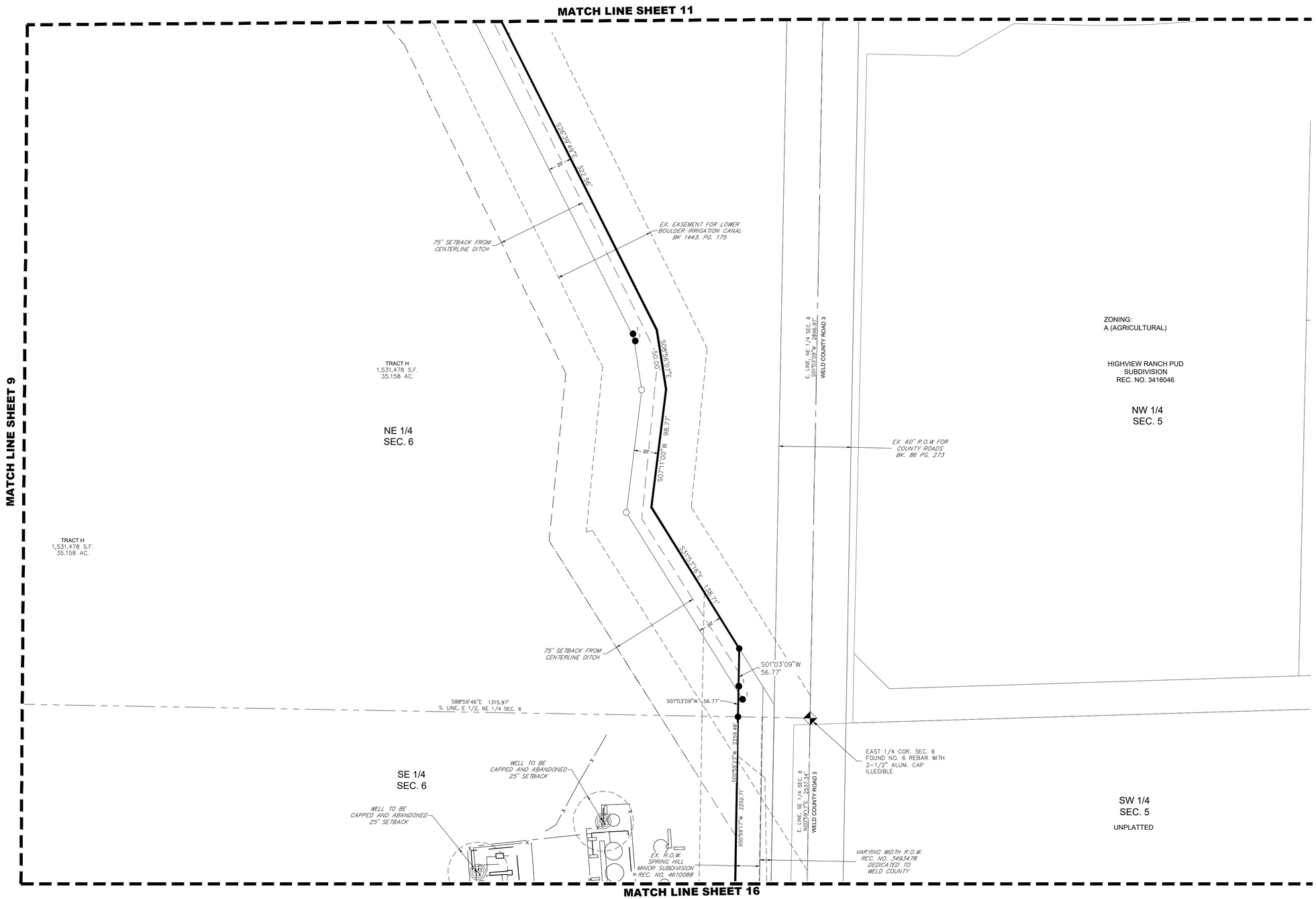
LEGEND	
◆	FOUND SECTION CORNER AS DESCRIBED
(2)	BLOCK NUMBER
●	SET NO. 5 REBAR, 24" LONG, WITH 1-1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
●1	SET NO. 5 REBAR, WITH 2" DIAMETER ALUMINUM CAP STAMPED WESTWOOD PLS 34591 20FT WITNESS CORNER
○	FOUND NO. 5 REBAR
○1	FOUND NO. 5 REBAR WITH 1-1/4" DIAMETER YELLOW PLASTIC CAP STAMPED EHRHART LS 29414
○2	FOUND NO. 5 REBAR WITH 1-1/2" ALUMINUM CAP STAMPED EHRHART LS 29414
○3	FOUND NO. 5 REBAR WITH 1-1/4" DIAMETER YELLOW PLASTIC CAP STAMPED HASCALL LS 23500
○4	RECOVERED NO. 5 REBAR, 24" LONG, WITH 1-1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
R.O.W.	RIGHT-OF-WAY
EX.	EXISTING
U.E.	UTILITY EASEMENT
G.E.	GAS EASEMENT
	EASEMENT LINE
	ROAD CENTERLINE
	SECTION LINE
	SUBDIVISION BOUNDARY LINE

GRAPHIC SCALE
40 0 40 80
(IN FEET)
1 inch = 40 ft.

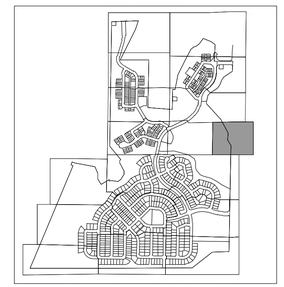
Westwood
10333 E DRY CREEK RD.
SUITE 400
ENGLEWOOD , CO 80112
Westwoodps.com
Westwood Professional Services, Inc.
TEL: 720.482.9526

SPRING HILL PRELIMINARY PLAT

A PORTION OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6th PRINCIPAL MERIDIAN,
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO
299.512 ACRES – 632 LOTS / 49 TRACTS
PP–001264–2021



KEYMAP



NOT TO SCALE

LEGEND

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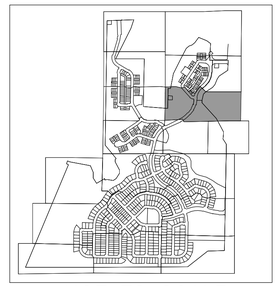
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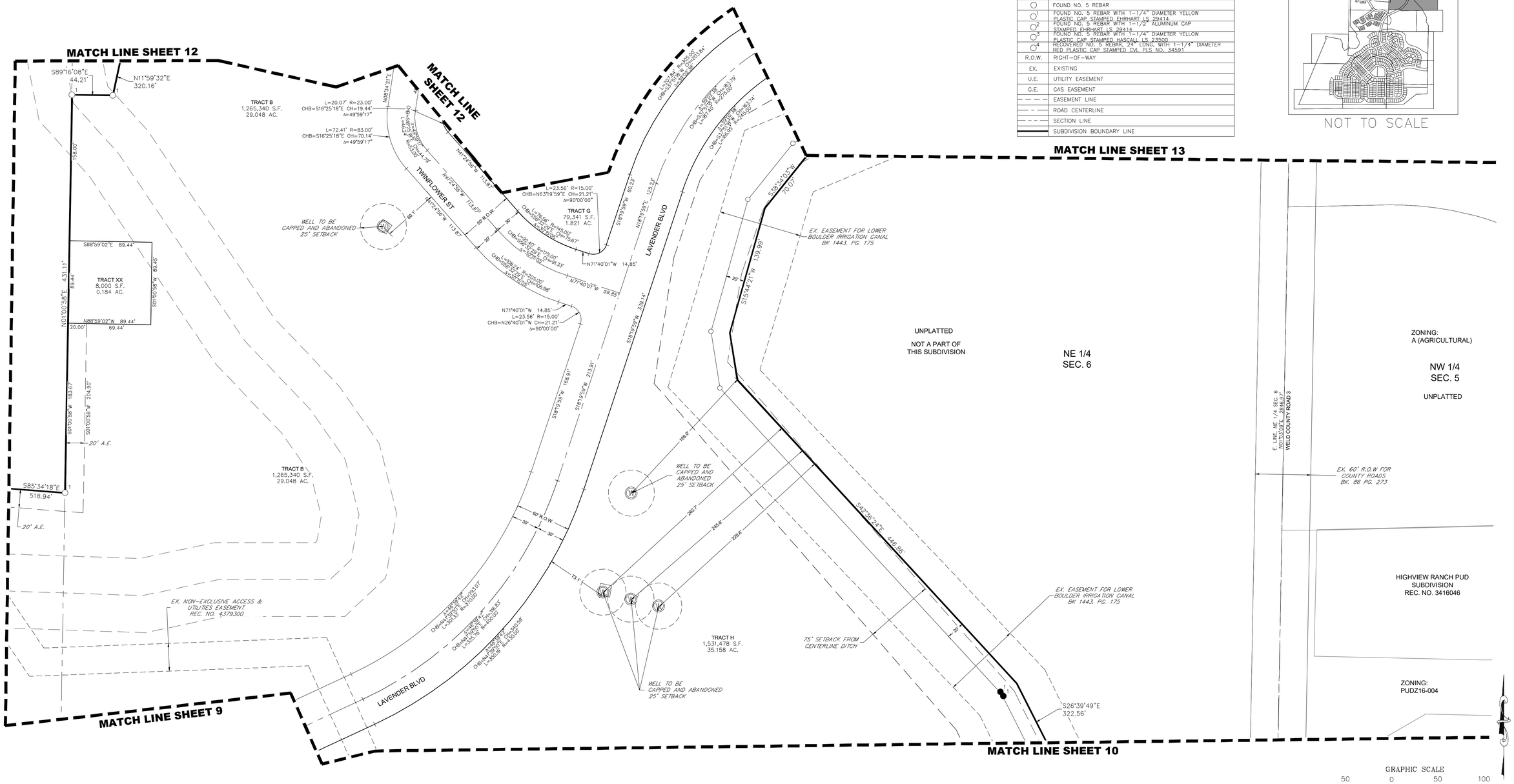
A PORTION OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6th PRINCIPAL MERIDIAN,
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KEYMAP



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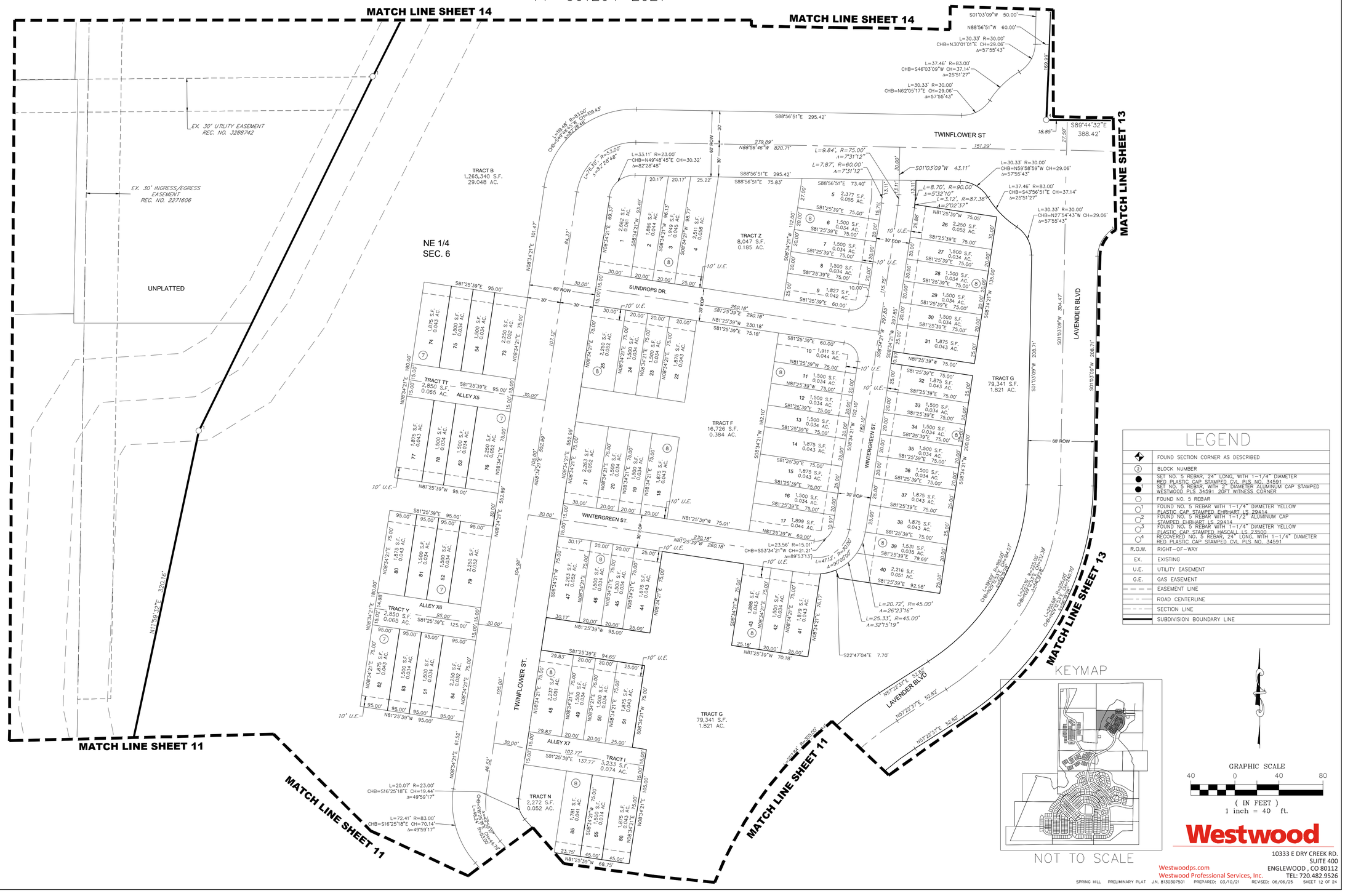


GRAPHIC SCALE
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1 inch = 50 ft.

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G.E.	GAS EASEMENT
— — —	EASEMENT LINE
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KEYMAP

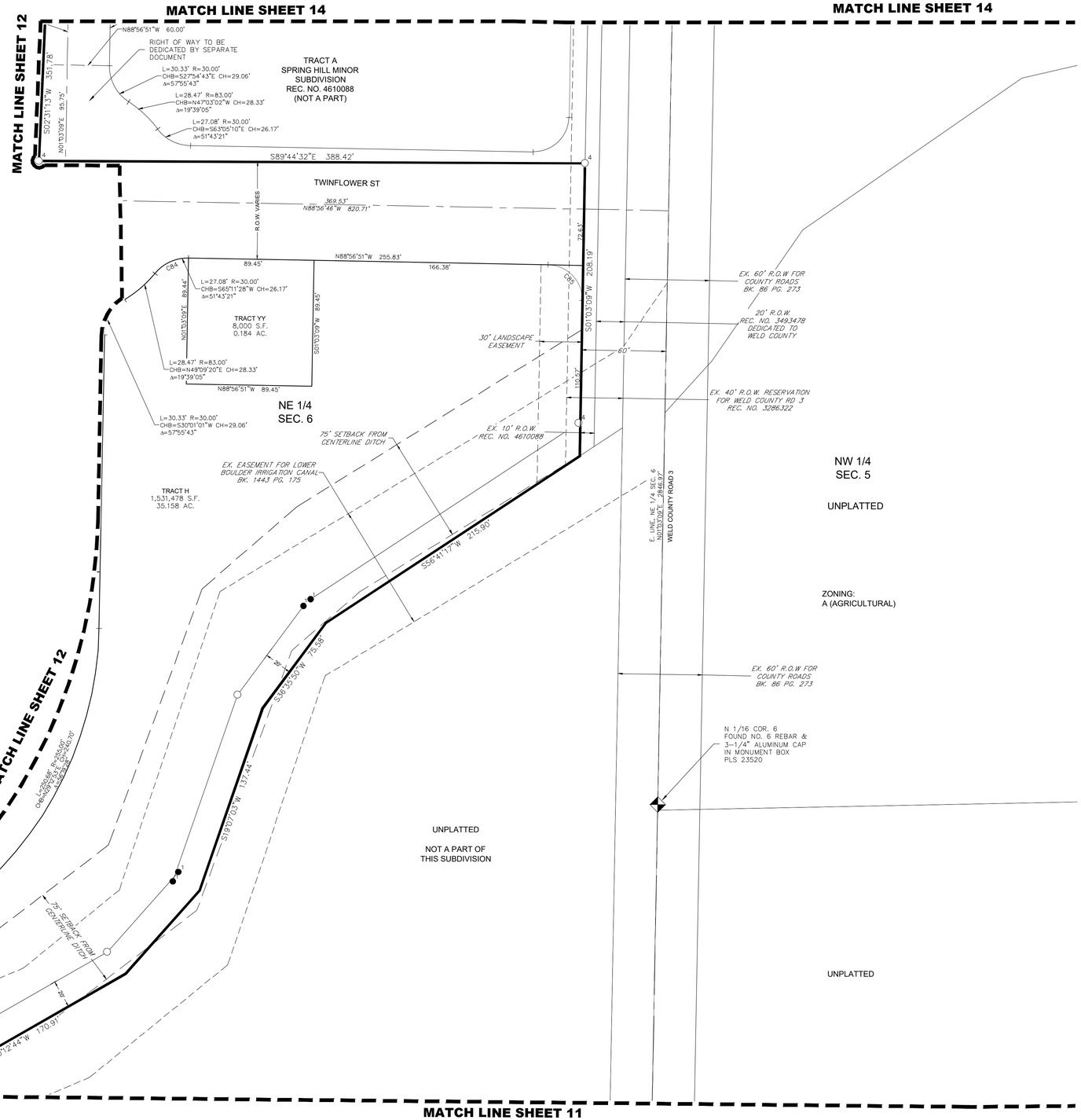
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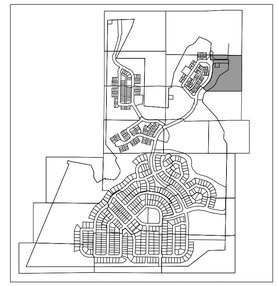
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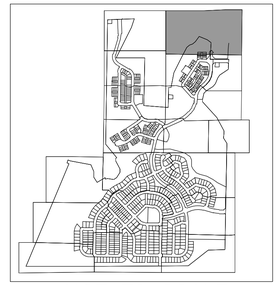
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KEYMAP



NOT TO SCALE

POINT OF COMMENCEMENT
N 1/4 COR. SEC. 6
FOUND NO. 6 REBAR WITH
3–1/4" ALUMINUM CAP
PLS 36053

UNPLATTED

COLORADO STATE HIGHWAY 52
(BASIS OF BEARINGS)
N88°46'59"E 2642.32'
N. LINE, NE 1/4 SEC. 6

NE COR. SEC. 6
FOUND NO. 6 REBAR WITH
A 2–1/2" ALUMINUM CAP
IN A RANGE BOX
STAMPED "T2N R68W 31/32/6/5
T1N 1993 LS 25937"

RIGHT OF WAY RESERVATION FOR STATE HIGHWAY 52 100' FROM CENTERLINE OF PAVED HIGHWAY

VARYING WIDTH
RIGHT OF WAY
BK. 1643 PG. 52

EX. R.O.W. REC. NO. 4610088

EX. 60' R.O.W FOR COUNTY ROADS BK. 86 PG. 273

EX. 40' R.O.W. RESERVATION FOR WELD COUNTY RD 3 REC. NO. 3286322

20' R.O.W. REC. NO. 349347B DEDICATED TO WELD COUNTY

EX. 10' R.O.W. REC. NO. 4610088

E. LINE, NE 1/4 SEC. 6
N01°03'09"E 2646.97'
WELD COUNTY ROAD 3

NW 1/4
SEC. 5

UNPLATTED

ZONING:
A (AGRICULTURAL)

MATCH LINE SHEET 5

EX. 30' INGRESS/EGRESS EASEMENT REC. NO. 2271606

NE 1/4
SEC. 6

ZONING:
A (AGRICULTURAL)

UNPLATTED

TRACT A
SPRING HILL MINOR SUBDIVISION
REC. NO. 4610088
(NOT A PART)

S88°02'35"E 188.09'

S62°07'33"E 98.34'

N38°30'09"E 137.75'

N25°57'56"E 83.63'

N70°51'22"E 60.26'

N02°27'08"E 82.05'

N12°39'43"E 242.98'

WELL TO BE CAPPED AND ABANDONED 25' SETBACK

WELL LOCATION PER COLORADO OIL & GAS CONSERVATION COMMISSION WEBSITE TO BE CAPPED AND ABANDONED 25' SETBACK

WELL TO BE CAPPED AND ABANDONED 25' SETBACK

WELL TO BE CAPPED AND ABANDONED 25' SETBACK

165.6'

166.4'

130.8'

168.4'

192.2'

152.7'

351.78'

S02°31'13"W

TRACT B
1,265,340 S.F.
29.048 AC.

TRACT B
1,265,340 S.F.
29.048 AC.

L=54.48' R=93.00'
CHB=S17°50'00"W CH=53.70'
Δ=33°33'42"

PORTION OF
RIGHT OF WAY

169.93'

N01°03'09"E 50.00'

L=47.93' R=63.00'
CHB=S22°50'56"W CH=46.78'
Δ=43°35'34"

L=25.11' R=33.00'
CHB=S22°50'56"W CH=24.51'
Δ=43°35'34"

N01°03'09"E 50.00'

LEGEND

◆	FOUND SECTION CORNER AS DESCRIBED
(2)	BLOCK NUMBER
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○4	RECOVERED NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
R.O.W.	RIGHT–OF–WAY
EX.	EXISTING
U.E.	UTILITY EASEMENT
G.E.	GAS EASEMENT
– – –	EASEMENT LINE
— – —	ROAD CENTERLINE
– – –	SECTION LINE
———	SUBDIVISION BOUNDARY LINE

MATCH LINE SHEET 12

MATCH LINE SHEET 13

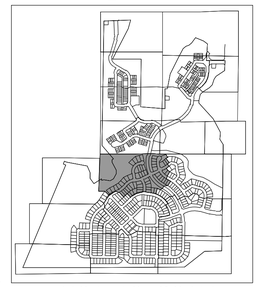
GRAPHIC SCALE
50 0 50 100
(IN FEET)
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299.512 ACRES – 632 LOTS / 49 TRACTS
PP–001264–2021

KEYMAP



NOT TO SCALE

MATCH LINE SHEET 8

MATCH LINE SHEET 8

MATCH LINE SHEET 16

MATCH LINE SHEET 16

MATCH LINE SHEET 17

MATCH LINE SHEET 19

MATCH LINE SHEET 19

UNPLATTED

TRACT A
3,078,625 S.F.
70.676 AC.

TRACT II
324,675 S.F.
7.454 AC.

TRACT W
324,675 S.F.
7.454 AC.

TRACT LL
69,360 S.F.
1.593 AC.

TRACT BB
63,367 S.F.
1.455 AC.

SE 1/4
SEC. 6

W. LINE, SE 1/4 SEC. 6
S0°22'15"W 2656.87'

N46°58'00"E
37.17'

25' OFFSET

N03°00'47"E
42.18'

N27°59'53"W 195.02'

N0°53'46"W
74.50'

N30°01'37"W
131.98'

S00°56'44"W
24.33'

N64°37'40"E
57.31'

S81°35'52"E
136.58'

N79°47'08"E
47.71'

N35°49'22"E
77.11'

N35°43'51"W 374.62'

75' SETBACK FROM CENTERLINE DITCH

WELL TO BE CAPPED AND ABANDONED 25' SETBACK

EX. EASEMENT FOR LOWER BOULDER IRRIGATION CANAL BK. 1443 PG. 175

GINGER CT

TURMERIC ST

VANILLA ST

LAVENDAR BLVD

CHICORY WAY

NUTMEG CIR

LEGEND	
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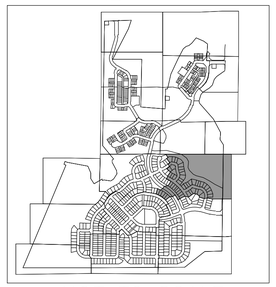
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KEYMAP



NOT TO SCALE

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50 0 50 100
(IN FEET)
1 inch = 50 ft.

MATCH LINE SHEET 9

MATCH LINE SHEET 10

MATCH LINE SHEET 15

MATCH LINE SHEET 19

MATCH LINE SHEET 20

MATCH LINE SHEET 20

MATCH LINE SHEET 20

SE 1/4 SEC. 6

TRACT II 324,675 S.F. 7.454 AC.

TRACT H 1,531,478 S.F. 35.158 AC.

TRACT LL 69,380 S.F. 1.593 AC.

TRACT BB 6,345 S.F. 0.146 AC.

NUTMEG CIR

CHICORY WAY

LAVENDAR BLVD

CINNAMON LOOP

75' SETBACK FROM CENTERLINE DITCH

EX. NON–EXCLUSIVE ACCESS & UTILITIES EASEMENT REC. NO. 4379300

EX. EASEMENT FOR LOWER BOULDER IRRIGATION CANAL BK. 1443 PG. 175

300' WELL SETBACK

WELL TO BE CAPPED AND ABANDONED 25' SETBACK

VARYING WIDTH R.O.W. REC. NO. 3493478 DEDICATED TO WELD COUNTY

206.5'

30' LANDSCAPE EASEMENT

EX. R.O.W. REC. NO. 4610088

ZONING: A (AGRICULTURAL)

EX. 60' R.O.W FOR COUNTY ROADS BK. 86 PG. 273

EX. PERMANENT EASEMENT REC. NO. 3493480

EX. 10' RIGHT OF WAY EASEMENT UNION RURAL ELECTRIC RE. NO. 1718924

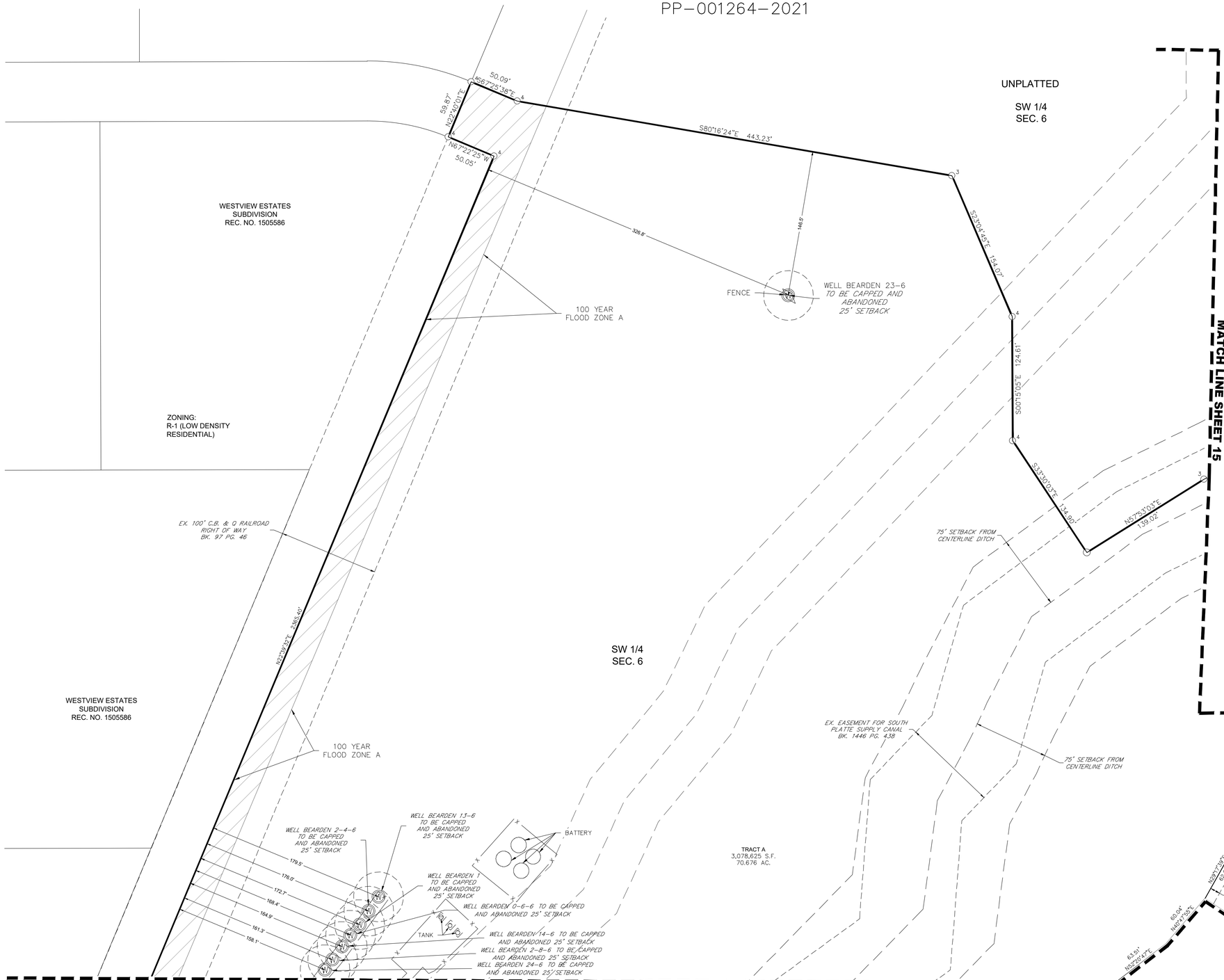
EX. 10' RIGHT OF WAY UNITED POWER, INC REC. NO. 2912125

E. LINE, SE 1/4 SEC. 6 N00°52'17"E 2637.34' WELD COUNTY ROAD 3

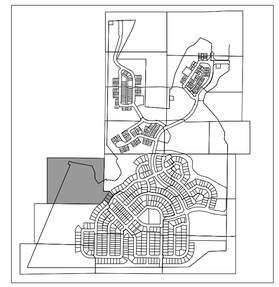
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EX.	EXISTING
U.E.	UTILITY EASEMENT
G.E.	GAS EASEMENT
– – – –	EASEMENT LINE
— · —	ROAD CENTERLINE
— · —	SECTION LINE
———	SUBDIVISION BOUNDARY LINE

GRAPHIC SCALE

50 0 50 100

(IN FEET)
1 inch = 50 ft.

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TEL: 720.482.9526

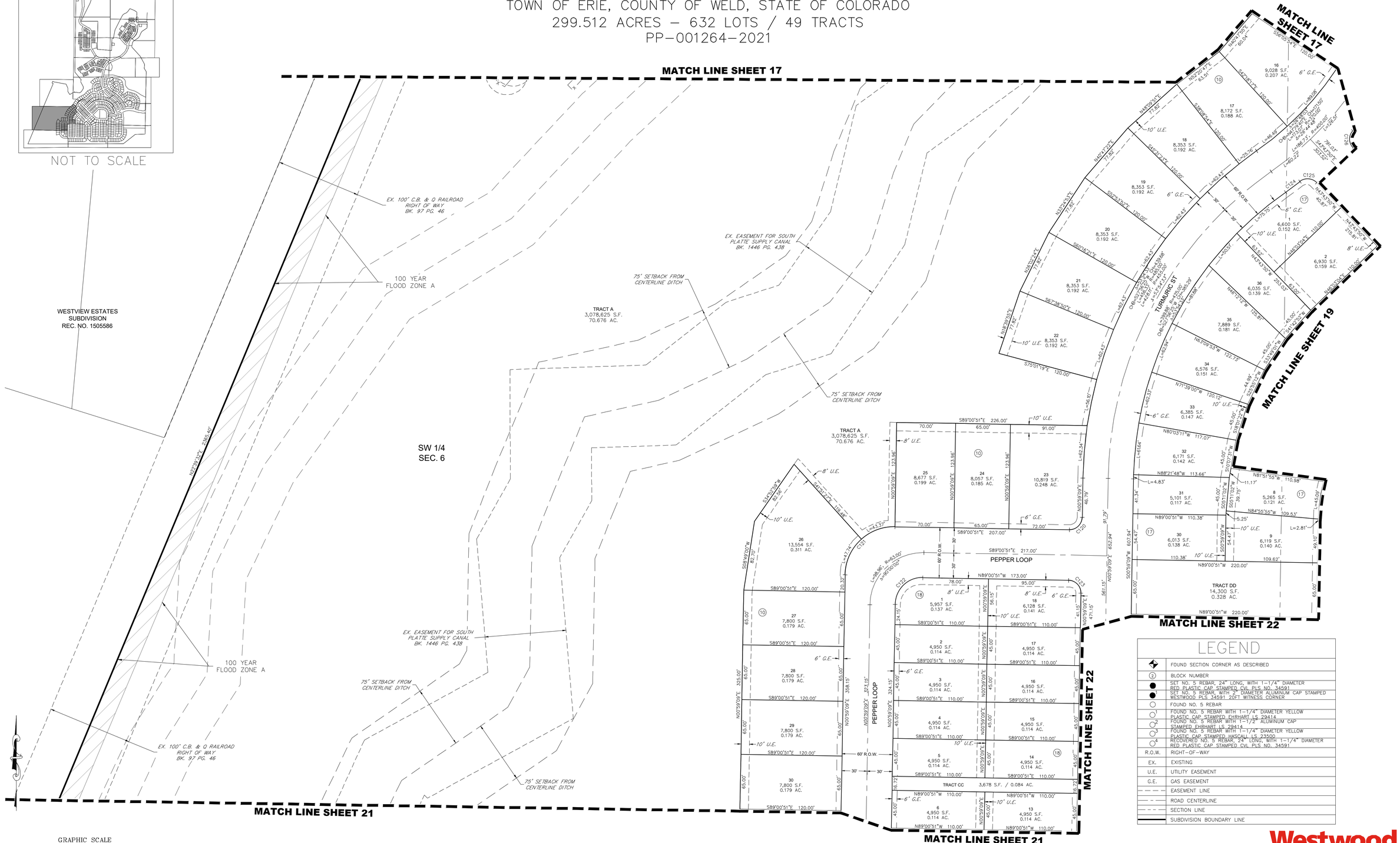
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SPRING HILL PRELIMINARY PLAT

A PORTION OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6th PRINCIPAL MERIDIAN,
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO
299.512 ACRES – 632 LOTS / 49 TRACTS
PP–001264–2021

KEYMAP

NOT TO SCALE



GRAPHIC SCALE
50 0 50 100
(IN FEET)
1 inch = 50 ft.

LEGEND

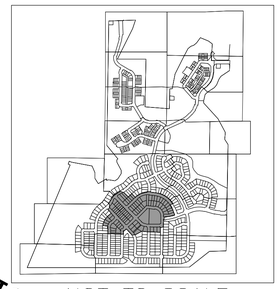
✦	FOUND SECTION CORNER AS DESCRIBED
(2)	BLOCK NUMBER
●	SET NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
●	SET NO. 5 REBAR WITH 2" DIAMETER ALUMINUM CAP STAMPED WESTWOOD PLS 34591 20FT WITNESS CORNER
○	FOUND NO. 5 REBAR
○1	FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED EHRHART LS 29414
○2	FOUND NO. 5 REBAR WITH 1–1/2" ALUMINUM CAP STAMPED EHRHART LS 29414
○3	FOUND NO. 5 REBAR WITH 1–1/4" DIAMETER YELLOW PLASTIC CAP STAMPED HASCALL LS 23500
○4	RECOVERED NO. 5 REBAR, 24" LONG, WITH 1–1/4" DIAMETER RED PLASTIC CAP STAMPED CVL PLS NO. 34591
R.O.W.	RIGHT–OF–WAY
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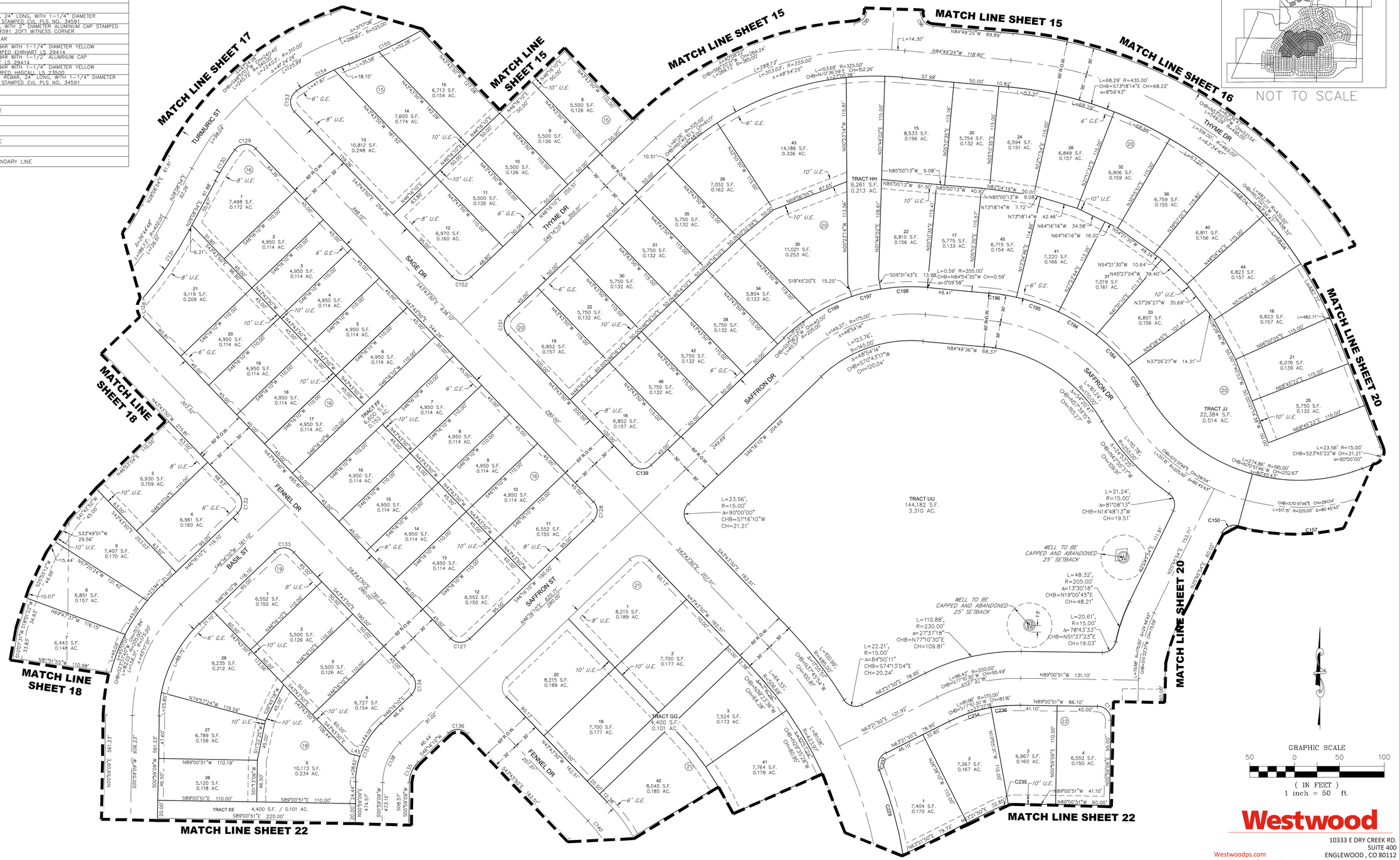
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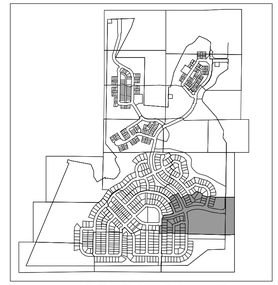
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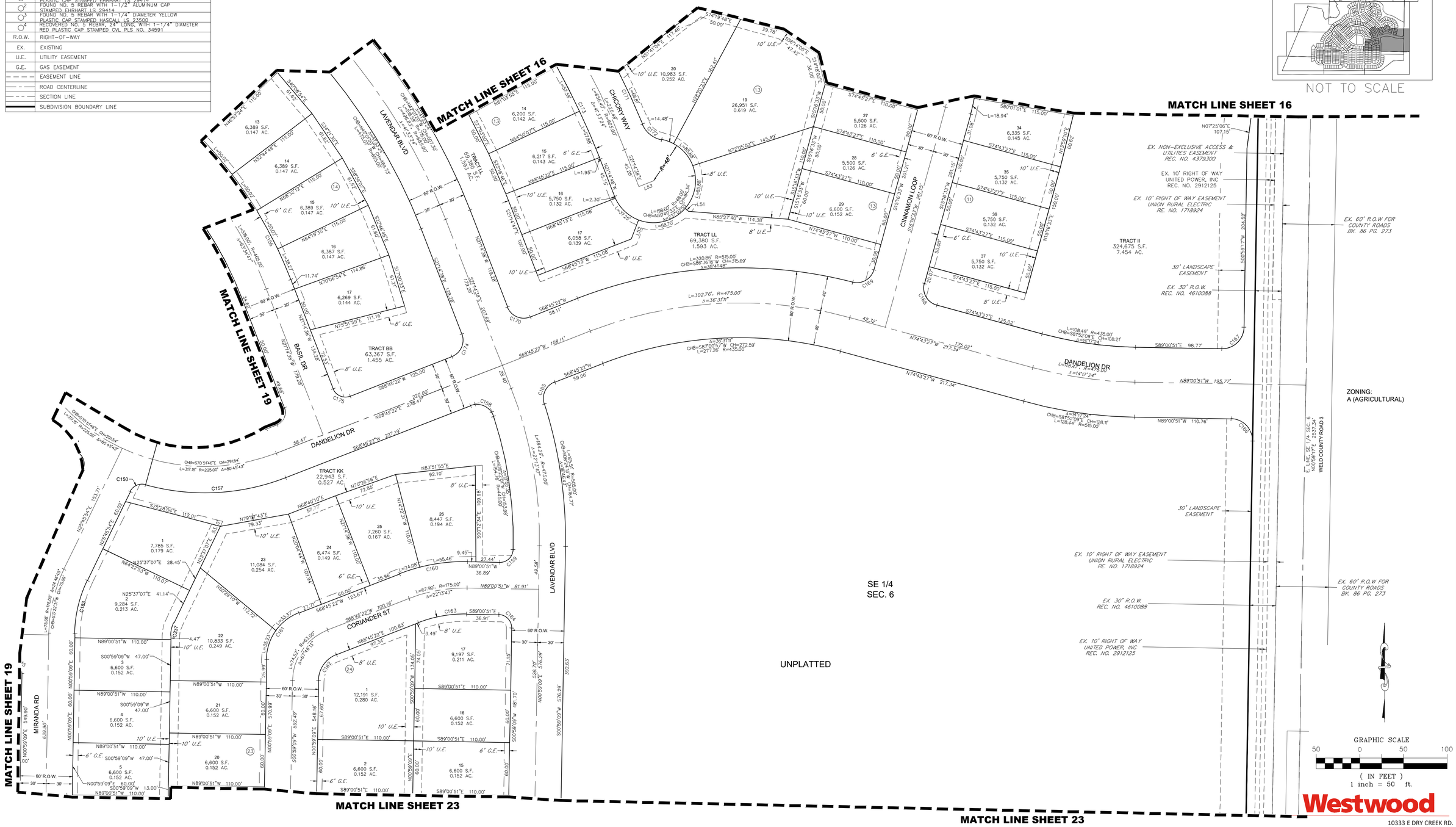
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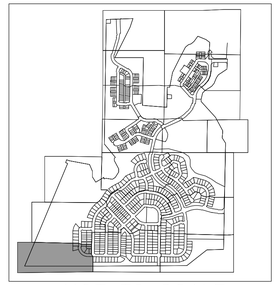


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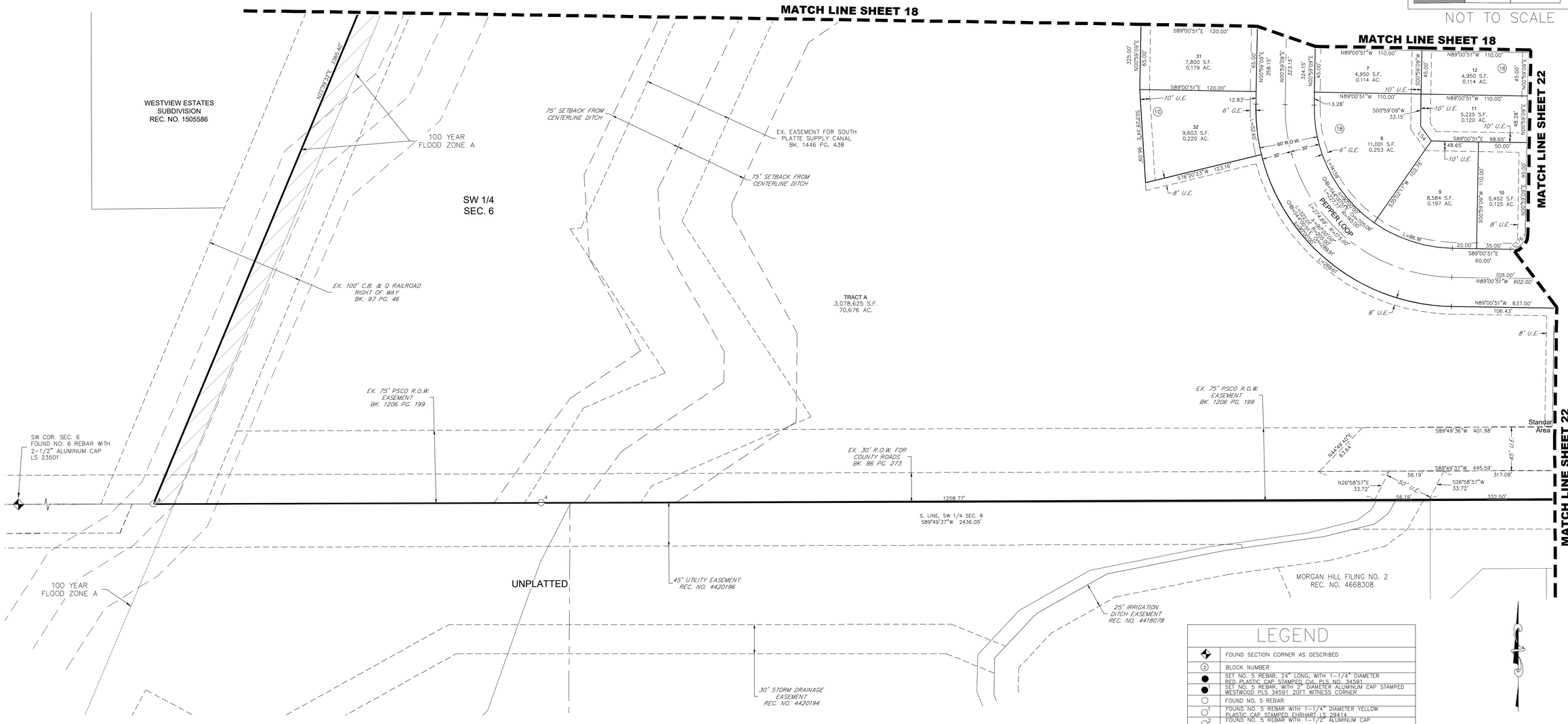
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299.512 ACRES – 632 LOTS / 49 TRACTS
PP–001264–2021

KEYMAP



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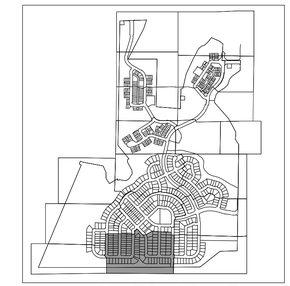
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KEYMAP



NOT TO SCALE

MATCH LINE SHEET 18

MATCH LINE SHEET 19

MATCH LINE SHEET 19

MATCH LINE SHEET 19

MATCH LINE SHEET 21

MATCH LINE SHEET 23

TRACT MM
18,086 S.F.
0.415 AC.

TRACT OO
6,198 S.F.
0.142 AC.

TRACT A
3,078,625 S.F.
70.676 AC.

TRACT A
3,078,625 S.F.
70.676 AC.

TRACT A
3,078,625 S.F.
70.676 AC.

TURMURIC ST

BASIL ST

SAFFRON ST

FENNEL ST

ROSEMARY ST

MIRANDA RD

PEPPER DR

THYME DR

EX. 75' PSCO R.O.W. EASEMENT BK. 1206 PG. 208

EX. 30' R.O.W. FOR COUNTY ROADS BK. 86 PG. 273

SOUTH 1/4 COR. SEC. 6
FOUND 2" DIAMETER PIPE WITH
3–1/4" BRASS CAP
US CADASTRAL SURV. BLM

S. LINE, SW 1/4 SEC. 6
S89°49'37"W 2436.05'

S89°42'29"W 1787.30'
S. LINE, SE 1/4 SEC. 6
S89°42'29"W 2627.43'

40' PIPELINE EASEMENT
REC. NO. 4307072

MORGAN HILL FILING NO. 2
REC. NO. 4668308

EX. 40' PIPELINE EASEMENT
REC. NO. 4307072

MORGAN HILL FILING NO. 2
REC. NO. 4668308

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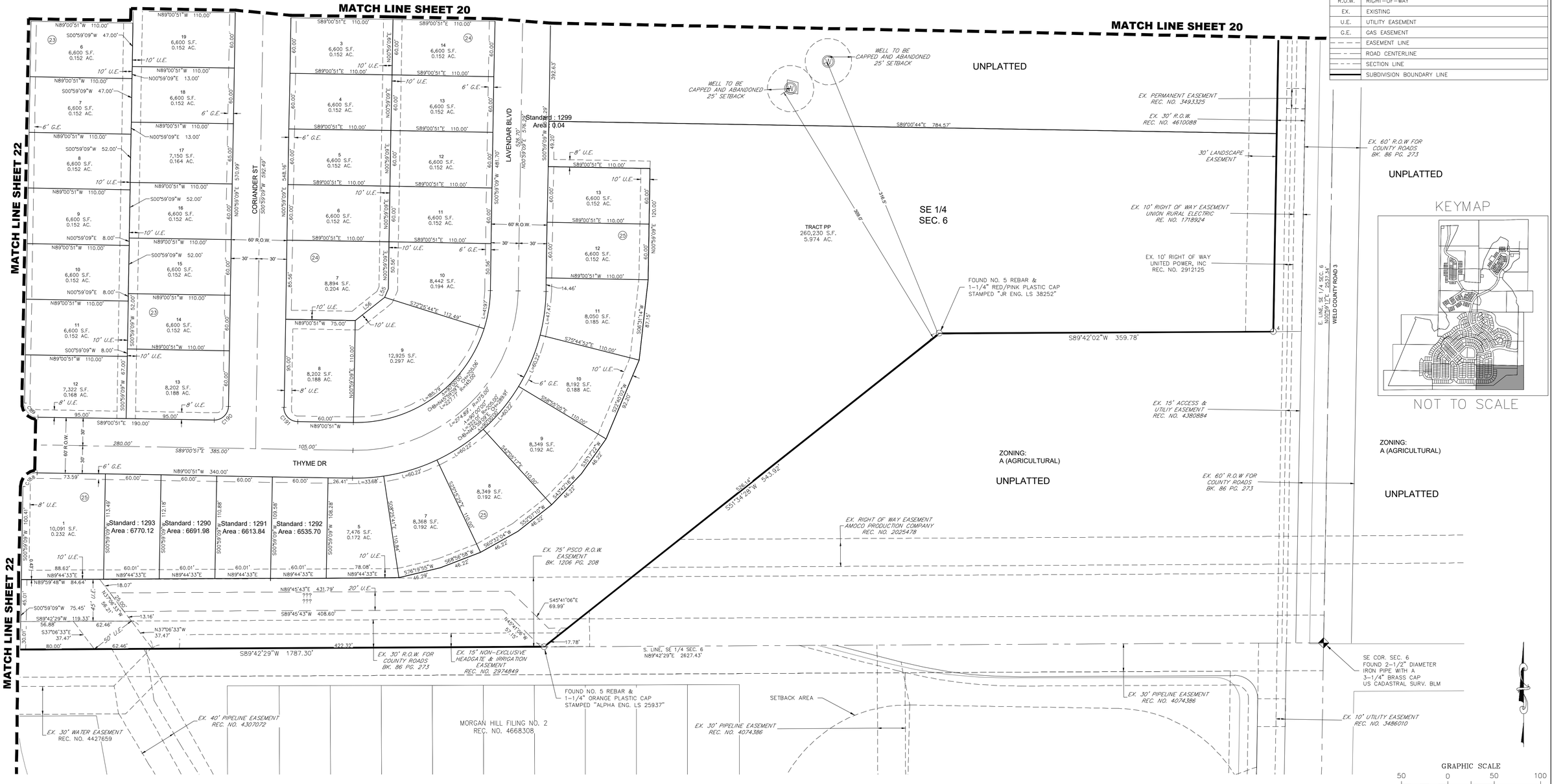
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CURVE TABLE					
CURVE NO.	RADIUS	DELTA	LENGTH	CHORD DIRECTION	CHORD LENGTH
C1	25.00'	90°00'00"	39.27'	N46°13'01"W	35.36'
C2	39.50'	31°03'14"	21.41'	S16°44'39"E	21.15'
C3	22.00'	36°39'34"	14.08'	N13°56'29"W	13.84'
C4	270.00'	12°00'55"	56.62'	N10°23'46"E	56.52'
C5	330.00'	13°06'06"	75.46'	N09°51'11"E	75.30'
C6	22.00'	30°26'08"	11.69'	S18°31'12"W	11.55'
C7	39.50'	34°57'18"	24.10'	N16°15'37"E	23.73'
C8	25.00'	90°00'00"	39.27'	S43°46'58"W	35.36'
C9	15.00'	90°00'00"	23.56'	N14°43'58"W	21.21'
C10	15.00'	90°00'00"	23.56'	S75°16'02"W	21.21'
C11	65.00'	30°16'02"	34.34'	N74°51'59"W	33.94'
C12	45.00'	60°36'49"	47.61'	N29°25'33"W	45.42'
C13	35.00'	30°16'02"	18.49'	N74°51'59"W	18.28'
C14	15.00'	60°36'49"	15.87'	N29°25'33"W	15.14'
C23	205.00'	29°23'11"	105.14'	S15°34'27"W	103.99'
C24	145.00'	29°23'11"	74.37'	S15°34'27"W	73.56'
C25	145.00'	60°36'49"	153.40'	N29°25'33"W	146.34'
C26	205.00'	60°36'49"	216.87'	N29°25'33"W	206.90'
C84	30.00'	51°43'21"	27.08'	S65°11'28"W	26.17'
C85	25.00'	90°00'00"	39.27'	N43°56'51"W	35.36'
C86	15.00'	85°59'58"	22.51'	N20°57'57"E	20.46'
C87	145.00'	15°52'31"	40.18'	N71°54'11"E	40.05'
C88	15.00'	90°00'00"	23.56'	S55°09'33"E	21.21'
C89	20.00'	42°40'06"	14.89'	N82°32'06"W	14.55'
C90	20.00'	42°40'05"	14.89'	N54°47'50"E	14.55'
C91	15.00'	86°51'45"	22.74'	N33°16'19"E	20.62'
C93	15.00'	74°35'09"	19.53'	N62°51'58"W	18.18'
C94	145.00'	28°26'30"	71.98'	N11°21'09"W	71.24'
C95	15.00'	83°32'26"	21.87'	N44°38'19"E	19.98'
C96	15.00'	87°41'31"	22.96'	S40°58'39"E	20.78'
C97	15.00'	89°32'20"	23.44'	S19°11'46"W	21.13'
C98	15.00'	85°59'58"	22.51'	N73°02'05"W	20.46'
C99	15.00'	94°38'20"	24.78'	S16°38'07"W	22.05'
C100	15.00'	83°56'15"	21.97'	N74°04'36"W	20.06'
C101	15.00'	97°42'00"	25.58'	S15°06'16"W	22.59'
C102	205.00'	11°13'42"	40.17'	N58°21'05"E	40.11'
C104	145.00'	11°13'42"	28.42'	N58°21'05"E	28.37'
C105	15.00'	97°44'22"	25.59'	S67°10'32"E	22.60'
C107	15.00'	83°54'24"	21.97'	N22°00'05"E	20.06'
C108	15.00'	94°39'45"	24.78'	S68°42'51"E	22.06'
C109	58.00'	52°57'51"	53.62'	S79°13'09"W	51.73'
C110	58.00'	72°53'12"	73.78'	N37°51'20"W	68.91'
C111	15.00'	87°17'06"	22.85'	S06°46'59"E	20.70'
C113	58.00'	50°19'27"	50.94'	S80°30'29"W	49.32'
C115	15.11'	87°17'06"	23.02'	S11°17'28"W	20.86'
C116	15.00'	87°17'06"	22.85'	N80°30'06"E	20.70'
C117	33.00'	56°01'40"	32.27'	N08°50'43"E	31.00'
C118	32.00'	70°41'09"	39.48'	N38°57'21"W	37.02'
C119	32.00'	52°57'51"	29.58'	S79°13'09"W	28.54'
C120	15.00'	90°00'00"	23.56'	N45°59'09"E	21.21'

CURVE TABLE					
CURVE NO.	RADIUS	DELTA	LENGTH	CHORD DIRECTION	CHORD LENGTH
C121	58.00'	90°00'00"	91.11'	S45°59'09"W	82.02'
C122	32.00'	90°00'00"	50.27'	S45°59'09"W	45.25'
C123	15.00'	90°00'00"	23.56'	N44°00'51"W	21.21'
C124	430.00'	2°49'18"	21.18'	N53°29'03"E	21.17'
C125	15.00'	84°11'46"	22.04'	N85°49'43"W	20.11'
C126	15.00'	84°11'46"	22.04'	S01°37'57"E	20.11'
C127	15.00'	90°00'00"	23.56'	S88°43'50"E	21.21'
C128	15.00'	90°00'00"	23.56'	N01°16'10"E	21.21'
C129	15.00'	99°46'37"	26.12'	S86°22'52"W	22.94'
C130	280.00'	8°20'39"	40.78'	S32°19'14"W	40.74'
C131	430.00'	12°22'03"	92.82'	N34°16'54"E	92.64'
C132	15.00'	90°00'00"	23.56'	N01°16'10"E	21.21'
C133	15.00'	90°00'00"	23.56'	N88°43'50"W	21.21'
C134	15.00'	90°00'00"	23.56'	N01°16'10"E	21.21'
C135	32.00'	45°17'02"	25.29'	S23°37'40"W	24.64'
C136	15.00'	90°00'00"	23.56'	N88°43'50"W	21.21'
C137	92.00'	45°17'02"	72.71'	S23°37'40"W	70.83'
C139	15.00'	90°00'00"	23.56'	N88°43'50"W	21.21'
C141	15.00'	90°00'00"	23.56'	N28°22'45"W	21.21'
C142	15.00'	92°26'32"	24.20'	N60°23'59"E	21.66'
C144	15.00'	90°00'00"	23.56'	S28°22'45"E	21.21'
C145	15.00'	89°59'55"	23.56'	N44°00'51"W	21.21'
C146	15.00'	90°00'00"	23.56'	N61°37'15"E	21.21'
C147	15.00'	86°23'09"	22.62'	S30°10'43"E	20.53'
C148	15.00'	84°47'03"	22.20'	S64°13'42"W	20.23'
C149	15.00'	84°47'03"	22.20'	S04°39'03"W	20.23'
C150	15.00'	79°40'24"	20.86'	S65°36'05"W	19.22'
C151	15.00'	90°00'00"	23.56'	S01°16'10"W	21.21'
C152	15.00'	90°00'00"	23.56'	S88°43'50"E	21.21'
C153	15.00'	99°46'37"	26.12'	S06°09'28"W	22.94'
C154	280.00'	13°30'33"	66.02'	S62°48'03"W	65.87'
C155	555.00'	31°17'08"	303.05'	N53°54'46"E	299.30'
C156	495.00'	63°34'47"	549.29'	N53°02'01"W	521.54'
C157	255.00'	36°40'55"	163.26'	N87°05'50"E	160.48'
C158	20.00'	92°54'49"	32.43'	N64°47'13"W	28.99'
C159	15.00'	89°23'22"	23.40'	N46°17'28"E	21.10'
C160	205.00'	22°13'47"	79.54'	S79°52'15"W	79.04'
C161	58.00'	67°46'13"	68.60'	S34°52'15"W	64.67'
C162	32.00'	67°46'13"	37.85'	S34°52'15"W	35.68'
C163	145.00'	22°13'47"	56.26'	S79°52'15"W	55.91'
C164	15.00'	90°00'00"	23.56'	N44°00'51"W	21.21'
C165	20.00'	86°32'56"	30.21'	S25°28'54"W	27.42'
C166	25.00'	90°00'08"	39.27'	N44°00'47"W	35.36'
C167	25.00'	89°59'52"	39.27'	N45°59'13"E	35.35'
C168	20.00'	90°00'00"	31.42'	S29°43'27"E	28.28'
C169	20.00'	89°10'38"	31.13'	N59°51'52"E	28.08'
C170	20.00'	90°00'00"	31.42'	S66°14'38"E	28.28'
C171	935.00'	10°17'44"	168.01'	N27°36'57"W	167.78'
C172	30.00'	56°23'19"	29.52'	S50°39'45"E	28.35'
C173	875.00'	41°33'14"	634.59'	N42°01'25"W	620.78'

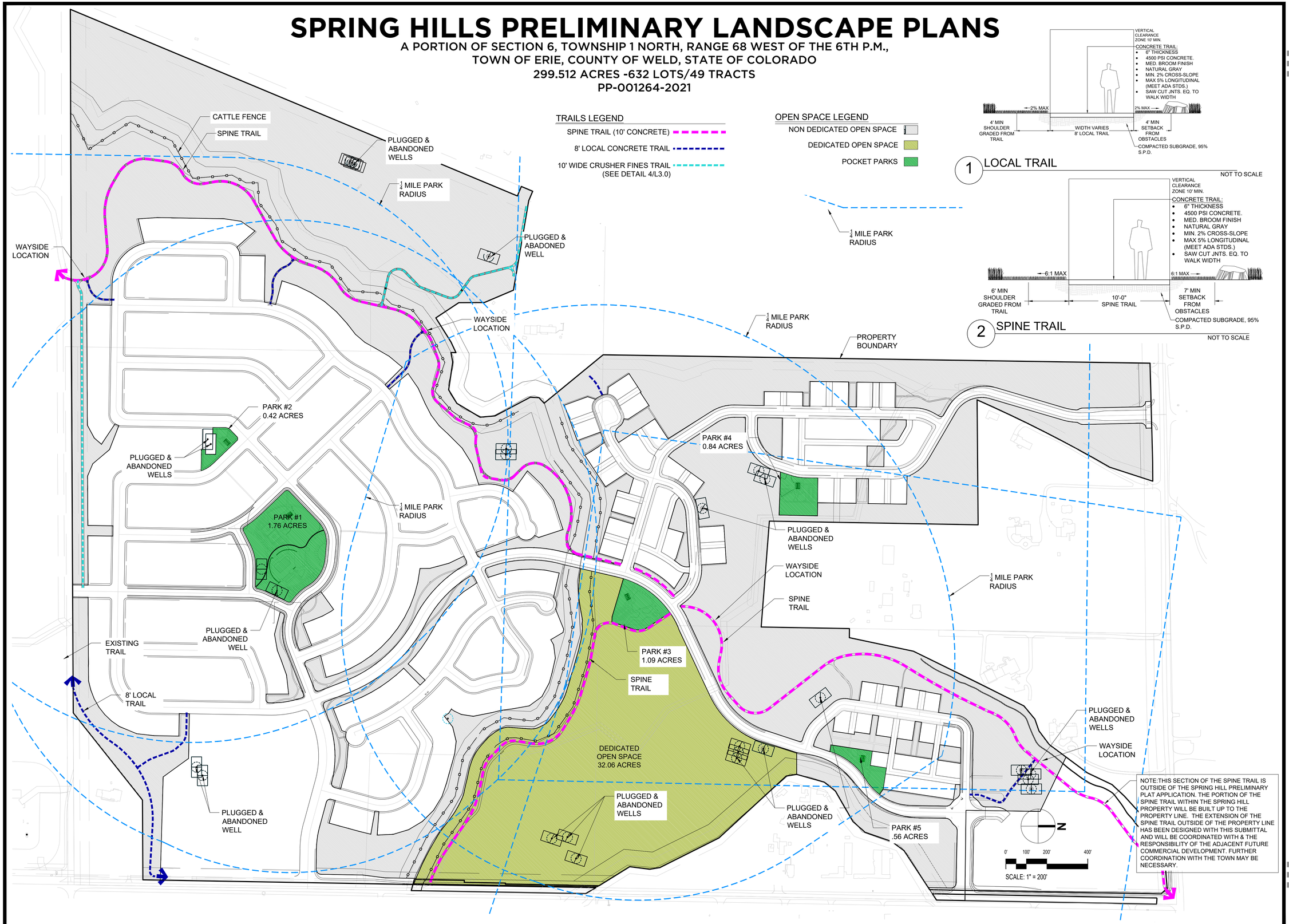
CURVE TABLE					
CURVE NO.	RADIUS	DELTA	LENGTH	CHORD DIRECTION	CHORD LENGTH
C174	20.00'	90°00'00"	31.42'	N23°45'22"E	28.28'
C175	15.00'	90°00'00"	23.56'	S66°14'38"E	21.21'
C176	15.00'	90°00'00"	23.56'	N45°59'09"E	21.21'
C177	15.00'	90°00'00"	23.56'	S44°00'51"E	21.21'
C178	15.00'	90°00'00"	23.56'	N45°59'09"E	21.21'
C179	15.00'	90°00'00"	23.56'	S44°00'51"E	21.21'
C180	32.00'	90°00'00"	50.27'	N45°59'09"E	45.25'
C181	145.00'	44°42'59"	113.16'	N21°22'20"W	110.31'
C182	58.00'	90°00'00"	91.11'	S44°00'51"E	82.02'
C183	145.00'	24°46'45"	62.71'	S13°22'31"W	62.22'
C184	230.00'	12°19'10"	49.45'	N46°22'08"W	49.36'
C185	15.00'	90°00'00"	23.56'	S44°00'51"E	21.21'
C186	15.00'	90°00'00"	23.56'	N45°59'09"E	21.21'
C187	15.00'	90°00'00"	23.56'	N44°00'51"W	21.21'
C188	15.00'	90°00'00"	23.56'	S45°59'09"W	21.21'
C189	15.00'	90°00'00"	23.56'	S44°00'51"E	21.21'
C190	15.00'	90°00'00"	23.56'	N45°59'09"E	21.21'
C191	15.00'	90°00'00"	23.56'	S44°00'51"E	21.21'
C192	30.00'	44°42'59"	23.41'	N21°22'20"W	22.82'
C194	230.00'	12°16'22"	49.27'	N58°39'54"W	49.17'
C195	230.00'	12°19'18"	49.46'	N70°57'44"W	49.37'
C196	230.00'	7°42'13"	30.92'	N80°58'30"W	30.90'
C197	205.00'	9°13'37"	33.01'	S75°51'29"W	32.98'
C198	205.00'	14°32'09"	52.01'	S87°44'22"W	51.87'
C199	205.00'	13°38'09"	48.79'	S64°25'36"W	48.67'
C200	230.00'	9°43'38"	39.05'	N35°20'44"W	39.00'
C229	485.00'	11°36'51"	98.31'	N15°39'55"W	98.14'
C230	485.00'	5°54'02"	49.95'	N06°54'29"W	49.93'
C231	485.00'	4°56'36"	41.85'	N01°29'09"W	41.83'
C232	15.00'	84°50'11"	22.21'	S20°56'45"W	20.24'
C234	170.00'	16°32'38"	49.09'	S71°38'10"W	48.92'
C235	60.00'	16°32'38"	17.32'	N71°38'10"E	17.26'
C236	170.00'	11°04'40"	32.87'	S85°26'49"W	32.82'
C237	35.00'	24°37'58"	15.05'	S13°18'08"W	14.93'

LINE TABLE		
LINE NO.	DIRECTION	LENGTH
L2	S30°16'02"W	11.42'
L3	N90°00'00"W	20.17'
L4	N90°00'00"W	20.63'
L5	N90°00'00"W	50.40'
L37	N76°07'53"E	18.98'
L38	S28°15'04"W	21.92'
L39	S76°07'53"W	18.98'
L40	N52°09'08"E	15.02'
L41	N59°40'52"E	15.02'
L42	N76°45'00"W	18.00'
L43	N78°56'36"W	16.30'
L44	N81°50'25"E	42.58'
L45	S74°23'20"E	12.05'
L51	S49°03'53"E	5.24'
L52	S21°00'24"W	23.27'
L53	N68°45'22"E	18.00'
L54	N35°52'57"W	18.91'
L55	N23°29'09"E	10.04'
L56	N51°26'42"E	40.40'

Westwood
10333 E DRY CREEK RD.
SUITE 400
ENGLEWOOD , CO 80112
Westwoodps.com
Westwood Professional Services, Inc.
TEL: 720.482.9526

SPRING HILLS PRELIMINARY LANDSCAPE PLANS

A PORTION OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M.,
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO
299.512 ACRES -632 LOTS/49 TRACTS
PP-001264-2021



TRAILS LEGEND

- SPINE TRAIL (10' CONCRETE)
- 8' LOCAL CONCRETE TRAIL
- 10' WIDE CRUSHER FINES TRAIL (SEE DETAIL 4/L3.0)

OPEN SPACE LEGEND

- NON DEDICATED OPEN SPACE
- DEDICATED OPEN SPACE
- POCKET PARKS

NOTE:THIS SECTION OF THE SPINE TRAIL IS OUTSIDE OF THE SPRING HILL PRELIMINARY PLAT APPLICATION. THE PORTION OF THE SPINE TRAIL WITHIN THE SPRING HILL PROPERTY WILL BE BUILT UP TO THE PROPERTY LINE. THE EXTENSION OF THE SPINE TRAIL OUTSIDE OF THE PROPERTY LINE HAS BEEN DESIGNED WITH THIS SUBMITTAL AND WILL BE COORDINATED WITH & THE RESPONSIBILITY OF THE ADJACENT FUTURE COMMERCIAL DEVELOPMENT. FURTHER COORDINATION WITH THE TOWN MAY BE NECESSARY.

1 LOCAL TRAIL — NOT TO SCALE

2 SPINE TRAIL — NOT TO SCALE

Prepared For
E5X MANAGEMENT
7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112

Land Planning
people creating spaces
pcs group inc. www.pcsgroupco.com
#3, B-180 Independence plaza
1007 16th street . denver co 80265
t 303.531.4905 . f 303.531.4908

Engineering
CVL a Westwood team
10333 E. Dry Creek Rd. Suite 240
Englewood, CO 80112
Tel:720.482.952
www.cvlinc.net
westwoodps.com

SPRING HILL
ERIE, COLORADO
PRELIMINARY LANDSCAPE PLANS

Drawn by:	BEM
Checked by:	JP
Submittal Date:	3.15.2020
	9.3.2021
	12.3.2021
	3.04.2022
	1.16.2023
	8.8.2024
	6.9.2025

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

Sheet Name
PARK, OPEN SPACE AND TRAILS PLAN

Sheet Number
L0.6

TOWN OF ERIE
Planning & Development – Planning Division
645 Holbrook Street – PO Box 750 – Erie, CO 80516
Tel: 303.926.2770 – Website: www.erieco.gov

LAND USE APPLICATION

Please fill in this form completely. Incomplete applications will not be processed. Application fees must accompany application.

STAFF USE ONLY		
FILE NAME:		
FILE NO:	DATE SUBMITTED:	FEES PAID:

PROJECT/BUSINESS NAME: Spring Hill

PROJECT ADDRESS: Generally South of HWY 52 and West of County Road 3

PROJECT DESCRIPTION: Spring Hill is proposed to be a high quality residential addition to the Town of Erie, this proposal will include a significant amount of open space, parks, and trails.

LEGAL DESCRIPTION *(attach legal description if Metes & Bounds)*

Subdivision Name:

Filing #: Lot #: Block #: Section: 36 Township: 1 North Range: 69 West

OWNER *(attach separate sheets if multiple)*

Name/Company: I & J Partnership/Moradi Holdings
Contact Person: Sam Kermanian
Address: 9301 Wilshire Blvd
City/State/Zip: Beverly Hills, CA 9021 0
Phone: 310.247.0755 Fax: 310.247.0758
E-mail: Skermanian@ICOinvestment.com

[ ] Check here if Owner is responsible for Application Billing

AUTHORIZED REPRESENTATIVE

Company/Firm: ME Erie, LLC
Contact Person: Matt Janke/Chris Elliott
Address: 7353 South Alton Way
City/State/Zip: Centennial, CO - 80112
Phone: 303.770.9111 Fax:
E-mail: mjanke@e5xmanagement.com

[X] Check here if Authorized Representative is responsible for Application Billing

MINERAL RIGHTS OWNER *(attach separate sheets if multiple)*

Name/Company:
Address:
City/State/Zip:

MINERAL LEASE HOLDER *(attach separate sheets if multiple)*

Name/Company:
Address:
City/State/Zip:

LAND-USE & SUMMARY INFORMATION

Present Zoning: LR
Proposed Zoning: PD
Gross Acreage: 301.89
Gross Site Density (du/ac): 2 du/ac
Lots/Units Proposed: 632
Gross Floor Area:

SERVICE PROVIDERS

Electric: Public Service
Metro District: N/A at this time
Water *(if other than Town)*:
Gas: Public Service
Fire District: Mountain View Fire District
Sewer *(if other than Town)*:

PAGE TWO MUST BE SIGNED AND NOTARIZED

DEVELOPMENT REVIEW FEES			
ANNEXATION		**SUBDIVISION**	
☐ Major (10+ acres)	$ 4000.00	☐ Sketch Plan	$ 1000.00 + 10.00 per lot
☐ Minor (less than 10 acres)	$ 2000.00	☑ Preliminary Plat	$ 2000.00 + 40.00 per lot
COMPREHENSIVE PLAN AMENDMENT		☐ Final Plat	$ 2000.00 + 20.00 per lot
☐ Major	$ 3000.00	☐ Minor Subdivision Plat	$ 2000.00
☐ Minor	$ 1200.00	☐ Minor Plat Amendment	$400.00
ZONING/REZONING		☐ Road Vacation (constructed)	$1000.00
☐ Initial Zoning	$ 1700.00 + 10.00 per acre	☐ Road Vacation (paper	$100.00
☐ Rezoning	$ 1700.00 + 10.00 per acre		
☐ PUD Rezoning	$ 1700.00 + 10.00 per acre	**SITE PLAN**	
☐ PUD Amendment	$ 1700.00 + 10.00 per acre	☐ Residential	$ 1400.00 + 10.00 per unit
☐ Major PD Amendment	$ 3700.00 + 10.00 per acre	☐ Non-Resi. (>10,000 sq. ft.)	$ 2,200.00
☐ Minor PD Amendment	$ 500.00	☐ Non-Resi. (>2,000 sq. ft.)	$ 1000.00
SPECIAL REVIEW USE		☐ Non-Resi. (<2,000 sq. ft.)	$ 200.00
☐ Major	$ 1000.00	☐ Amendment (major)	$1100.00
☐ Minor	$ 400.00	☐ Amendment (minor)	$350.00
☐ Oil & Gas	$ 1200.00	**VARIANCE**	$600.00
MISCELLANEOUS		**METRO DIST SERVICE PLAN**	$10,000.00
☐ Outdoor Café Permit/R.O.W. Encroachment	$50.00		
☐			

*All fees **include** both Town of Erie Planning & Engineering review. These fees **do not include** referral agency review fees, outside consultant review fees, or review fees incurred by consultants acting on behalf of staff. See Town of Erie Municipal Code, Title 2-10-5 for all COMMUNITY DEVELOPMENT FEES.*

The undersigned is fully aware of the request/proposal being made and the actions being initiated on the referenced property. The undersigned understand that the application must be found to be complete by the Town of Erie before the request can officially be accepted and the development review process initiated. **The undersigned is aware that the applicant is fully responsible for all reasonable costs associated with the review of the application/request being made to the Town of Erie. Pursuant to Title 10, Section 7.2.B.5 of the Town of Erie Municipal Code, applicants shall pay all costs billed by the Town for legal, engineering and planning costs incurred by staff, including consultants acting on behalf of staff, necessary for project review. By this acknowledgement, the undersigned hereby certify that the above information is true and correct.**

Owner: METERRA By _____ Date: March 30, 2021

Owner: _____ Date: _____

Applicant: METERRA By _____ Date: March 30, 2021

STATE OF COLORADO)
) ss.
County of Arapahoe)

The foregoing instrument was acknowledged before me this 30th day of March, 2021, by Christopher Elliott.

My commission expires: Oct 12, 2022.
Witness my hand and official seal.

CHRISTIAN MATTHEW JANKE
Notary Public
State of Colorado
Notary ID # 20184040220
My Commission Expires 10-12-2022

_____
Notary Public



Spring Hill Preliminary Plat Narrative

March - 2021 - Updated Feb. - 2026

ME Erie, LLC
7353 South Alton Way, Centennial, CO - 80112
| O | 303-770-9111
| E | celliott@e5xmanagement.com

March, 2021 - Updated Feb. - 2026

Town of Erie
Community Development Department
645 Holbrook Street
Erie, CO 80516

RE: Preliminary Plat, Spring Hill

To Whom It May Concern:

ME Erie, LLC ("Applicant") is pleased to submit the enclosed Preliminary Plat application for the property located west of Weld County Road 3, and south of Hwy 52. This project consists of a parcel with an area of approximately 300 acres that is located in the Town of Erie and is currently zoned PD, and identified as Residential Low in the Comprehensive Plan.

General Project Concept and Purpose of the Request

The creative vision for Spring Hill draws its inspiration from the open space and trail corridors that have helped shape the design of the community. Spring Hill is envisioned as a series of crafted neighborhoods that are generally organized around park areas. Park areas also are used as community identity features. This community will strike a balance between the natural environment and the land uses required to provide an active lifestyle with access to all the services needed to support residents of every age. The property includes approximately 300 acres of vacant agricultural land with three irrigation ditches bisecting the property. In addition there are some wetland areas that will be preserved, and existing wells scattered throughout the property that have been plugged and abandoned.

Parks and trails provide transitions between the built environment and natural open space areas, enhancing the connection between humans and nature. Trails and trail connections encourage Spring Hill residents to live an active lifestyle, and link the community to adjacent communities with the extension of a Regional Spine Trail. Approximately 162 acres of land has been set aside for Open Space uses, with approximately 35 acres proposed to be dedicated to the Town of Erie for Open Space and Trail corridor. In addition to the Open Space areas, approximately 4 additional acres are being depicted for Park type uses - Pocket Parks. In our discussions with the Town of Erie Park's department we understand that the Town does not desire a Town owned or maintained Neighborhood Park in this location.

The property is zoned PD, in the Town of Erie. The property was annexed to the Town of Erie in February of 2014, the overall maximum allowed number of dwelling units supported by the Residential Low Designation in the Comprehensive Plan would be between 600 - 1,800 units; however, the annexation agreement limits the maximum number of dwelling units to 632. This Preliminary Plat submittal includes 632 units, or an approximate gross density of 2.1 dwelling units per acre.

There are many public benefits to this style of community design. The design of Spring Hill is composed of a well-connected street network that disperses traffic and increases pedestrian connections, there are many pedestrian connections throughout the community to get to the Regional Spine Trail. A "sense of place" refers to unique characteristics that help define that location from any other place. This sense of place can be expressed in a number of ways including the natural and built environment. Spring Hill's natural setting and incredible views provide an already established sense of place with the wetland areas, irrigation ditches, the future Regional Spine trail, a future school and pocket parks. Whether residents are walking along the internal trails, playing and socializing in the parks throughout the community, bicycling along the Regional Spine trail, or taking in the views of the Front Range, they will always recognize this area as a unique "place" and a place they are proud to call home, and perhaps more importantly this style of community crafting provides areas for social interaction, areas to linger with friends, sit and talk, or simply hang out with neighbors. In addition, this community concept provides approximately 57% of the homes within the community backing on to, or looking directly at a park or open space area.

The Spring Hill community is intended to become a community where all residents can achieve an optimal lifestyle regardless of age, thus creating a multi-generational community. The Spring Hill plan anticipates providing an array of amenities that equally address the needs and inspirations of residents of multiple life stages, from young, single professionals to families. Park programming for Spring Hill will be universal in accommodation and appeal to all age groups. This philosophy recognizes that a successful community requires seamless integration of all age groups, engaging people across all life stages, and recognizing the independence and value of all generations. The community's physical and activity structure should support to the fullest extent possible each individual's journey toward fulfilling their ultimate human potential through all life stages providing both active and passive activities throughout the community. The design of this community includes a mix of housing, providing a range of housing types, sizes and prices throughout the community.

The Total Land Area to be Subdivided, Number of Residential Lots & Density

The property is zoned Planned Development (PD), in the Town of Erie. The property was annexed to the Town of Erie in February of 2014, with an annexation agreement that limits the maximum number of dwelling units to 632. This Preliminary Plat submittal includes 632 units, or an approximate gross density of 2.1 dwelling units per acre. The specific lot/home size breakdown is shown below.

LAND SUMMARY CHART	
LOT OR PRODUCT SIZE	**TOTAL UNITS**
21' X 77' (T-HOME)	70
20' X 60' (DUPLEX)	148
45' X 110'	112
50' X 110'	151
60' X 110'	107
65' X 120'	44
TOTAL	**632**

**361 HOMES BACK TO OR FRONT OPEN SPACE / PARKS*

The Total Land Area to be Preserved as Open Space

Parks and trails provide transitions between the built environment and natural open space areas, enhancing the connection between humans and nature. Trails and trail connections encourage Spring Hill residents to live an active lifestyle, and link the community to adjacent communities with the extension of a Regional Spine Trail.

Approximately 162 acres of land has been set aside for Open Space uses, with approximately 35 acres proposed to be dedicated to the Town of Erie for Open Space and Trail corridor. In addition to the Open Space areas, approximately 4 additional acres are being depicted for Park type uses - Pocket Parks. In our discussions with the Town of Erie Park's department we understand that the Town does not desire a Town owned or maintained Neighborhood Park in this location.

Brief Description regarding Phasing

At this time we anticipate multiple phases for the development of the Spring Hill property; however, the number of phases has not been determined at this stage of the entitlement process. It seems logical that the development will start at the south and move to the north, any phasing for the property will meet the Town of Erie and Life Safety requirements.



Infrastructure, Utilities and Service Providers

The property will be served by Town Water and Sewer, and all services are in close proximity to the project. We have confirmed that the property will be served by United Power for Electricity, Xcel for Gas, Comcast and Century Link for Internet and Cable, and Waste Connection for Trash disposal.

Location, Function & Ownership of Public and Private Open Space

The Preliminary Plat includes a table that identifies tracts with their proposed ownership, use function. Additionally, the preliminary landscape plans detail the design intent for all tracts. Again, approximately 163 acres of land has been set aside for Open Space uses, with approximately 36 acres proposed to be dedicated to the Town of Erie for Open Space and Trail corridor. In addition to the Open Space areas, approximately 4 additional acres are being depicted for Park type uses - Pocket Parks. In our discussions with the Town of Erie Park's department we understand that the Town does not desire a Town owned or maintained Neighborhood Park in this location.

Description of any Special Conditions, or other Restrictions

Final surface use agreements are in place with the various mineral owners, information has been included with this Preliminary Plat submittal. These agreements assures that there are no future drilling sites located within this community, and that the existing facilities that would impact residential uses will be removed.

Additionally, agreements are in place with the Lower Boulder Ditch, and the Boulder/Weld Drainage Ditch for the required crossings, and for the under grounding of a portion of the Erie/Coal Creek Cottonwood Extension.

Thank you for your consideration of the project and we look forward to reviewing the plans with the Town of Erie.

Sincerely,

ME Erie, LLC

LSC TRANSPORTATION CONSULTANTS, INC.

1889 York Street
Denver, CO 80206
(303) 333-1105
FAX (303) 333-1107
E-mail: lsc@lscdenver.com

September 26, 2025

Mr. Chris Elliott
E5X Management
7353 S. Alton Way, Suite A-100
Englewood, CO 80112

Re: Spring Hill Update
Erie, CO
LSC #180812

Dear Mr. Elliott:

In response to your request, LSC Transportation Consultants, Inc. has prepared this traffic impact analysis for the proposed Spring Hill development. As shown on Figure 1, the site is located west of WCR 3 and south of State Highway (SH) 52 in the Town of Erie. A copy of the approved Town of Erie Transportation Impact Analysis (TIA) Base Assumption Form for this project has been attached for reference.

REPORT CONTENTS

The report contains the following: the existing roadway and traffic conditions in the vicinity of the site including the lane geometries, traffic controls, posted speed limits, etc.; the existing weekday peak-hour traffic volumes; the existing daily traffic volumes in the area; the typical weekday site-generated traffic volume projections for the site; the assignment of the projected traffic volumes to the area roadways; the projected short-term and long-term background and resulting total traffic volumes on the area roadways; the site's projected traffic impacts; and any recommended roadway improvements to mitigate the site's traffic impacts.

LAND USE AND ACCESS

The site is currently undeveloped. It is proposed to include 412 single-family homes, 70 townhome dwelling units, 150 duplex dwelling units, and a 400-student elementary school. In the future the 9-acre parcel located just southwest of SH 52/WCR 3 is planned to be developed with up to 80,000 square feet of commercial space.

Full movement access is proposed directly to SH 52 aligning with the existing Erie North Water Reclamation Facility access. Two full movement access points are proposed from Weld County Road (WCR) 3 and cross access is proposed to the Morgan Hill residential development south of the site. An additional right-in/right-out access is proposed to WCR 3 just south of SH 52 for the future commercial parcel.

ROADWAY AND TRAFFIC CONDITIONS

Area Roadways

The major roadways in the site's vicinity are shown on Figure 1 and are described below.

- **State Highway (SH) 52** is an east-west, two-lane principal arterial roadway north of the site. It is classified as Regional Highway (R-A) by CDOT. The speed limit in the vicinity of the site is 55 mph. The long-term plan assumes four lanes in the future but CDOT has said they have no plans or funding for additional through lanes at this time. The 2030 analysis assumes two through lanes and the 2050 analysis assumes four through lanes.

- **E. County Line Road** is a north-south, two-lane minor arterial roadway west of the site. Its intersection with SH 52 is traffic signal controlled. The posted speed limit in the vicinity of the site is 50 mph.

- **WCR 3** is a north-south, two-lane minor arterial roadway east of the site. Its intersection with SH 52 is unsignalized but is planned to be reconstructed as a modern roundabout in the future through coordination with the Shores on Plum Creek in Frederick to the north. The posted speed limit in the vicinity of the site is 45 mph.

Existing Traffic Conditions

Figure 3 shows the existing lane geometries, traffic controls, and traffic volumes in the site's vicinity on a typical weekday. The weekday peak-hour traffic volumes and daily traffic counts are from the attached traffic counts conducted by Counter Measures in September and August 2025 except for the average daily traffic volume on SH 52 which is based on CDOT data.

2030 and 2050 Background Traffic

Figure 4 shows the estimated 2030 background traffic. The 2030 background traffic volumes are based an annual growth rate of about 2.7 percent as required by the Town in the approved base assumption form. The background volumes also assume additional traffic due to partial buildout of the Shores on Plum Creek development proposed north of SH 52.

Figure 5 shows the estimated 2050 background traffic. The 2050 background traffic volumes are based an annual growth rate of about 2.7 percent as required by the Town in the approved base assumption form. The background volumes also assume additional traffic due to full buildout of the Shores on Plum Creek development proposed north of SH 52.

Existing, 2030, and 2050 Background Levels of Service

Level of service (LOS) is a quantitative measure of the level of congestion or delay at an intersection. Level of service is indicated on a scale from "A" to "F." LOS A is indicative of little congestion or delay and LOS F is indicative of a high level of congestion or delay. Attached are specific level of service definitions for signalized and unsignalized intersections.

The intersections in Figures 3, 4, and 5 were analyzed to determine the existing, 2030 background, and 2050 background levels of service. Table 1 shows the level of service analysis results. The level of service reports are attached.

1. **SH 52/E. County Line Road:** This existing traffic signal controlled intersection currently operates at an overall LOS "D" during the morning and afternoon peak-hours. During the morning peak-hour the northbound left-turn lane currently operates at LOS "E" and the shared southbound through and right-turn lane currently operates at LOS "F". During the afternoon peak-hour the shared northbound through and right-turn lane currently operates at LOS "E". By 2030 this intersection is expected to operate an overall LOS "E" during the morning peak-hour and LOS "D" during the afternoon peak-hour. During the morning peak-hour the shared westbound through and right-turn lane, the northbound left-turn lane, and the shared southbound through and right-turn lane are projected to operate at LOS "F". During the afternoon peak-hour the shared eastbound through lane, the shared northbound through and right-turn lane, and the shared southbound through and right-turn lane are projected to operate at LOS "F". By 2050 it was assumed that SH 52 will be widened to provide two eastbound and westbound left-turn lanes and that right-turn lanes will be added on all approaches. Based on the projected 2050 background volumes and lane geometry shown in Figure 5 this intersection is expected to operate at an overall LOS "C" during the morning peak-hour and LOS "D" during the afternoon peak-hour.

2. **SH 52/Existing Erie North Water Reclamation Facility Access/Site Access:** The southbound approach at this unsignalized intersection currently operates at LOS "E" during the morning peak-hour and LOS "B" during the afternoon peak-hour. By 2030, the southbound approach is expected to continue to operate at LOS "E" during the morning peak-hour and operate at LOS "D" during the afternoon peak-hour. By 2050 the southbound approach is expected to operate at LOS "F" during the morning peak-hour and LOS "E" during the afternoon peak-hour.

3. **SH 52/WCR 3:** The northbound left-turn movement at this unsignalized intersection currently operates at LOS "F" during both morning and afternoon peak-hours. All other movements currently operate at LOS "C" or better during the peak-hours. This intersection is planned to be reconstructed as a two-lane modern roundabout. It is expected to operate at an overall LOS "A" during the peak-hours based on the 2030 background traffic volumes and an overall LOS "B" during the peak-hours based on the 2050 background traffic volumes.

4. **WCR 3/WCR 12:** All movements at this unsignalized intersection currently operate at LOS "B" or better during both morning and afternoon peak-hours and are expected to do so through 2050.

5. **WCR 3/Future Commercial Right-In/Right-Out Only Site Access:** This intersection was analyzed only in the total traffic scenarios.

6. **WCR 3/North Full-Movement Site Access:** This intersection was analyzed only in the total traffic scenarios.

7. **WCR 3/South Site Full-Movement Access:** This intersection was analyzed only in the total traffic scenarios.

TRIP GENERATION

Table 2 shows the estimated average weekday, morning peak-hour, and afternoon peak-hour trip generation for the proposed site based on the rates from *Trip Generation, 12th Edition, 2025* by the Institute of Transportation Engineers (ITE).

The residential portion of the site is projected to generate about 5,191 vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak-hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 104 vehicles would enter and about 289 vehicles would exit the site. During the afternoon peak-hour, which generally occurs for one hour between 4:00 and 6:00 p.m., about 302 vehicles would enter and about 194 vehicles would exit the site.

The elementary school portion of the site is projected to generate about 908 total vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak-hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 158 vehicles would enter and about 134 vehicles would exit the site. During the afternoon peak-hour, which generally occurs for one hour between 4:00 and 6:00 p.m., about 29 vehicles would enter and about 35 vehicles would exit the site. About 40 percent of the trips generated by the elementary school are estimated to be internal to the Spring Hill and/or Morgan Hill developments.

The future commercial portion of the site is projected to generate about 5,230 vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak-hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 79 vehicles would enter and about 48 vehicles would exit the site. During the afternoon peak-hour, which generally occurs for one hour between 4:00 and 6:00 p.m., about 187 vehicles would enter and about 194 vehicles would exit the site. Table 2 shows the number of commercial-related trips that are assumed to be internal to the Spring Hill development. The internal trips were estimated using the NCHRP 684 Internal Trip Capture Estimation Tool. Based on the Pass-By Data and Rate Tables/2025 Pass-By Tables for ITE TripGen Appendices about 40 percent of the total external trips were assumed to be passby trips.

At buildout the Spring Hill development is projected to generate about 7,959 new external vehicle-trips on the average weekday, with about half entering and half exiting the site.

TRIP DISTRIBUTION

Figure 6 shows the estimated directional distribution of the primary site-generated traffic volumes on the area roadways. The estimates were based on the location of the site with respect to the regional population, employment, and activity centers and the site's proposed land use and access plan.

TRIP ASSIGNMENT

Figure 7a shows the estimated residential site-generated traffic volumes for the site on the area roadways, which were determined by applying the residential directional distribution percentages (from Figure 6) to the external residential trip generation estimates (from Table 2).

Figure 7b shows the estimated primary commercial site-generated traffic volumes for the site on the area roadways, which were determined by applying the commercial directional distribution percentages (from Figure 6) to the new external commercial trip generation estimates (from Table 2).

Figure 7c shows the estimated passby commercial site-generated traffic volumes. The passby trips were assigned based on the existing traffic patterns adjacent to the site and assume about 90 percent of the passby trips are from SH 52 and 10 percent of the passby trips are from WCR 3.

Figure 7d shows the estimated school site-generated traffic volumes for the site on the area roadways, which were determined by applying the school directional distribution percentages (from Figure 6) to the external school trip generation estimates (from Table 2).

2030 AND 2050 TOTAL TRAFFIC

Figure 8 shows the estimated 2030 total traffic which is the sum of the 2030 background traffic volumes (from Figure 4), the residential site-generated traffic (from Figure 7a), and the school site-generated traffic (from Figure 7d). Figure 8 also shows the recommended 2030 lane geometry and traffic control.

Figure 9 shows the estimated 2050 total traffic which is the sum of the 2050 background traffic volumes (from Figure 5), the residential site-generated traffic (from Figure 7a), the primary commercial site-generated traffic (from Figure 7b), the passby generated traffic (from Figure 7c), and the school site-generated traffic (from Figure 7d). Figure 9 also shows the recommended 2050 lane geometry and traffic control.

PROJECTED LEVELS OF SERVICE

The intersections in Figures 8 and 9 were analyzed to determine the 2030 and 2050 total levels of service. Table 1 shows the level of service analysis results. The level of service reports are attached.

1. **SH 52/E. County Line Road:** Based on the 2030 total traffic volumes shown in Figure 8 this intersection is expected to operate an overall LOS “F” during the morning peak-hour and LOS “E” during the afternoon peak-hour assuming no improvements. By 2050 it was assumed that SH 52 will be widened to provide two eastbound and westbound left-turn lanes and that right-turn lanes will be added on all approaches. Based on the projected 2050 total volumes and lane geometry shown in Figure 9 this intersection is expected to operate at an overall LOS “C” during the morning peak-hour and LOS “D” during the afternoon peak-hour.

2. **SH 52/Existing Erie North Water Reclamation Facility Access/Site Access:** The northbound and southbound approaches at this intersection are expected to operate at LOS "F" during the morning and afternoon peak-hours if it remains stop-sign controlled. If it is converted to traffic signal control it is expected to operate at an overall LOS "A" during the peak-hours through 2050.

3. **SH 52/WCR 3:** This intersection is planned to be reconstructed as a two-land modern roundabout. It is expected to operate at an overall LOS "A" during the peak-hours based on the 2030 total traffic volumes and an overall LOS "C" during the peak-hours based on the 2050 total traffic volumes.

4. **WCR 3/WCR 12:** All movements at this unsignalized intersection are expected to operate at LOS "C" or better during both morning and afternoon peak-hours through 2050.

5. **WCR 3/Future Commercial Right-In/Right-Out Only Site Access:** All movements at this future unsignalized intersection are expected to operate at LOS "B" or better during both morning and afternoon peak-hours through 2050.

6. **WCR 3/North Full Movement Site Access:** All movements at this future unsignalized intersection are expected to operate at LOS "C" or better during both morning and afternoon peak-hours through 2050.

7. **WCR 3/South Site Full Movement Access:** All movements at this future unsignalized intersection are expected to operate at LOS "C" or better during both morning and afternoon peak-hours through 2050.

TRAFFIC SIGNAL WARRANT ANALYSIS

The proposed full movement site access to SH 52 (#2) and the proposed north full movement site access to WCR 3 (#6) were analyzed to determine if the projected morning and afternoon peak-hour volumes would meet the thresholds criteria for Eight-Hour, Four-Hour, and/or Peak-hour Vehicular Volume Traffic Signal Warrants in the *2023 Manual on Uniform Traffic Control Devices, 11th Edition* (MUTCD). The signal warrant analysis was based on the 2030 and 2050 total traffic peak-hour traffic volumes. Off-peak-hour volumes were estimated by LSC based on the peak-hour volume and on 24-hour counts conducted by CDOT on SH 52 east of SH 287 and the ITE Vehicle Time of Day Distribution Data.

SH 52/Existing Erie North Water Reclamation Facility Access/Site Access (#2)

As shown on Table 3 the intersection of SH 52/Existing Erie North Water Reclamation Facility Access/Site Access (#2) is estimated to meet the thresholds for the Eight-Hour Vehicular Volume Traffic Signal Warrants based on Condition B-The Interruption of Continuous Traffic with the 70% factor applied for a posted speed limit above 40 mph for only two hours of the day. None of the hours analyzed are anticipated to meet the thresholds for Condition A-Minimum Vehicular Volume or the thresholds for a combination of Condition A and Condition B. In order for this warrant to be met another six hours of the day would need to meet the Eight-Hour threshold for Condition B or eight hours of the day would need to meet the 56% threshold for Condition A.

As shown on Table 3 only two hours of the day are estimated to meet the thresholds for both the Four-Hour Vehicular Volume Traffic Signal Warrants. In order for this warrant to be met another two hours of the day would need to meet the Four-Hour threshold.

Based on the 2030 and 2050 total traffic volumes one hour of the day is expected to meet the criteria for the Peak-Hour Traffic Signal, however, this warrant should only be applied in unusual cases such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

WCR 3/North Full-Movement Site Access (#6)

As shown on Table 4 none of the vehicular volume warrants are expected to be met at the intersection of WCR 3/North Full Movement Site Access (#6) based on the 2030 total traffic volumes which assume only the residential and the school sites within Spring Hill have been developed. All three vehicular volume traffic signal warrants are expected to be met based on the 2050 total traffic volumes which assume the commercial parcel has been fully developed. Although multiple traffic signal warrants are expected to be met at this intersection it is expected to operate at a satisfactory level of service as a two-way, stop-sign controlled intersection through 2050.

95th PERCENTILE QUEUE LENGTH

The estimated 2030 and 2050 95th percentile queue lengths for the intersections in the study area are shown in Table 5. Table 5 also shows the recommended turn lane lengths based on the CDOT *State Highway Access Code* and Town of Erie standards.

RECOMMENDED IMPROVEMENTS

Table 6 summarizes the recommended improvements in both 2030 and 2050.

CONCLUSIONS AND RECOMMENDATIONS

Trip Generation

1. The residential portion of the site is projected to generate about 5,191 total vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak-hour, about 104 vehicles would enter and about 289 vehicles would exit the site. During the afternoon peak-hour, about 302 vehicles would enter and about 194 vehicles would exit the site. A portion of these trips were assumed to be internal to the site. The internal residential trips were balanced with the estimated internal trips to and from the school site and the future commercial site.

2. The elementary school portion of the site is projected to generate about 908 total vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak-hour, about 158 vehicles would enter and about 134 vehicles would exit the site. During the afternoon peak-hour, about 29 vehicles would enter and about 35 vehicles would exit the site. About 40 percent of the trips generated by

the elementary school are estimated to be internal to the Spring Hill and/or Morgan Hill developments.

3. The future commercial portion of the site is projected to generate about 5,230 vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak-hour about 79 vehicles would enter and about 48 vehicles would exit the site. During the afternoon peak-hour about 187 vehicles would enter and about 194 vehicles would exit the site. Table 2 shows the number of commercial related trips that are assumed to be internal to the Spring Hill development. The internal trips were estimated using the NCHRP 684 Internal Trip Capture Estimation Tool. Based on the Pass-By Data and Rate Tables/2025 Pass-By Tables for ITE TripGen Appendices about 40 percent of the total external trips were assumed to be passby trips.

Projected Levels of Service

4. The intersection of SH 52/County Line Road (#1) is expected to operate an overall LOS "F" during the morning peak-hour and LOS "E" during the afternoon peak-hour assuming no improvements. By 2050 it was assumed that SH 52 will be widened to provide two east-bound and westbound left-turn lanes and that right-turn lanes will be added on all approaches. Based on the projected 2050 total volumes and lane geometry shown in Figure 9 this intersection is expected to operate at an overall LOS "C" during the morning peak-hour and LOS "D" during the afternoon peak-hour.

5. The northbound and southbound approaches at the SH 52/Existing Erie North Water Reclamation Facility Access/Site Access (#2) are expected to operate at LOS "F" during the morning and afternoon peak-hours if it remains stop-sign controlled. If it is converted to traffic signal control it is expected to operate at an overall LOS "A" during the peak-hours through 2050, however, this intersection is not expected to meet any of the vehicular volume traffic signal warrants.

6. The intersection of SH 52/WCR 3 is planned to be reconstructed as a two-lane modern roundabout. It is expected to operate at an overall LOS "C" or better during the peak-hours through 2050.

7. The intersection of WCR 3/WCR 12 is projected to continue to operate at a satisfactory level of service (LOS "C" or better) during the peak-hours through 2050 as a two-way-stop sign controlled intersection.

8. The proposed site access points to WCR 3 are all expected to operate at acceptable levels of service (LOS "C" or better) during the peak-hours through 2050 as two-way-stop sign controlled intersections. The north full movement site access point is expected to meet multiple traffic signal warrants by 2050, however, the satisfaction of warrants does not indicate that a traffic signal must be installed. The decision to require a traffic signal to be installed rests with the Town of Erie.

Recommended Improvements

9. The recommended improvements are shown in Figures 8 and 9 and detailed in Tables 5 and 6.

* * * * *

We trust our findings will assist you in gaining approval of the proposed Spring Hill development. Please contact me if you have any questions or need further assistance.

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.



By_____
Christopher S. McGranahan, P.E.
Principal/President

CSM/wc

Enclosures: Tables 1 - 6
Figures 1 - 9
Approved Base Assumptions form
Traffic Count Reports
Level of Service Definitions
Level of Service Reports
Queuing Reports

G:\Shared drives\Denver Projects 2011-2020\2018\180812-SpringHillUpdate\Report\SpringHillUpdate-092625.wpd

Table 1 (Page 1 of 2)
Intersection Levels of Service Analysis
Spring Hill Update
Erie, CO
LSC #180812; September, 2025

Intersection No. & Location	Traffic Control	Existing Traffic Level of Service AM	Existing Traffic Level of Service PM	2030 Background Level of Service AM	2030 Background Level of Service PM	2030 Total Level of Service AM	2030 Total Level of Service PM	2050 Background Level of Service AM	2050 Background Level of Service PM	2050 Total Level of Service AM	2050 Total Level of Service PM
1) SH 52/E. County Line Road	Signalized										
EB Left		C	B	C	B	C	C	C	B	C	B
EB Through		B	D	B	F	B	F	B	D	B	D
EB Right		B	B	B	B	B	B	B	B	B	B
WB Left		A	C	B	D	B	D	B	D	B	E
WB Through/Right or Through		D	C	F	C	F	C	C	C	D	C
WB Right		--	--	--	--	--	--	B	B	B	B
NB Left		E	C	F	D	F	D	D	D	D	D
NB Through/Right or Through		D	E	D	F	D	F	D	E	D	E
NB Right		--	--	--	--	--	--	C	D	D	D
SB Left		D	D	D	F	D	F	D	F	D	F
SB Through/Right or Through		F	D	F	D	F	D	D	D	D	D
SB Right		--	--	--	--	--	--	D	C	D	D
Entire Intersection Delay (sec /veh)		51.9	38.4	70.6	51.1	90.4	62.5	30.0	41.3	32.6	50.8
Entire Intersection LOS		D	D	E	D	F	E	C	D	C	D
2) SH 52/Site Access/ Erie North Water Reclamation Facility Access	TWSC										
NB Approach		--	--	--	--	F	F	--	--	--	--
EB Left/Through or Left		A	A	B	A	B	A	C	B	--	--
WB Left		--	--	--	--	A	B	--	--	--	--
SB Approach		E	B	E	D	F	F	F	E	--	--
Critical Movement Delay		37.4	13.3	37.4	31.5	>240	>240	71.7	42.5	--	--
	Signalized										
EB Left		--	--	--	--	--	--	--	--	A	A
EB Through		--	--	--	--	--	--	--	--	A	A
EB Right		--	--	--	--	--	--	--	--	A	A
WB Left		--	--	--	--	--	--	--	--	A	A
WB Through/Right		--	--	--	--	--	--	--	--	A	A
NB Approach		--	--	--	--	--	--	--	--	C	C
SB Approach		--	--	--	--	--	--	--	--	C	C
Entire Intersection Delay (sec /veh)		--	--	--	--	--	--	--	--	4.8	4.4
Entire Intersection LOS		--	--	--	--	--	--	--	--	A	A

Table 1 (Page 2 of 2)
Intersection Levels of Service Analysis
Spring Hill Update
Erie, CO
LSC #180812; September, 2025

Intersection No. & Location	Traffic Control	Existing Traffic Level of Service AM	Existing Traffic Level of Service PM	2030 Background Level of Service AM	2030 Background Level of Service PM	2030 Total Level of Service AM	2030 Total Level of Service PM	2050 Background Level of Service AM	2050 Background Level of Service PM	2050 Total Level of Service AM	2050 Total Level of Service PM
3) SH 52/CR 3	TWSC										
NB Left		F	F	--	--	--	--	--	--	--	--
NB Right		B	C	--	--	--	--	--	--	--	--
WB Left/Through		A	B	--	--	--	--	--	--	--	--
Critical Movement Delay		108.3	100.0	--	--	--	--	--	--	--	--
	Roundabout										
EB Approach		--	--	A	A	A	B	A	C	B	D
WB Approach		--	--	A	A	A	A	C	B	D	C
NB Approach		--	--	A	B	A	B	A	B	A	C
SB Approach		--	--	B	A	B	A	C	A	C	B
Entire Intersection Delay (sec /veh)		--	--	7.8	8.1	8.8	10.0	13.9	14.1	18.6	24.5
Entire Intersection LOS		--	--	A	A	A	A	B	B	C	C
4) CR 3/CR 12	TWSC										
NB Approach or Left		A	A	A	A	A	A	A	A	A	A
EB Approach		B	B	B	B	B	B	B	B	B	B
WB Approach		B	B	B	B	B	B	B	B	C	C
SB Approach or Left		A	A	A	A	A	A	A	A	A	A
Critical Movement Delay		11.0	10.6	11.1	11.1	14.1	12.5	13.3	13.1	18.6	15.4
5) CR 3/Commercial RIRO Access	TWSC										
EB Right		--	--	--	--	--	--	--	--	B	B
Critical Movement Delay		--	--	--	--	--	--	--	--	10.2	10.4
6) CR 3/North Full Movement Site Access	TWSC										
NB Left		--	--	--	--	A	A	--	--	A	A
EB Left		--	--	--	--	B	B	--	--	C	C
EB Right		--	--	--	--	A	A	--	--	B	B
Critical Movement Delay		--	--	--	--	12.4	12.4	--	--	16.1	23.1
7) CR 3/South Full Movement Site Access	TWSC										
NB Left		--	--	--	--	A	A	--	--	A	A
EB Left		--	--	--	--	B	B	--	--	C	C
EB Right		--	--	--	--	B	A	--	--	B	A
Critical Movement Delay		--	--	--	--	14.5	13.6	--	--	17.5	16.7

Table 2
ESTIMATED TRAFFIC GENERATION
Spring Hill Update
Erie, CO
LSC #180812; September, 2025

		Trip Generation Rates [1]					Vehicle-Trips Generated				
		Average	AM Peak-Hour		PM Peak-Hour		Average	AM Peak-Hour		PM Peak-Hour	
Trip Generating Category	Quantity	Weekday	In	Out	In	Out	Weekday	In	Out	In	Out
CURRENTLY PROPOSED RESIDENTIAL LAND USE											
Single Family Housing [2]	412 DU [3]	9.09	0.189	0.511	0.577	0.353	3,745	78	211	238	146
Duplexes [4]	150 DU	6.57	0.118	0.352	0.291	0.219	986	18	53	44	33
Townhomes [4]	70 DU	6.57	0.118	0.352	0.291	0.219	460	8	25	20	15
				Total Residential Trips =			**5,191**	**104**	**289**	**302**	**194**
CURRENTLY PROPOSED SCHOOL LAND USE											
Elementary School [5]	400 Students	2.27	0.394	0.336	0.074	0.086	908	158	134	29	35
				School Related Internal Trips [6]: school to residential uses=			363	63	54	12	14
				resdential to school uses =			363	54	63	14	12
				External School Trips (Total School Trips - School to Residential Internal Trips)			**545**	**95**	**80**	**17**	**21**
CURRENTLY PROPOSED COMMERCIAL LAND USE											
Commercial [7]	80.0 KSF [8]	65.38	0.986	0.604	2.332	2.428	5,230	79	48	187	194
				Commercial Related Internal Trips [9]: commercial to residential uses =			345	3	2	12	42
				residential to commercial uses =			345	2	3	42	12
				External Commercial Trips (Total Commercial Trips - Commercial to Residential Internal Trips)=			**4,885**	**76**	**46**	**175**	**152**
				Passby Trips [10] =			1,954	24	24	65	65
				Primary Commercial Trips (External Commercial Trips - Passby Trips)=			**2,931**	**52**	**22**	**110**	**87**
				Total Trips (Residential + School + Commercial) =			**11,329**	**341**	**471**	**518**	**423**
				Total Internal Trips =			**1,416**	**122**	**122**	**80**	**80**
				Total Passby Trips =			**1,954**	**24**	**24**	**65**	**65**
				Total New External Trips (Total Trips - Internal Trips - Passby Trips) =			**7,959**	**195**	**325**	**373**	**278**

Notes:
(1) Source: *Trip Generation*, Institute of Transportation Engineers, 12th Edition, 2025
(2) ITE Land Use No. 210 - Single-Family Detached Housing
(3) DU = dwelling units
(4) ITE Land Use No. 215 - Single-Family Attached Housing
(5) ITE Land Use No. 520 - Elementary School
(6) Assumes 40% of school trips are internal to the site. The internal school trips were then balanced with the internal residential trips
(7) ITE Land Use No. 821 - Shopping Center (40-150k)
(8) KSF = 1,000 square feet
(9) See NCHRP 684 Internal Trip Capture Estimation Tool
(10) 40% of the external commercial trips were assumed to be pass-by trips based on the Pass-By Data and Rate Tables/2025 Pass-By Tables for ITE TripGen Appe

Table 3
Intersection #2 - SH 52/Site Access/Erie North Water Reclamation Facility Access
Spring Hill
Erie, CO
LSC #180812; September, 2025

Warrant Analysis[1]

	Traffic Volume (vph)[2]			Warrant 1: Eight Hour Vehicular Volume Evaluation												Warrant 2: Four Hour Vehicular Volume Evaluation			Warrant 3: Peak Hour Vehicular Volume Evaluation		
				Warrant Thresholds						Warrant Threshold Met?											
				Condition A (70%)		Condition B (70%)		Combination of A & B		Minor 1 Leg			Minor 2 Leg			70% Warrant Threshold Minor Minimum	Warrant Threshold Met?		70% Warrant Threshold Minor Minimum	Warrant Threshold Met?	
	Major[3]	Minor 1[4]	Minor 2[4]	Major	Minor	Major	Minor	Major	Minor	A	B	A & B[5]	A	B	A & B[5]		Minor 1 Leg	Minor 2 Leg		Minor 1 Leg	Minor 2 Leg
2030 Total Traffic																					
12-1 AM	44	3	0	420	105	630	53	504	42	No	No	No	No	No	No	Low Vol	No	No	Low Vol	No	No
1-2 AM	55	1	0	420	105	630	53	504	42	No	No	No	No	No	No	Low Vol	No	No	Low Vol	No	No
2-3 AM	41	1	0	420	105	630	53	504	42	No	No	No	No	No	No	Low Vol	No	No	Low Vol	No	No
3-4 AM	68	3	0	420	105	630	53	504	42	No	No	No	No	No	No	Low Vol	No	No	Low Vol	No	No
4-5 AM	284	9	0	420	105	630	53	504	42	No	No	No	No	No	No	273	No	No	Low Vol	No	No
5-6 AM	863	19	0	420	105	630	53	504	42	No	No	No	No	No	No	71	No	No	147	No	No
6-7 AM	1498	45	2	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
7-8 AM	1967	75	2	420	105	630	53	504	42	No	Yes	Yes	No	No	No	60	Yes	No	75	Yes	No
8-9 AM	1887	63	2	420	105	630	53	504	42	No	Yes	Yes	No	No	No	60	Yes	No	75	No	No
9-10 AM	1426	48	2	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
10-11 AM	1522	46	2	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
11-12 PM	1584	43	2	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
12-1 PM	1713	39	3	420	105	630	53	504	42	No	No	No	No	No	No	60	No	No	75	No	No
1-2 PM	1490	39	3	420	105	630	53	504	42	No	No	No	No	No	No	60	No	No	75	No	No
2-3 PM	1828	43	3	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
3-4 PM	2039	47	3	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
4-5 PM	2117	51	3	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
5-6 PM	1821	44	3	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
6-7 PM	813	40	3	420	105	630	53	504	42	No	No	No	No	No	No	78	No	No	157	No	No
7-8 PM	490	30	2	420	105	630	53	504	42	No	No	No	No	No	No	170	No	No	286	No	No
8-9 PM	374	22	1	420	105	630	53	504	42	No	No	No	No	No	No	228	No	No	356	No	No
9-10 PM	264	17	1	420	105	630	53	504	42	No	No	No	No	No	No	283	No	No	Low Vol	No	No
10-11 PM	155	9	0	420	105	630	53	504	42	No	No	No	No	No	No	Low Vol	No	No	Low Vol	No	No
11-12 AM	99	5	0	420	105	630	53	504	42	No	No	No	No	No	No	Low Vol	No	No	Low Vol	No	No
Numbers of hours the thresholds are are met										**0**	**2**	**10**	**0**	**0**	**0**		**2**	**0**		**1**	**0**
Warrant met?										**YES[5]**							**No**			**Yes**	
2050 Total Traffic																					
12-1 AM	64	3	0	420	105	630	53	504	42	No	No	No	No	No	No	Low Vol	No	No	Low Vol	No	No
1-2 AM	82	1	0	420	105	630	53	504	42	No	No	No	No	No	No	Low Vol	No	No	Low Vol	No	No
2-3 AM	59	1	0	420	105	630	53	504	42	No	No	No	No	No	No	Low Vol	No	No	Low Vol	No	No
3-4 AM	100	3	0	420	105	630	53	504	42	No	No	No	No	No	No	Low Vol	No	No	Low Vol	No	No
4-5 AM	420	9	0	420	105	630	53	504	42	No	No	No	No	No	No	205	No	No	328	No	No
5-6 AM	1282	19	0	420	105	630	53	504	42	No	No	No	No	No	No	60	No	No	76	No	No
6-7 AM	2223	45	2	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
7-8 AM	2920	75	2	420	105	630	53	504	42	No	Yes	Yes	No	No	No	60	Yes	No	75	Yes	No
8-9 AM	2800	63	2	420	105	630	53	504	42	No	Yes	Yes	No	No	No	60	Yes	No	75	No	No
9-10 AM	2114	48	2	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
10-11 AM	2259	46	2	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
11-12 PM	2349	43	2	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
1-2 PM	2586	39	3	420	105	630	53	504	42	No	No	No	No	No	No	60	No	No	75	No	No
2-3 PM	2245	39	3	420	105	630	53	504	42	No	No	No	No	No	No	60	No	No	75	No	No
3-4 PM	2752	43	3	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
4-5 PM	3065	47	3	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
5-6 PM	3176	51	3	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
6-7 PM	2728	44	3	420	105	630	53	504	42	No	No	Yes	No	No	No	60	No	No	75	No	No
7-8 PM	1204	40	3	420	105	630	53	504	42	No	No	No	No	No	No	60	No	No	80	No	No
8-9 PM	721	30	2	420	105	630	53	504	42	No	No	No	No	No	No	96	No	No	192	No	No
9-10 PM	548	22	1	420	105	630	53	504	42	No	No	No	No	No	No	148	No	No	263	No	No
10-11 PM	387	17	1	420	105	630	53	504	42	No	No	No	No	No	No	222	No	No	348	No	No
11-12 AM	227	9	0	420	105	630	53	504	42	No	No	No	No	No	No	302	No	No	Low Vol	No	No
Numbers of hours the thresholds are are met										**0**	**2**	**10**	**0**	**0**			**2**	**0**		**1**	**0**
Warrant met?										**YES[5]**							**No**			**Yes**	

Notes:
(1) Thresholds are based on 2 or more lanes on the major approach and one lane on the minor approach with the 70% factor applied for a posted speed limit above 40 mph
(2) Off peak hour traffic volumes are estimates by LSC based on 24-hour count data by CDOT on SH 52 east of SH 287 and ITE Vehicle Time of Day Distribution Data
(3) The major street traffic includes all movements (left, through, and right)
(4) The minor street traffic includes all of left, through, and right-turn volumes from the minor street
(5) A combination of A and B may be used after adequate trail of other remedial measures when the major street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Source: LSC Transportation Consultants, Inc.

Table 4
Intersection #6 - WCR 3/North Full-Movement Site Access
Spring Hill
Erie, CO
LSC #180812; September, 2025

Warrant Analysis[1]

	Traffic Volume (vph)[2]		Warrant 1: Eight Hour Vehicular Volume Evaluation															Warrant 2: Four Hour Vehicular Volume		Warrant 3: Peak Hour Vehicular Volume	
			Warrant Thresholds								Warrant Threshold Met?										
			Condition A (70%)		Condition B (70%)		Combination of A & B Condition A (56%)		Combination of A & B Condition B (56%)		Minor Leg					70% Warrant Threshold Minor Minimum	Warrant Threshold Met?	70% Warrant Threshold Minor Minimum	Warrant Threshold Met?
	Major[3]	Minor[4]	Major	Minor	Major	Minor	Major	Minor	Major	Minor	A (70%)	B (70%)	A (56%)	B (56%)	A (56%) & B (56%)[5]		Minor Leg		Minor Leg
2030 Total Traffic																			
12-1 AM	97	64	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
1-2 AM	54	3	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
2-3 AM	53	1	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
3-4 AM	74	1	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
4-5 AM	112	2	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
5-6 AM	129	8	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
6-7 AM	161	17	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
7-8 AM	443	39	420	105	630	53	336	84	504	42	No	No	No	No	No	194	No	314	No
8-9 AM	560	64	420	105	630	53	336	84	504	42	No	No	No	Yes	No	144	No	259	No
9-10 AM	521	54	420	105	630	53	336	84	504	42	No	No	No	Yes	No	158	No	273	No
10-11 AM	484	40	420	105	630	53	336	84	504	42	No	No	No	No	No	173	No	290	No
11-12 PM	444	39	420	105	630	53	336	84	504	42	No	No	No	No	No	193	No	314	No
12-1 PM	337	42	420	105	630	53	336	84	504	42	No	No	No	No	No	247	No	378	No
1-2 PM	371	32	420	105	630	53	336	84	504	42	No	No	No	No	No	230	No	357	No
2-3 PM	410	32	420	105	630	53	336	84	504	42	No	No	No	No	No	210	No	334	No
3-4 PM	410	35	420	105	630	53	336	84	504	42	No	No	No	No	No	210	No	334	No
4-5 PM	495	39	420	105	630	53	336	84	504	42	No	No	No	No	No	168	No	283	No
5-6 PM	561	42	420	105	630	53	336	84	504	42	No	No	No	No	No	144	No	259	No
6-7 PM	549	36	420	105	630	53	336	84	504	42	No	No	No	No	No	148	No	263	No
7-8 PM	419	33	420	105	630	53	336	84	504	42	No	No	No	No	No	206	No	329	No
8-9 PM	300	25	420	105	630	53	336	84	504	42	No	No	No	No	No	265	No	400	No
9-10 PM	217	18	420	105	630	53	336	84	504	42	No	No	No	No	No	307	No	Low Vol	No
10-11 PM	167	14	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
11-12 AM	92	7	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
			Numbers of hours the thresholds are are met								**0**	**0**			**0**		**0**		**0**
											Warrant met?						**No**		**Yes**
2050 Total Traffic																			
12-1 AM	124	105	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
1-2 AM	69	6	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
2-3 AM	69	3	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
3-4 AM	96	3	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
4-5 AM	144	4	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
5-6 AM	170	10	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
6-7 AM	212	34	420	105	630	53	336	84	504	42	No	No	No	No	No	309	No	Low Vol	No
7-8 AM	588	55	420	105	630	53	336	84	504	42	No	No	No	Yes	No	134	No	249	No
8-9 AM	737	105	420	105	630	53	336	84	504	42	No	Yes	Yes	Yes	Yes	93	Yes	185	No
9-10 AM	703	115	420	105	630	53	336	84	504	42	Yes	Yes	Yes	Yes	Yes	99	Yes	199	No
10-11 AM	669	146	420	105	630	53	336	84	504	42	Yes	Yes	Yes	Yes	Yes	109	Yes	214	No
11-12 PM	623	214	420	105	630	53	336	84	504	42	Yes	No	Yes	Yes	Yes	123	Yes	235	No
12-1 PM	483	174	420	105	630	53	336	84	504	42	Yes	No	Yes	No	No	174	Yes	290	No
1-2 PM	525	169	420	105	630	53	336	84	504	42	Yes	No	Yes	Yes	Yes	156	Yes	271	No
2-3 PM	572	170	420	105	630	53	336	84	504	42	Yes	No	Yes	Yes	Yes	140	Yes	255	No
3-4 PM	569	167	420	105	630	53	336	84	504	42	Yes	No	Yes	Yes	Yes	141	Yes	256	No
4-5 PM	681	167	420	105	630	53	336	84	504	42	Yes	Yes	Yes	Yes	Yes	106	Yes	209	No
5-6 PM	776	174	420	105	630	53	336	84	504	42	Yes	Yes	Yes	Yes	Yes	85	Yes	170	Yes
6-7 PM	759	169	420	105	630	53	336	84	504	42	Yes	Yes	Yes	Yes	Yes	88	Yes	176	No
7-8 PM	581	150	420	105	630	53	336	84	504	42	Yes	No	Yes	Yes	Yes	137	Yes	252	No
8-9 PM	412	129	420	105	630	53	336	84	504	42	No	No	Yes	No	No	209	No	333	No
9-10 PM	295	111	420	105	630	53	336	84	504	42	No	No	No	No	No	268	No	Low Vol	No
10-11 PM	235	81	420	105	630	53	336	84	504	42	No	No	No	No	No	298	No	Low Vol	No
11-12 AM	129	68	420	105	630	53	336	84	504	42	No	No	No	No	No	Low Vol	No	Low Vol	No
			Numbers of hours the thresholds are are met								**11**	**6**	**13**	**12**	**11**		**12**		**1**
											Warrant met?						**Yes**		**Yes**

Notes:
(1) Thresholds are based on 2 or more lanes on the major approach and one lane on the minor approach with the 70% factor applied for a posted speed limit above 40 mph
(2) Off peak hour traffic volumes are estimates by LSC based on 24-hour count data by LSC on WCR 3 and ITE Vehicle Time of Day Distribution Data
(3) The major street traffic includes all movements (left, through, and right)
(4) The minor street traffic includes only the left-turn volumes from the minor street
(5) A combination of A and B may be used after adequate trail of other alternatives that could cause less delay and inconvenicnes to traffic has failed to solve the traffic problem.

Source: LSC Transportation Consultants, Inc.

Table 5
95th Percentile Queue Lengths
Spring Hill Update
Erie, CO
LSC #180812; September, 2025

Intersection No. & Location	Posted Speed Limit (mph)	Existing Lane Lengths (feet)	Recommended Lane Lengths (feet)	95th Percentile Queue Length 2030 Total AM Peak (feet)	95th Percentile Queue Length 2030 Total PM Peak (feet)	95th Percentile Queue Length 2050 Total AM Peak (feet)	95th Percentile Queue Length 2050 Total PM Peak (feet)
1) SH 52/E. County Line Road							
EB Left	55	360	503	25	46	40	73
EB Through	55	- - -	- - -	422	1188	298	793
EB Right	55	460	378	0	0	2	22
WB Left	55	530	563	42	108	66	235
WB Through/Right or Through	55	- - -	- - -	1492	630	833	317
WB Right	55	- - -	378	--	--	42	41
NB Left	50	115	490	152	101	163	131
NB Through/Right or Through	50	- - -	- - -	248	512	254	553
NB Right	50	- - -	320	--	--	33	61
SB Left	50	90	526	119	204	177	325
SB Through/Right or Through	50	- - -	- - -	417	262	224	303
SB Right	50	- - -	320	--	--	220	19
2) SH 52/Site Access/Existing Access							
EB Left	55	- - -	408	--	--	1	1
EB Through	55	- - -	- - -	--	--	137	287
EB Right	55	- - -	378	--	--	6	8
WB Left	55	- - -	408	--	--	4	10
WB Through/Right	55	- - -	- - -	--	--	324	155
NB Approach	30	- - -	- - -	--	--	75	53
SB Approach	30	- - -	- - -	--	--	0	1

Table 6
Recommended Improvements
Spring Hill Update
Erie, CO
LSC #180812; September, 2025

Inter-section No.	Intersection Location	Recommended Improvements by 2030 (1)	Responsibility	Recommended Improvements by 2050 (1)	Responsibility
SH 52				Widen to provide 2 through lanes in each direction	Others
1	SH 52/ E. County Line Road			EB LT - extend existing lane to 503 feet and a 222 foot transition taper	Others
				WB LT - extend existing lane to 563 feet and a 222 foot transition taper	Others
				WB RT - construct lane - 1 @ 378 feet and 222-foot transition taper	Others
				NB LT - extend existing lane to 490 feet and a 180 foot transition taper	Others
				NB RT - construct lane - 1 @ 320 feet and 180-foot transition taper	Others
				SB LT - extend existing lane to 526 feet and a 180 foot transition taper	Others
				SB RT - construct lane - 1 @ 320 feet and 180-foot transition taper	Others
2	SH 52/ Erie North Water Reclamation Facility Access/ Full-Movement Site Access	EB LT - construct lane - 1 @ 408 feet and 222-foot transition taper	Applicant	Traffic signalization if/when warranted	Applicant
		EB RT - construct lane - 1 @ 378 feet and 222-foot transition taper	Applicant		
		WB LT - construct lane - 1 @ 408 feet and 222-foot transition taper	Applicant		
3	SH 52/WCR 3	Reconstruct as 2-lane modern roundabout	Applicant/Others	Potentially expand roundabout to provide slip lanes	Applicant/Others
4	WCR 3/WCR 12			NB LT - construct lane - 1 @ 100 feet and 144-foot transition taper	Applicant/Others
				NB RT - construct lane - 1 @ 100 feet and 144-foot transition taper	Others
				SB LT - construct lane - 1 @ 100 feet and 144-foot transition taper	Applicant/Others
5	WCR 3/Future Commercial Right-in/Right-out Access			SB RT - construct lane - 1 @ 100 feet and 144-foot transition taper	Applicant
6	WCR 3/North Full-Movement Site Access	EB RT - construct lane - 1 @ 50 feet and 120-foot transition taper	Applicant		
		NB LT - construct lane - 1 @ 100 feet and 144-foot transition taper	Applicant		
		SB RT - construct lane - 1 @ 100 feet and 144-foot transition taper	Applicant		
7	WCR 3/South Full-Movement Site Access	EB RT - construct lane - 1 @ 50 feet and 120-foot transition taper	Applicant		
		NB LT - construct lane - 1 @ 100 feet and 144-foot transition taper	Applicant		
		SB RT - construct lane - 1 @ 100 feet and 144-foot transition taper	Applicant		

(1) A transition taper of 18.5:1 was used for SH 52 based on a posted speed limit of 55 mph. An appropriate redirect taper for 55 mph is 55:1
A transition taper of 15:1 was used for E. County Line Road based on a posted speed limit of 50 mph. An appropriate redirect taper for 50 mph is 50:1
A transition taper of 13.5:1 was used for WCR 3 and WCR 12 based on a posted speed limit of 45 mph. An appropriate redirect taper for 45 mph is 45:1
A transition taper of 10:1 was used for all collector roadways based on a posted speed of 35 mph. An appropriate redirect taper for 35 mph is 20:1



Figure 1

Vicinity Map

Spring Hill Update (LSC #180812)

LSC TRANSPORTATION CONSULTANTS, INC.

Approximate Scale
Scale: NTS

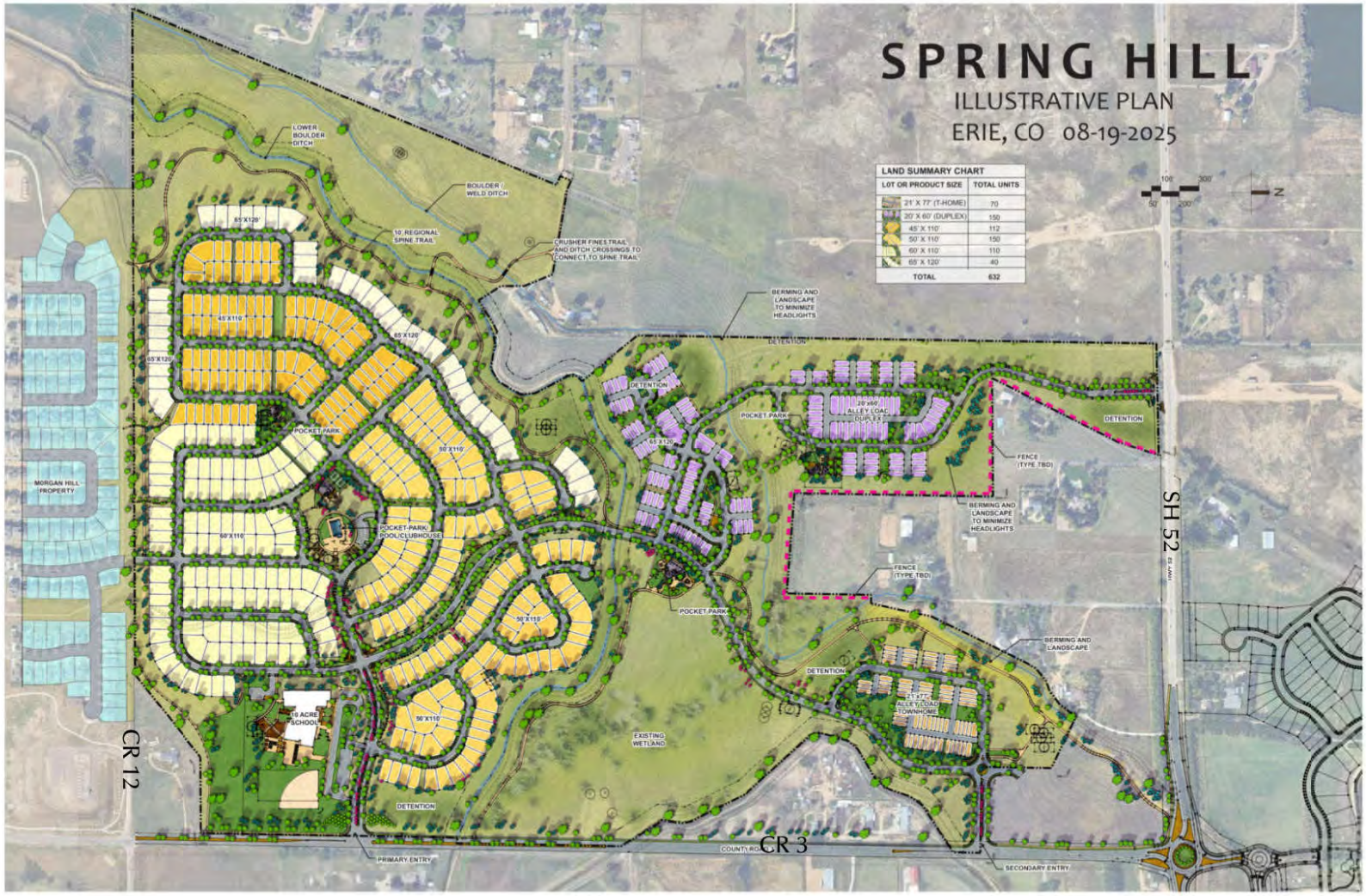
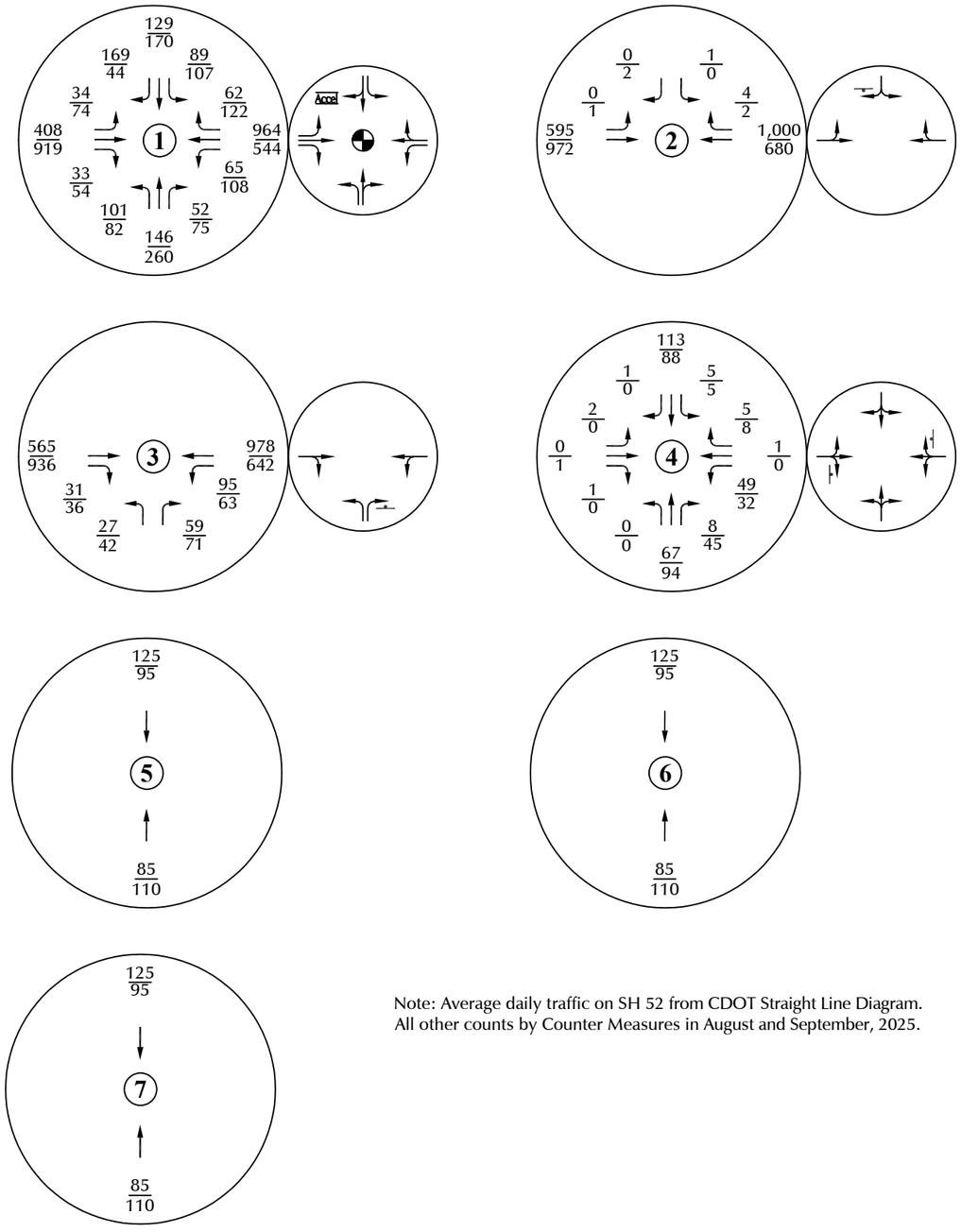


Figure 2

Site Plan

Spring Hill Update (LSC #180812)



Note: Average daily traffic on SH 52 from CDOT Straight Line Diagram.
All other counts by Counter Measures in August and September, 2025.

LEGEND:
= Stop Sign
= Traffic Signal
= Speed Limit
26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic
1,000 = Average Daily Traffic

N

Approximate Scale
Scale: 1"=1,000'

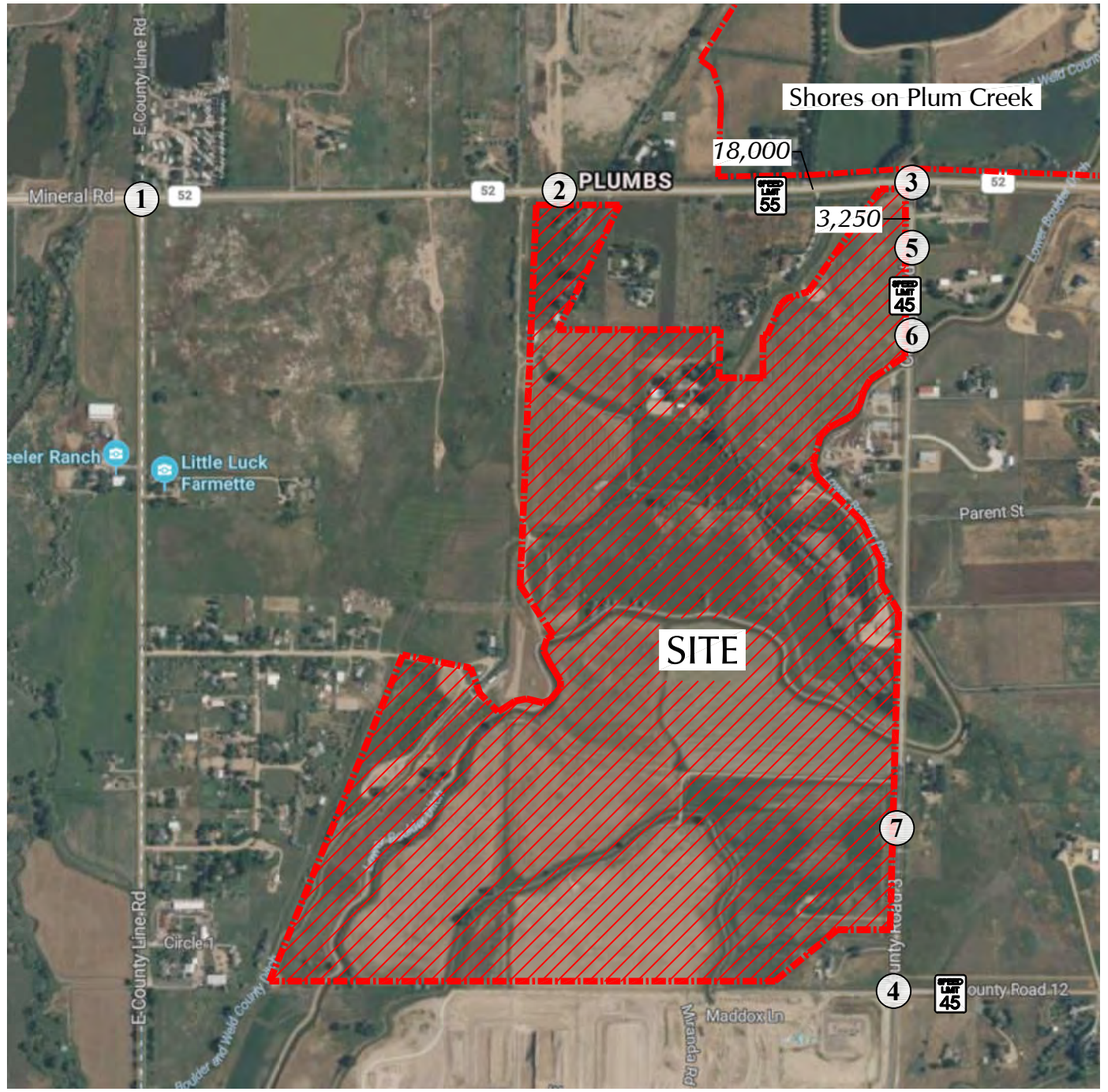
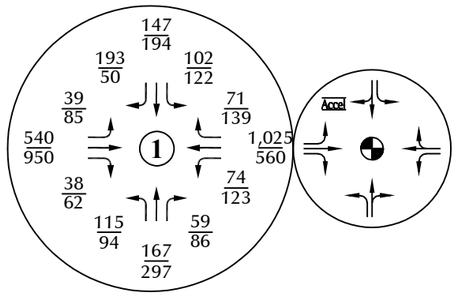


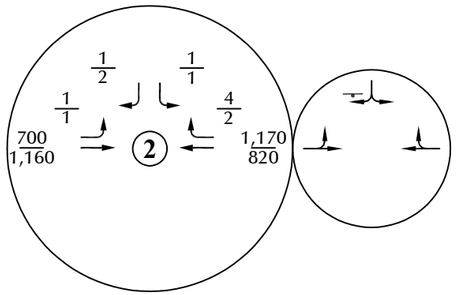
Figure 3

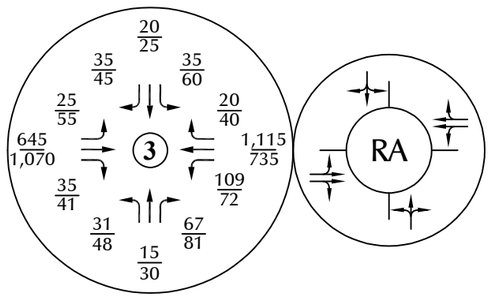
Existing Traffic, Lane Geometry and Traffic Control

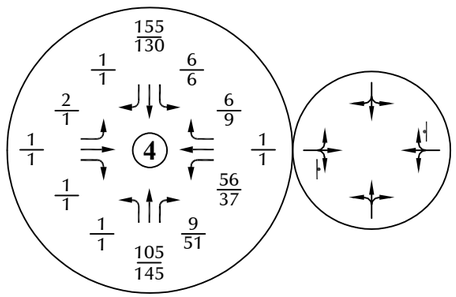
Spring Hill Update (LSC #180812)

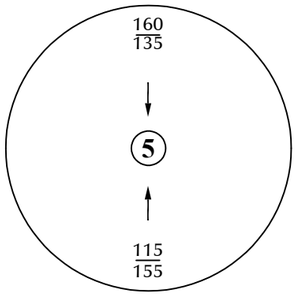
TRANSPORTATION CONSULTANTS, INC.

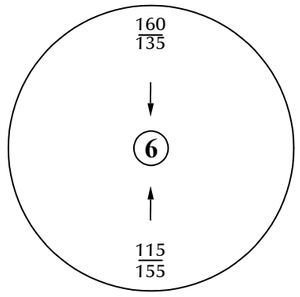


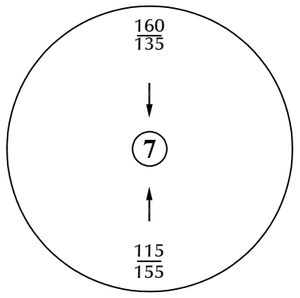












Note: Assumes 2.7 percent annual growth rate as required by the Town in the approved base assumptions form. It also assumes partial buildout of Shores at Plum Creek north of SH 52.

LEGEND:

= Stop Sign

= Traffic Signal

RA = Modern Roundabout

26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic

1,000 = Average Daily Traffic

N

Approximate Scale
Scale: 1"=1,000'

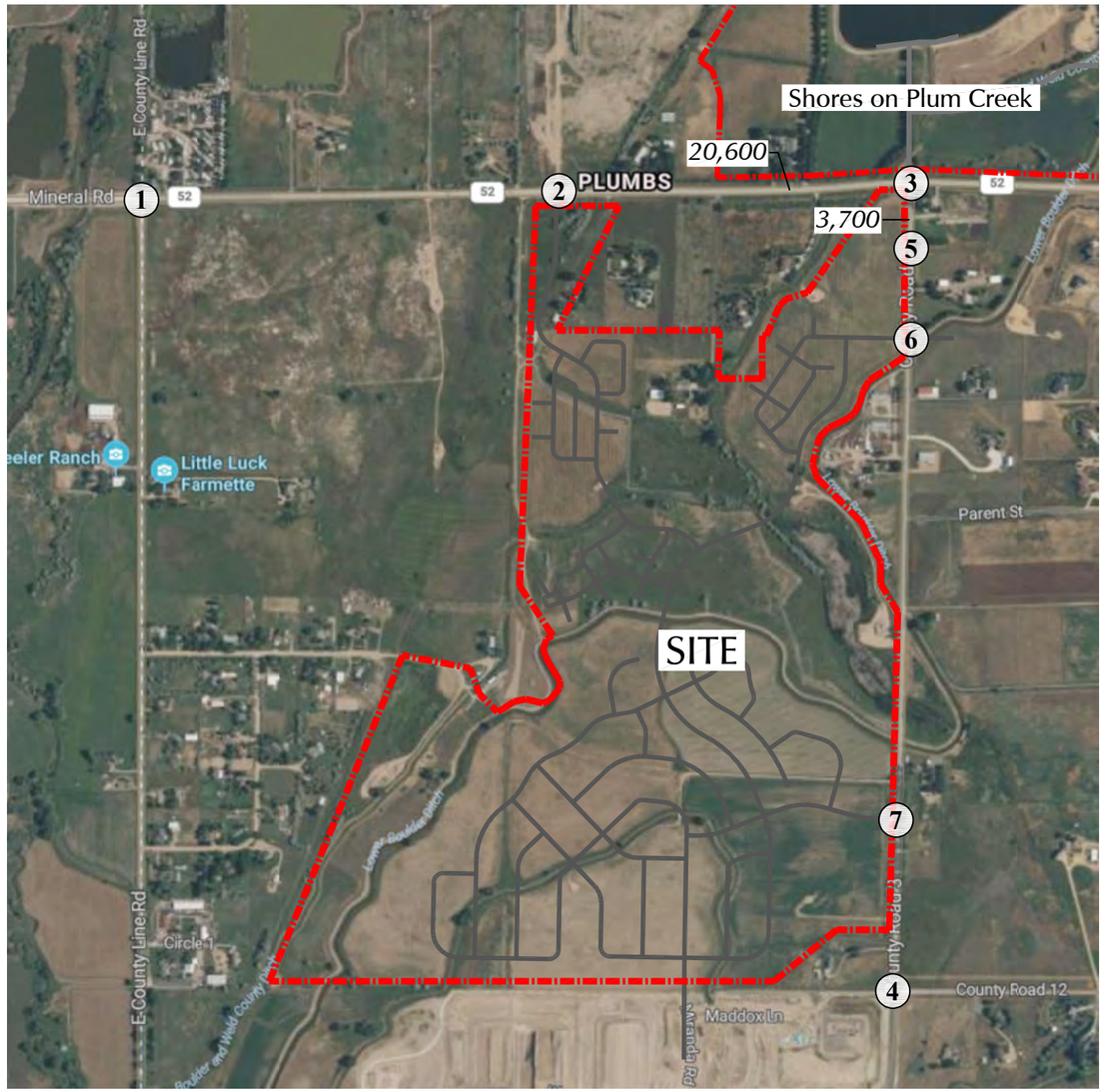
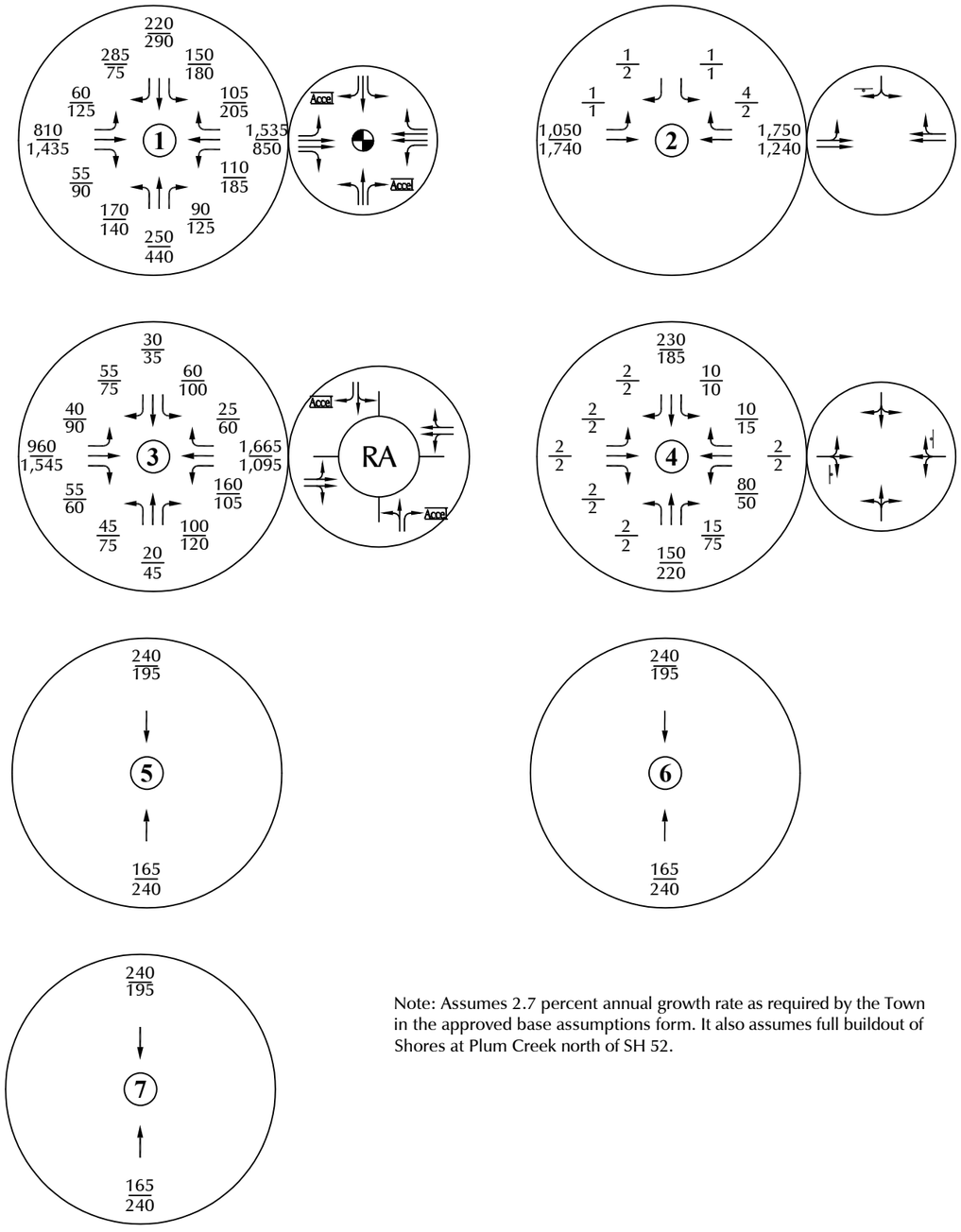


Figure 4

Year 2030 Background Traffic, Lane Geometry and Traffic Control

Spring Hill Update (LSC #180812)

TRANSPORTATION CONSULTANTS, INC.



Note: Assumes 2.7 percent annual growth rate as required by the Town in the approved base assumptions form. It also assumes full buildout of Shores at Plum Creek north of SH 52.

LEGEND:

= Stop Sign

= Traffic Signal

RA = Modern Roundabout

26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic

1,000 = Average Daily Traffic

N

Approximate Scale
Scale: 1"=1,000'

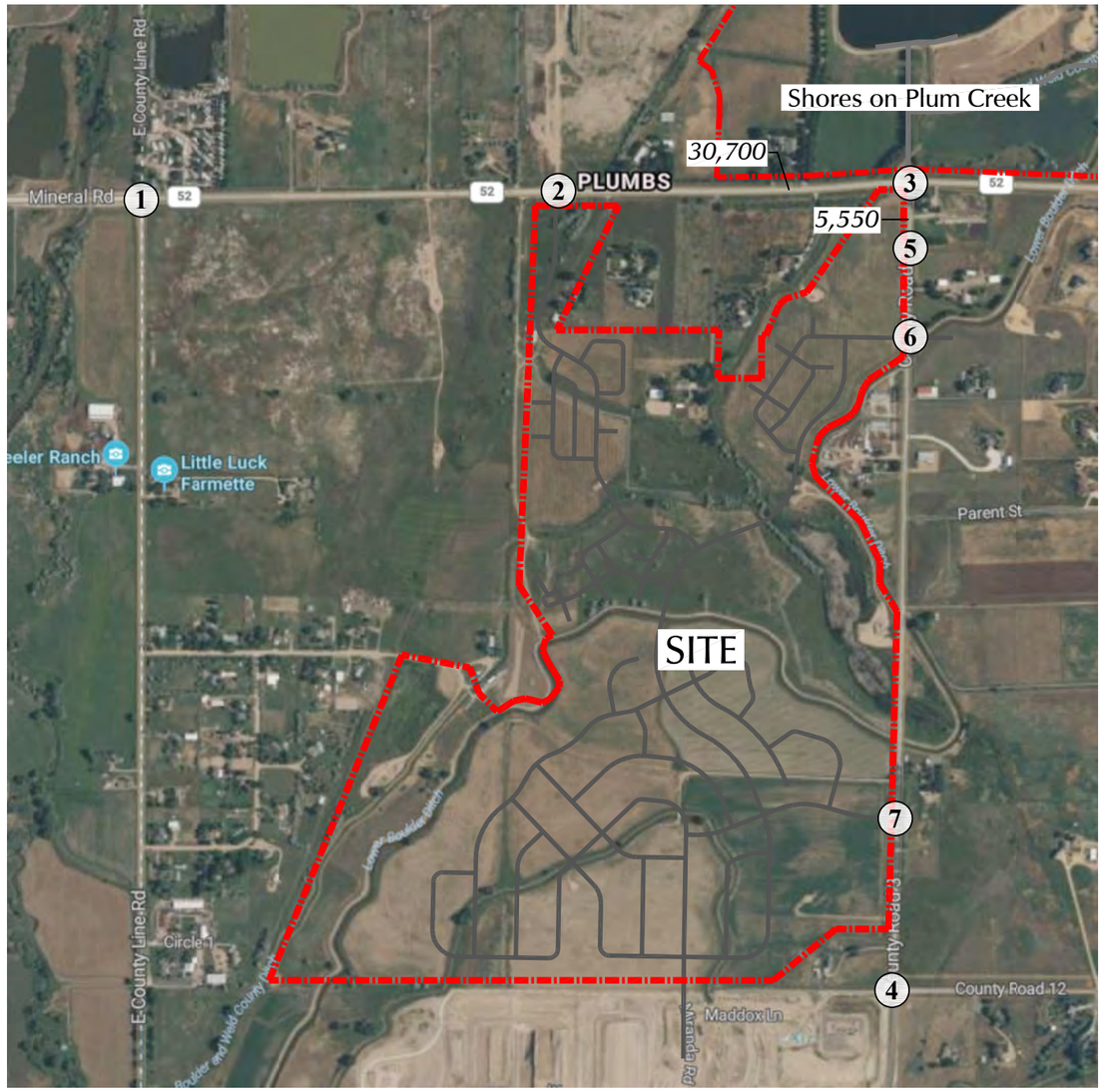


Figure 5

Year 2050 Background Traffic, Lane Geometry and Traffic Control

Spring Hill Update (LSC #180812)

TRANSPORTATION CONSULTANTS, INC.



LEGEND:

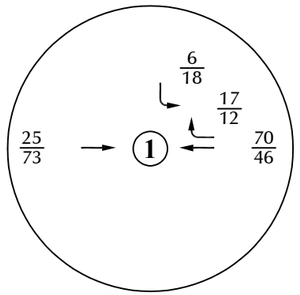
5%
5%
5%

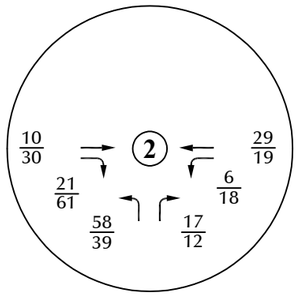
= Residential External Trip Percent Directional Distribution / School External Trip Percent Directional Distribution / Primary Commercial External Trip Percent Directional Distribution

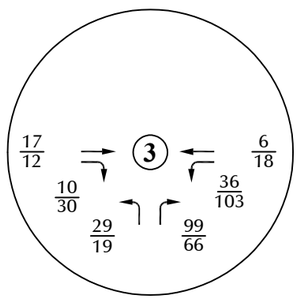
Figure 6

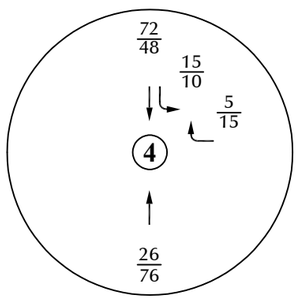
Directional Distribution of External Site-Generated Traffic

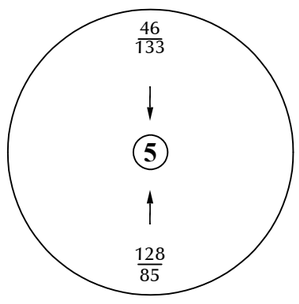
Spring Hill Update (LSC #180812)

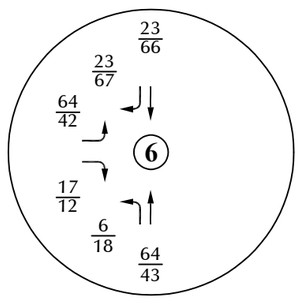


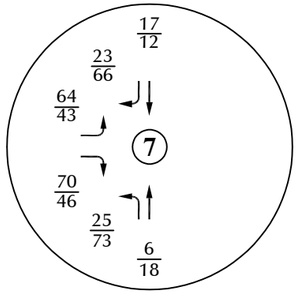












Note: These trips are included in both the 2030 and 2050 total traffic volumes in Figure 8 and 9.

LEGEND:
26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic
1,000 = Average Daily Traffic

Approximate Scale
Scale: 1"=1,000'

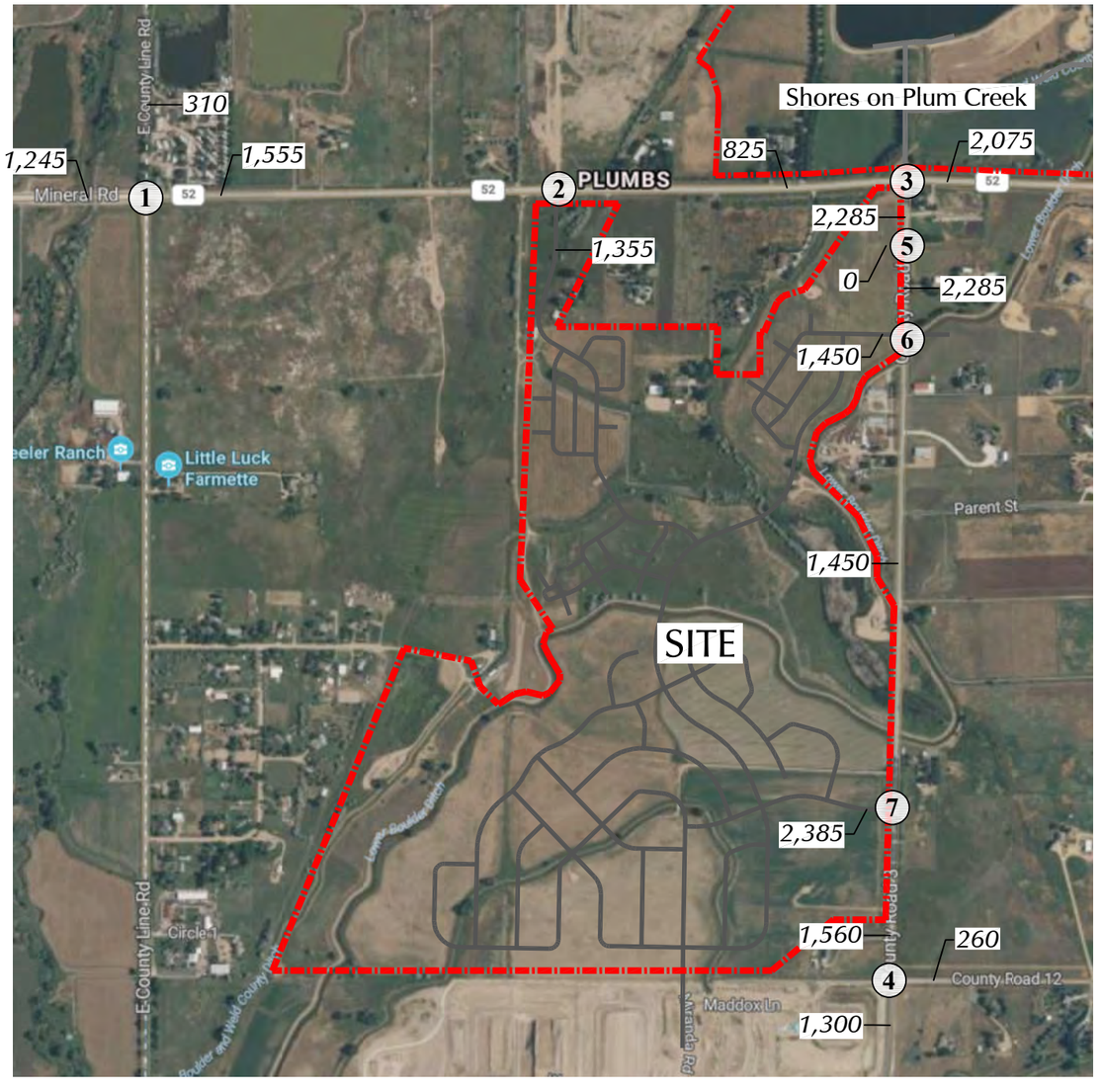
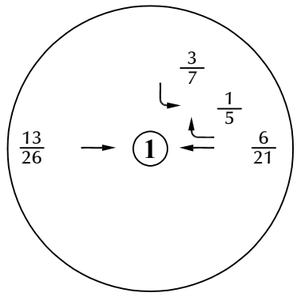


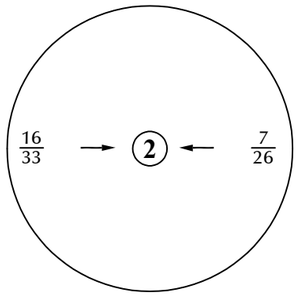
Figure 7a

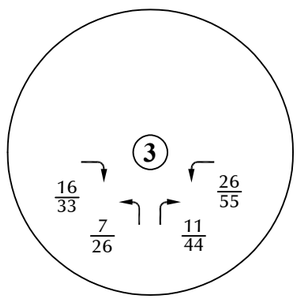
Assignment of Residential Site-Generated Traffic

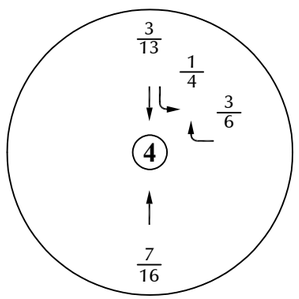
Spring Hill Update (LSC #180812)

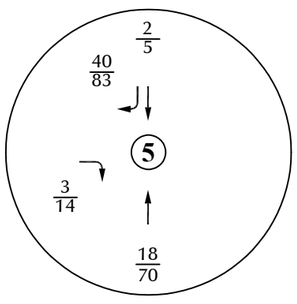
LSC TRANSPORTATION CONSULTANTS, INC.

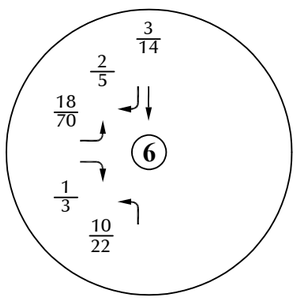


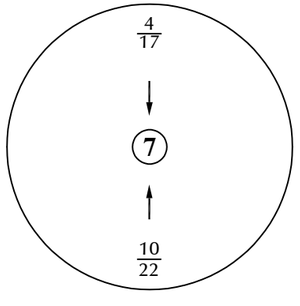












Note: These trips are included only in the 2050 total traffic volumes in Figure 9.

LEGEND:
26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic
1,000 = Average Daily Traffic

Approximate Scale
Scale: 1"=1,000'

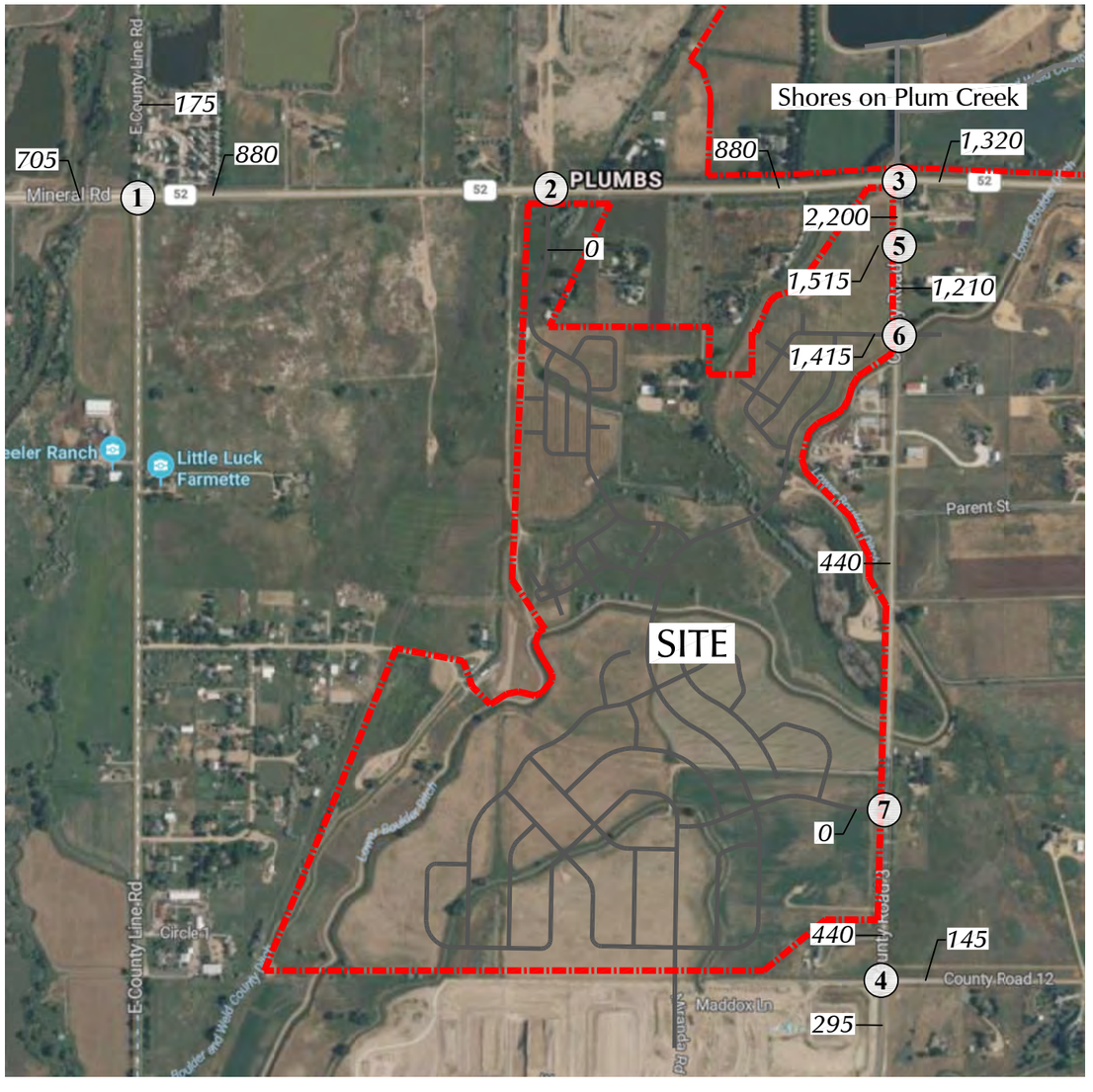
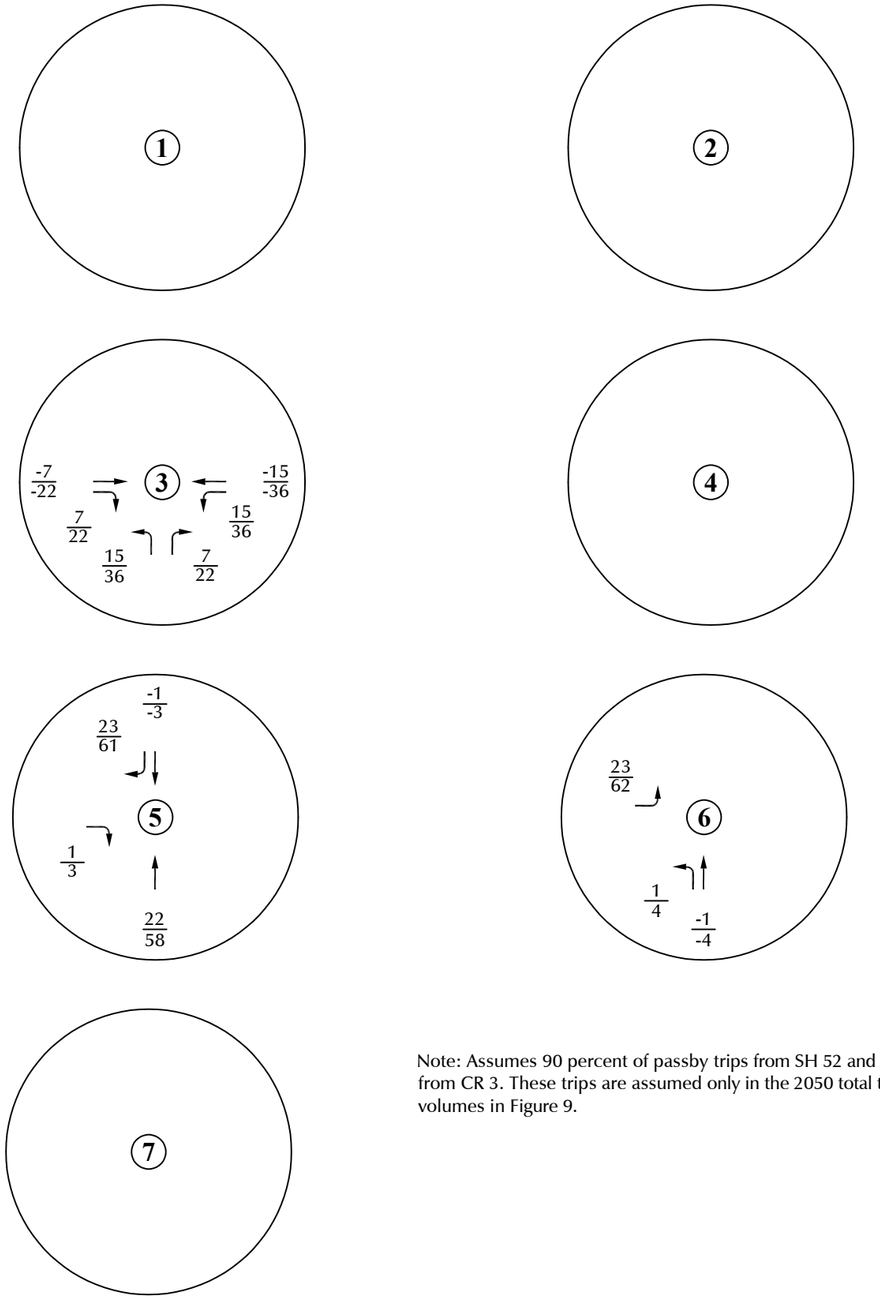


Figure 7b

Assignment of Primary Commercial Site-Generated Traffic

Spring Hill Update (LSC #180812)

LSC TRANSPORTATION CONSULTANTS, INC.



Note: Assumes 90 percent of passby trips from SH 52 and 10 percent from CR 3. These trips are assumed only in the 2050 total traffic volumes in Figure 9.

LEGEND:

$\frac{26}{35}$ = AM Peak Hour Traffic / PM Peak Hour Traffic

1,000 = Average Daily Traffic

Approximate Scale
Scale: 1"=1,000'

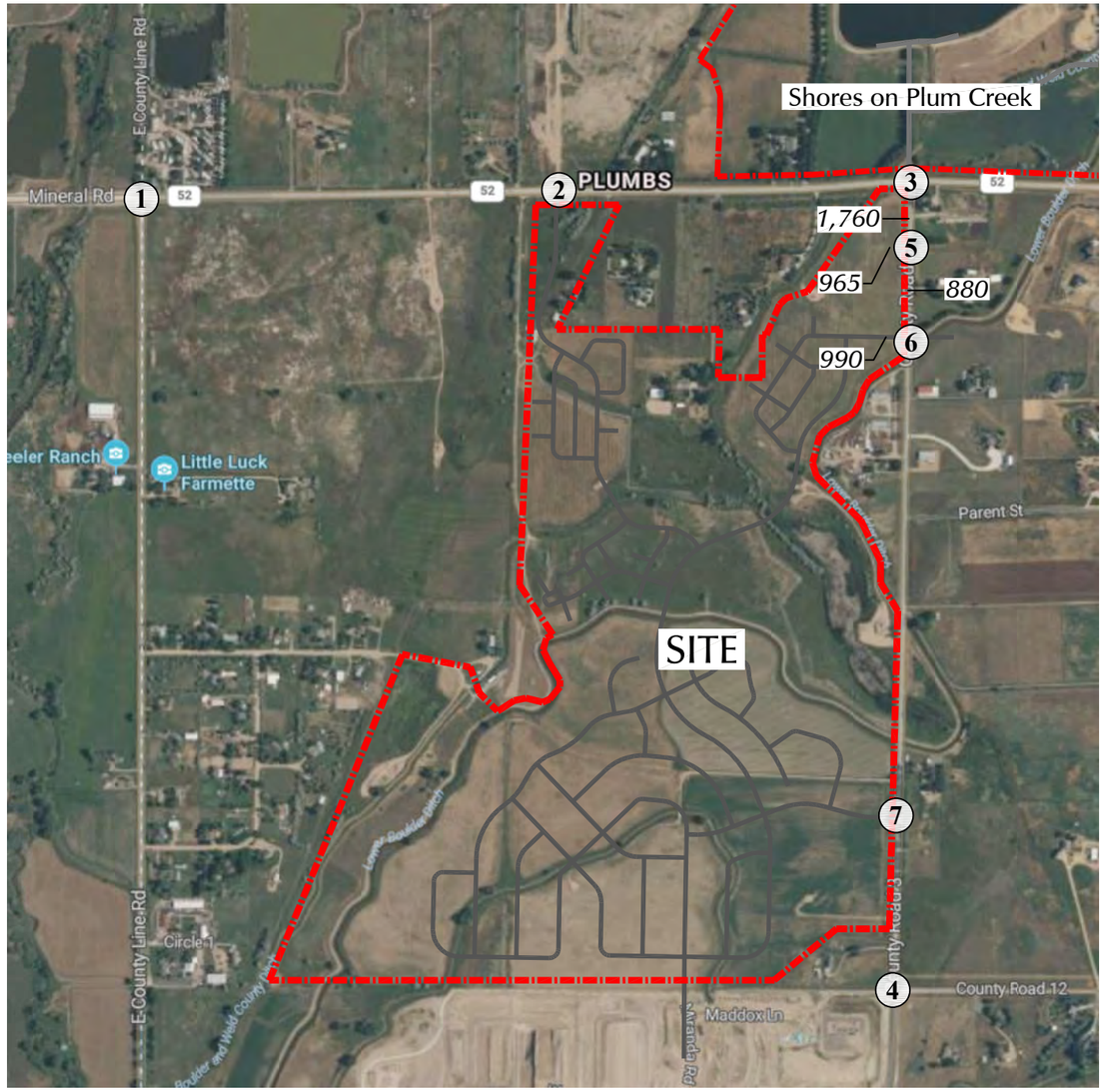
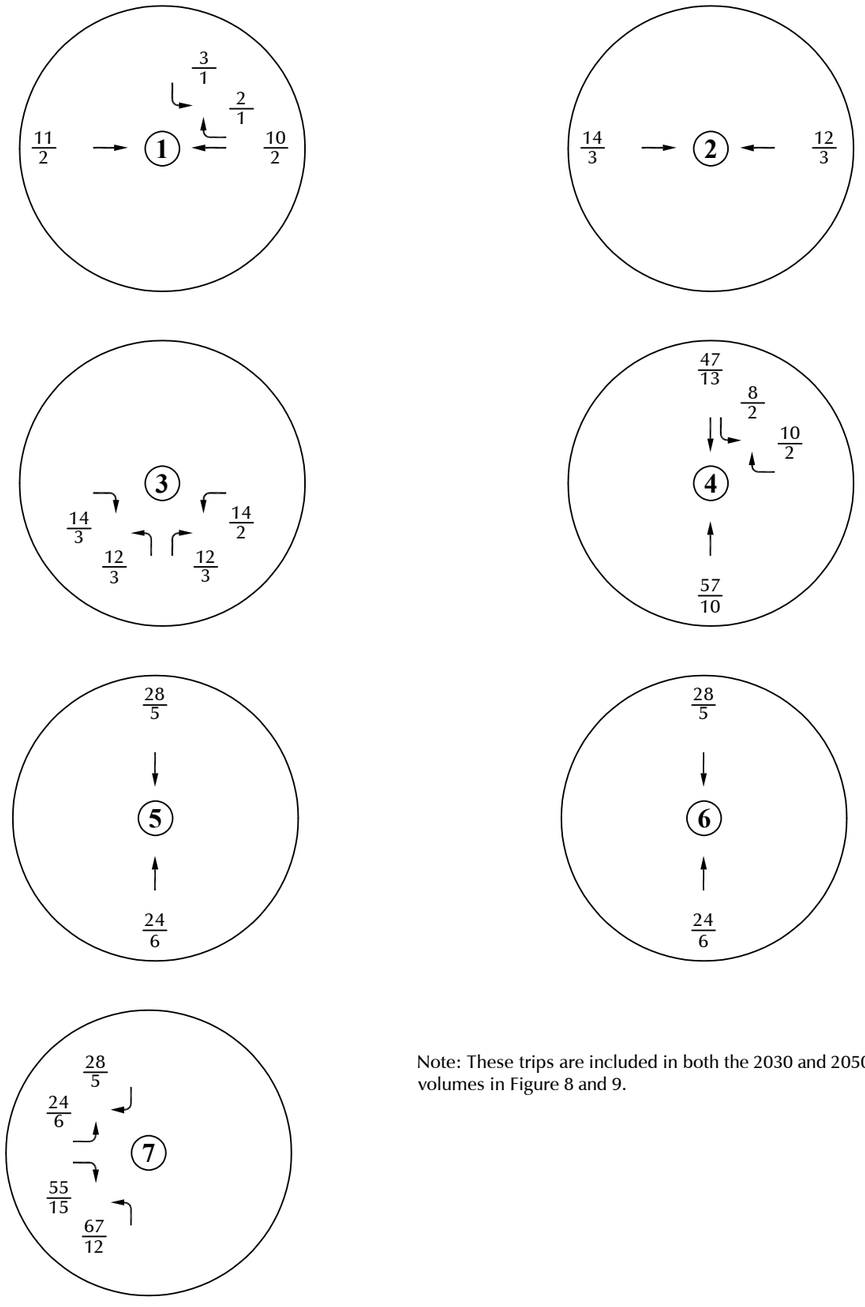


Figure 7c

Assignment of Passby Commercial Site-Generated Traffic

Spring Hill Update (LSC #180812)

TRANSPORTATION CONSULTANTS, INC.



Note: These trips are included in both the 2030 and 2050 total traffic volumes in Figure 8 and 9.

LEGEND:

$\frac{26}{35}$ = AM Peak Hour Traffic / PM Peak Hour Traffic

1,000 = Average Daily Traffic

N

Approximate Scale
Scale: 1"=1,000'

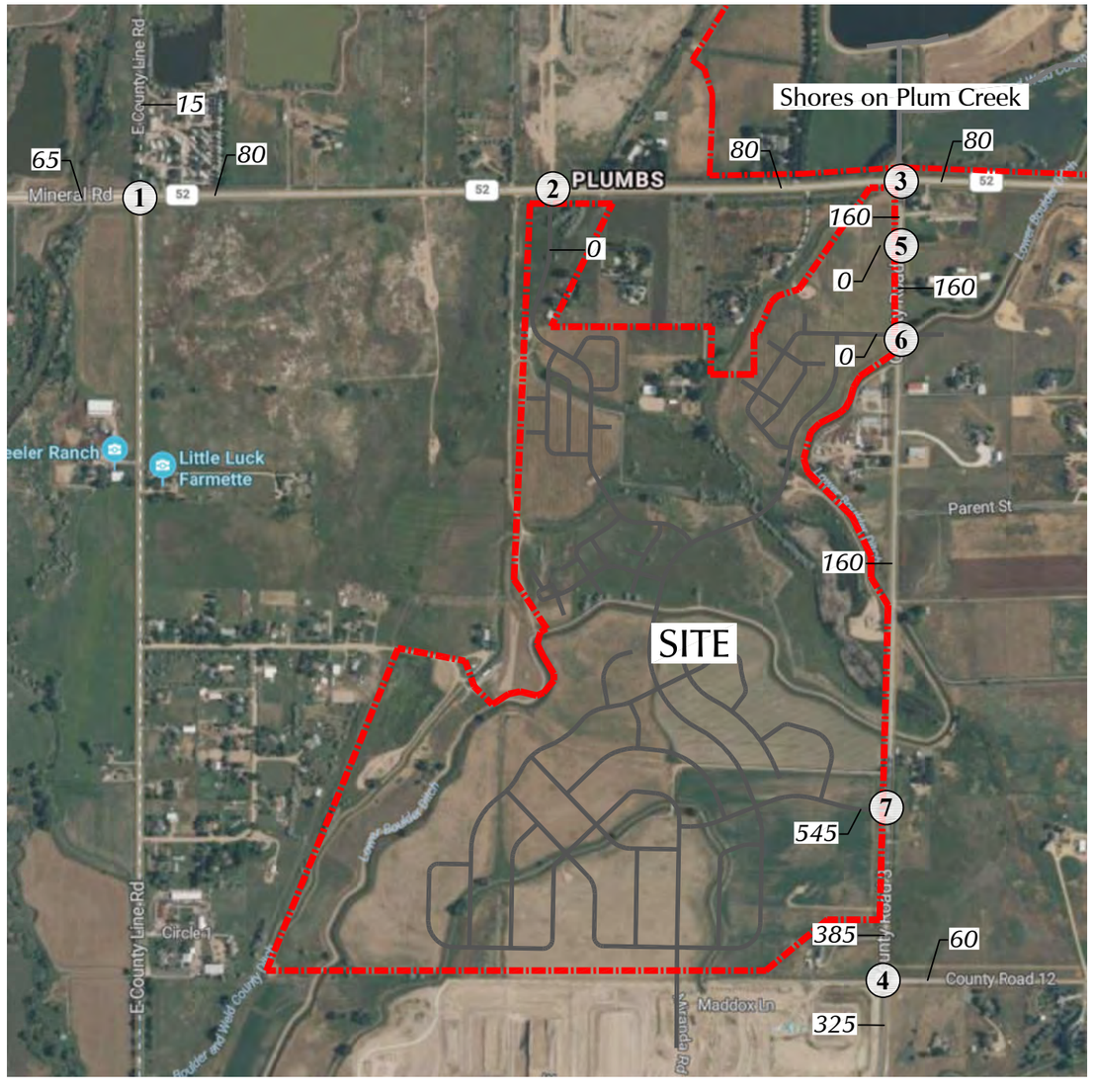
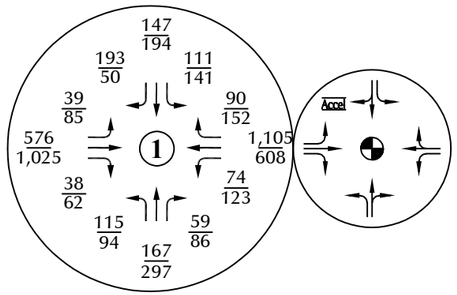


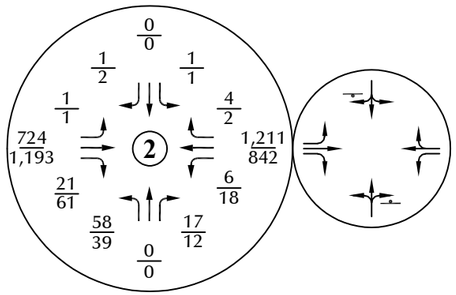
Figure 7d

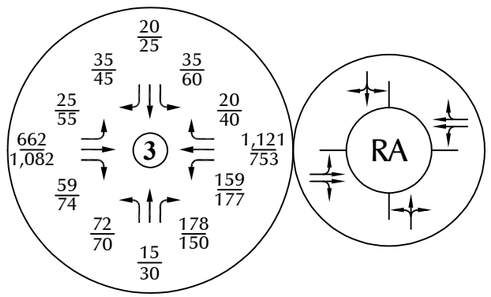
Assignment of External School Site-Generated Traffic

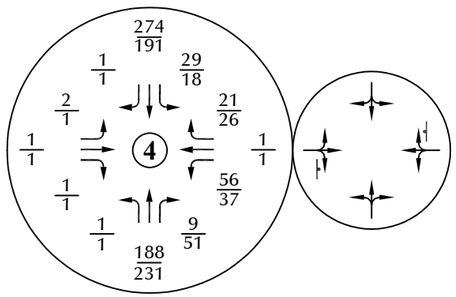
Spring Hill Update (LSC #180812)

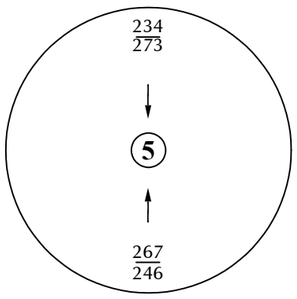
LSC TRANSPORTATION CONSULTANTS, INC.

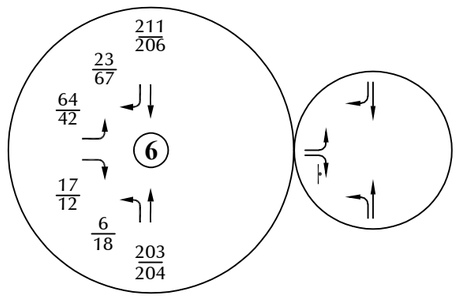


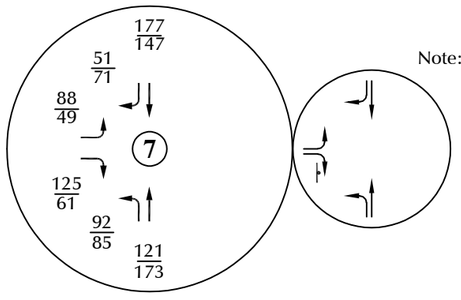












Note: These volumes are the sum of the volumes in Figures 4, 7a and 7d.

LEGEND:
= Stop Sign
= Traffic Signal
RA = Modern Roundabout
26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic
1,000 = Average Daily Traffic

N

Approximate Scale
Scale: 1"=1,000'

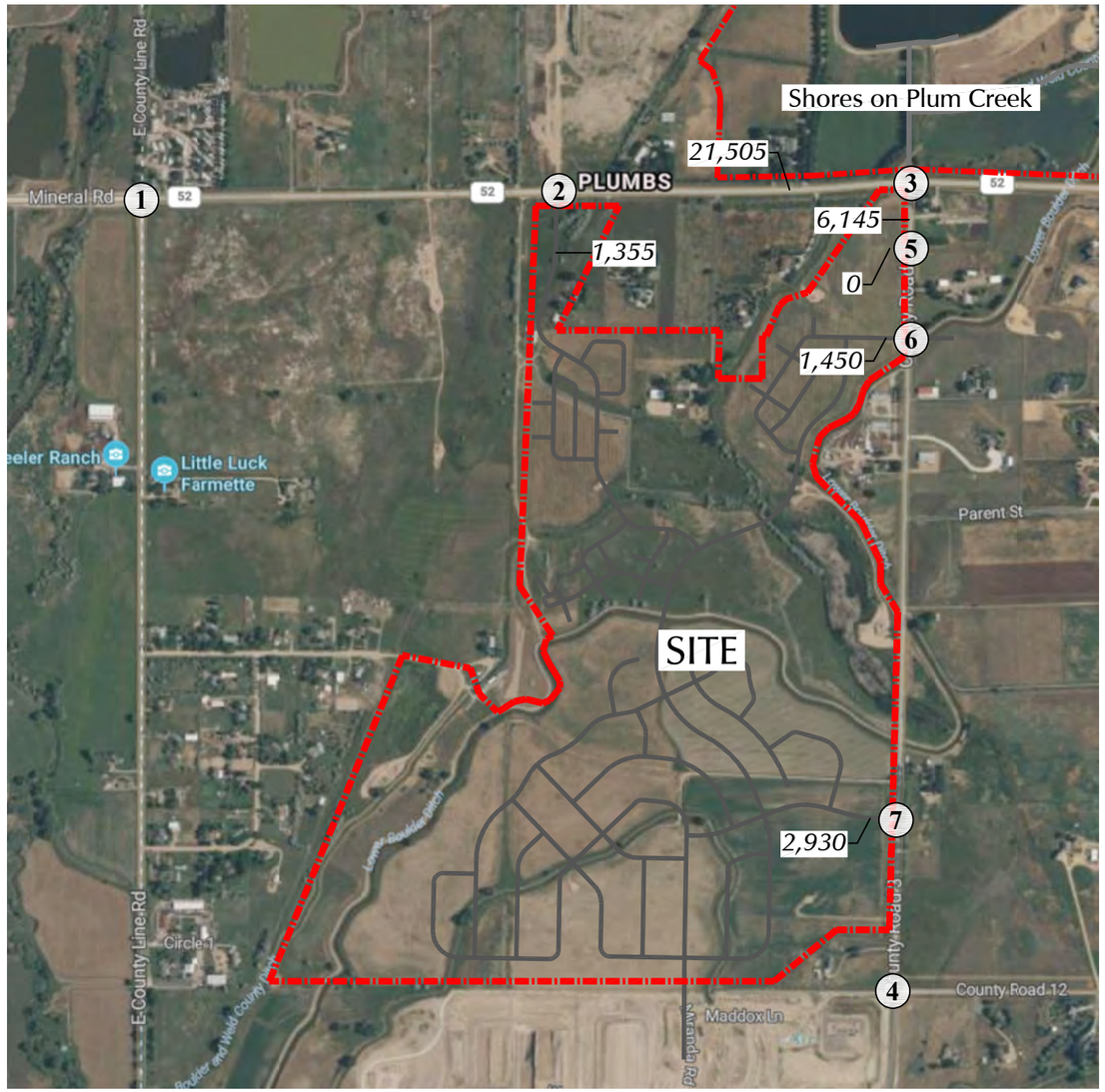
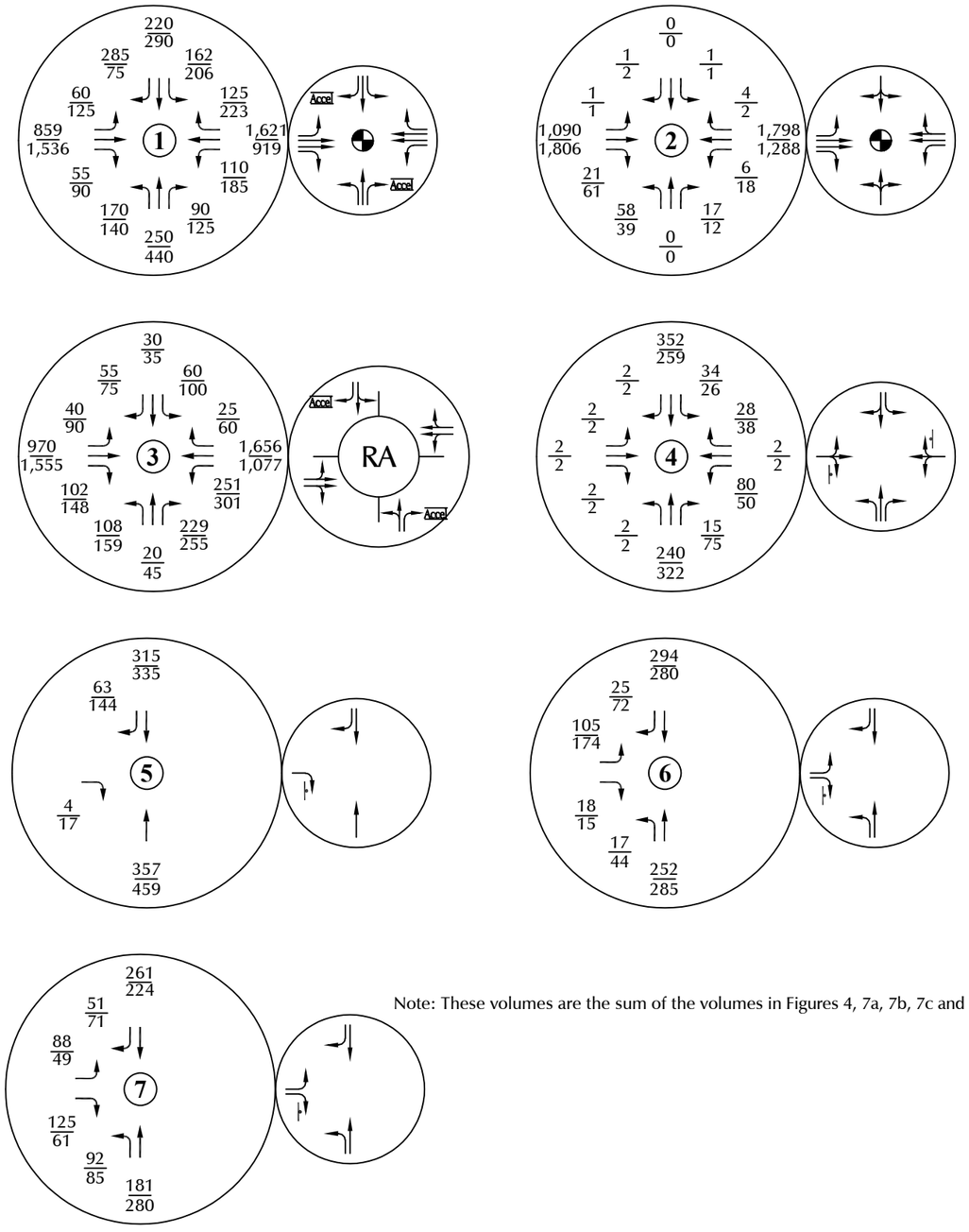


Figure 8

Year 2030 Total Traffic, Lane Geometry and Traffic Control

Spring Hill Update (LSC #180812)

TRANSPORTATION CONSULTANTS, INC.



Note: These volumes are the sum of the volumes in Figures 4, 7a, 7b, 7c and 7d.

LEGEND:

= Stop Sign

= Traffic Signal

RA = Modern Roundabout

26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic

1,000 = Average Daily Traffic

Approximate Scale
Scale: 1"=1,000'

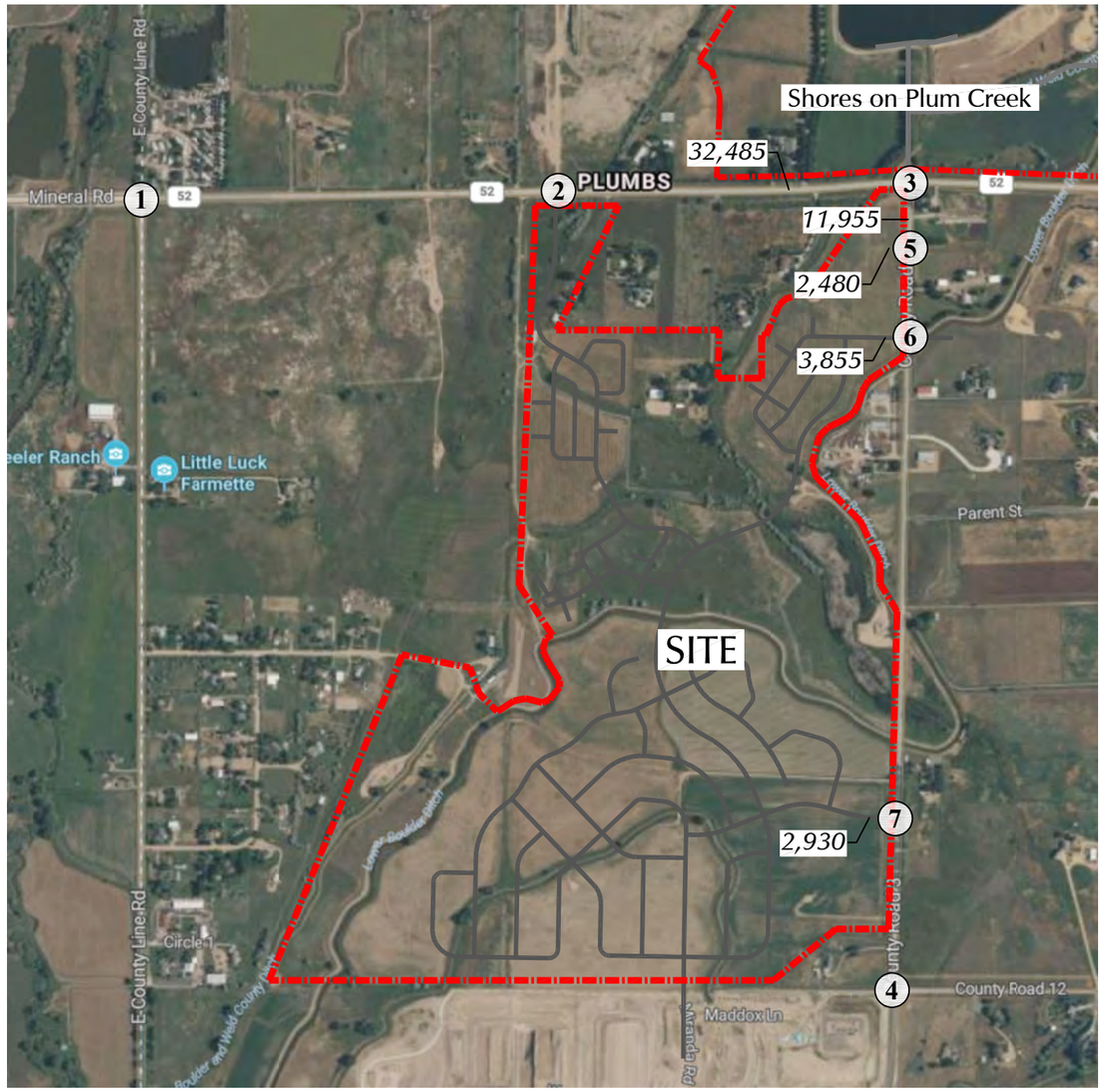


Figure 9

Year 2050 Total Traffic, Lane Geometry and Traffic Control

Spring Hill Update (LSC #180812)

TRANSPORTATION CONSULTANTS, INC.

Town of Erie - Transportation Impact Analysis (TIA)

Base Assumptions Form

GENERAL INFORMATION				
Project Name: Parkdale North				
Project Location: Adjacent to future Coal Creek Blvd. alignment south of Arapahoe Road				
TIA ASSUMPTIONS				
Muni Code Applicability (TIA Warrant):	1-Hour Vol. Exceeds 100 Trips *Est. 1-Hour Vol: >100*		AADT Exceeds 250 *Est. AADT: >250*	Other:
Study Area Boundaries	North: Arapahoe Rd	South: SH 7	East: Coal Creek Blvd. and Old County Line Road	West: N. 119th Street
Study Years	Short Range: 2030		Long Range: 2050	
Future Traffic Growth Rates	Use 2.7% annual growth per Town TMP per Town feedback.		Growth Rate Reference(s): TMP and staff feedback	
Study Intersections	1. N. 119th St/Arapahoe Rd		5. Coal Creek Blvd./Monroe Street	
	2. N. 119th St/Lancaster St		6. Coal Creek Blvd./SH 7	
	3. N. 119th Street/SH 7		7. County Line Road/Arapahoe Rd	
	4. N. 119th Street/Shay Dr		8. Arapahoe Road/Quest Drive	
			9. County Line Road/Main Street	
Time Period(s) For Study	AM Peak Hour: 6:30 – 8:30 AM PM Peak Hour: 4:00 – 6:00 PM		72-hour counts will be provided as appropriate.	
ITE Trip Generation Rates	210 – Single-Family Detached Housing 215 – Single-Family Attached Housing		520 – Elementary School	
Trip Adjustment Factors	Background Trips: Depending on how the analysis is completed – trips generated by existing buildout of Parkdale can be subtracted		Transit Investments: None assumed to maintain a conservative analysis	Captive Market: 40% school trips internal to site – support will be provided for whatever % is used.
Trip Distribution Rational (Attach Diagram)	See Figure 6 from prior Parkdale North TIA by LSC			
Mode Split Assumptions	Assumed to be primarily passenger vehicles to maintain a conservative analysis.			
Committed Roadway Improvements	Applicant to connect missing section of Caol Creek Boulevard. Intersection improvements at site access intersections.			
Other Traffic Studies (Less than 2 Years Old)	Prior Parkdale TIAs			
Areas Requiring Special Study				
Is the project within 1/2 mile of a State Highway?	**Yes X** **No**			

Date: September 10, 2025

Signature - Project Traffic Engineer:

Signature - Town of Erie Staff:

COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: CONSTRUCTION ENTRANCE
E/W STREET: HWY 52
CITY: ERIE
COUNTY: HWY 52

File Name : CONST. ENTRANCE HWY 52
Site Code : 00000020
Start Date : 8/20/2025
Page No : 1

Groups Printed- Unshifted

	CONSTRUCTION ENTRANCE SOUTHBOUND				HWY 52 WESTBOUND				NO ACCESS NORTHBOUND				HWY 52 EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30 AM	0	0	0	0	0	247	0	0	0	0	0	0	0	110	0	0	357
06:45 AM	0	0	0	0	0	232	0	0	0	0	0	0	0	130	0	0	362
Total	0	0	0	0	0	479	0	0	0	0	0	0	0	240	0	0	719
07:00 AM	0	0	0	0	0	249	0	0	0	0	0	0	0	150	0	0	399
07:15 AM	0	0	0	0	0	244	1	0	0	0	0	0	0	152	0	0	397
07:30 AM	1	0	0	0	0	253	1	0	0	0	0	0	0	135	0	0	390
07:45 AM	0	0	0	0	0	228	2	1	0	0	0	0	0	150	0	0	381
Total	1	0	0	0	0	974	4	1	0	0	0	0	0	587	0	0	1567
08:00 AM	0	0	0	0	0	215	3	0	0	0	0	0	0	135	0	0	353
08:15 AM	0	0	0	0	0	265	0	0	0	0	0	0	0	119	0	0	384
Total	0	0	0	0	0	480	3	0	0	0	0	0	0	254	0	0	737
04:00 PM	0	0	0	0	0	184	0	0	0	0	0	0	0	272	0	0	456
04:15 PM	0	0	0	0	0	168	0	0	0	0	0	0	1	249	0	0	418
04:30 PM	0	0	2	0	0	150	2	0	0	0	0	0	0	250	0	0	404
04:45 PM	0	0	0	0	0	166	0	0	0	0	0	0	0	264	0	0	430
Total	0	0	2	0	0	668	2	0	0	0	0	0	1	1035	0	0	1708
05:00 PM	0	0	0	0	0	151	0	0	0	0	0	0	0	263	0	0	414
05:15 PM	0	0	0	0	0	174	0	0	0	0	0	0	0	280	0	0	454
05:30 PM	0	0	0	0	0	151	0	0	0	0	0	0	0	262	0	0	413
05:45 PM	0	0	0	0	0	140	0	0	0	0	0	0	0	244	0	0	384
Total	0	0	0	0	0	616	0	0	0	0	0	0	0	1049	0	0	1665
Grand Total	1	0	2	0	0	3217	9	1	0	0	0	0	1	3165	0	0	6396
Apprch %	33.3	0	66.7	0	0	99.7	0.3	0	0	0	0	0	0	100	0	0	
Total %	0	0	0	0	0	50.3	0.1	0	0	0	0	0	0	49.5	0	0	

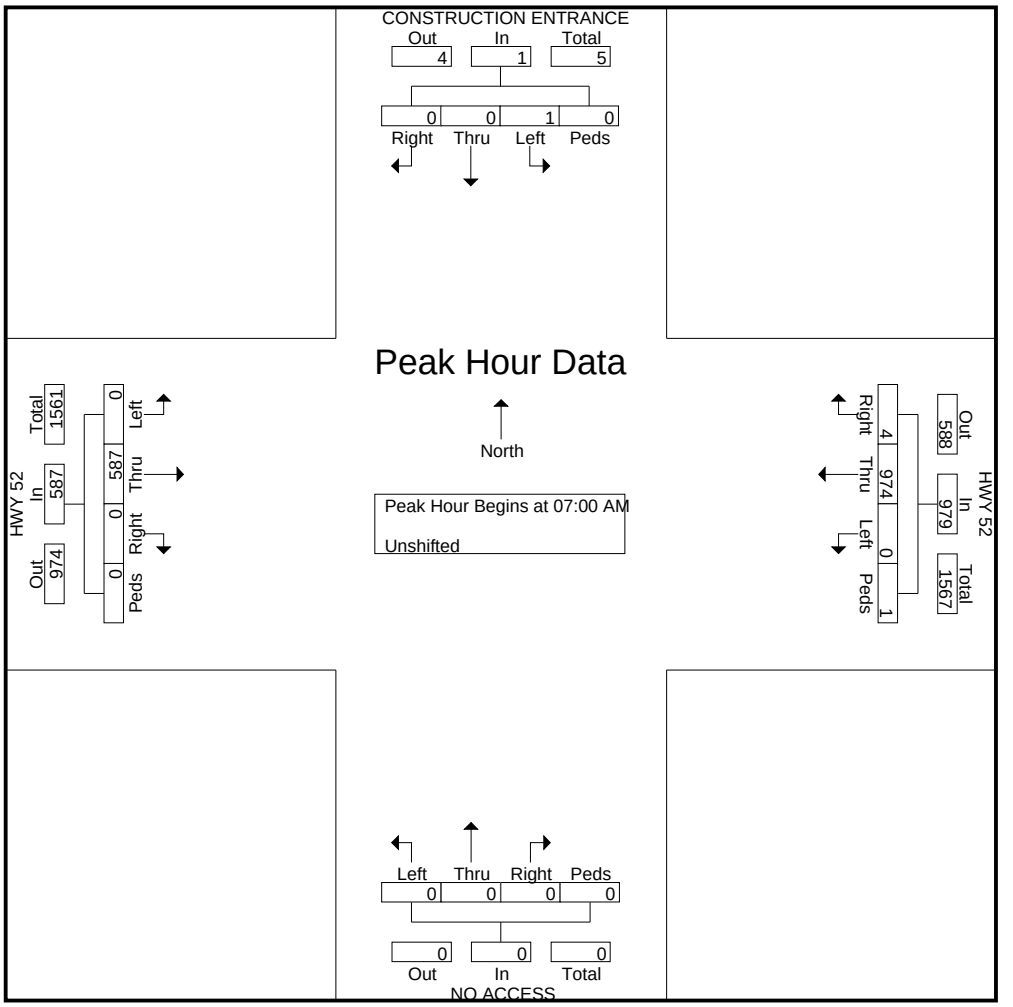
COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: CONSTRUCTION ENTRANCE
E/W STREET: HWY 52
CITY: ERIE
COUNTY: HWY 52

File Name : CONST. ENTRANCE HWY 52
Site Code : 00000020
Start Date : 8/20/2025
Page No : 2

	CONSTRUCTION ENTRANCE SOUTHBOUND					HWY 52 WESTBOUND					NO ACCESS NORTHBOUND					HWY 52 EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	249	0	0	249	0	0	0	0	0	0	150	0	0	150	**399**
07:15 AM	0	0	0	0	0	0	244	1	0	245	0	0	0	0	0	0	**152**	0	0	**152**	397
07:30 AM	**1**	0	0	0	**1**	0	**253**	1	0	**254**	0	0	0	0	0	0	135	0	0	135	390
07:45 AM	0	0	0	0	0	0	228	**2**	**1**	231	0	0	0	0	0	0	150	0	0	150	381
Total Volume	1	0	0	0	1	0	974	4	1	979	0	0	0	0	0	0	587	0	0	587	1567
% App. Total	100	0	0	0		0	99.5	0.4	0.1		0	0	0	0		0	100	0	0		
PHF	.250	.000	.000	.000	.250	.000	.962	.500	.250	.964	.000	.000	.000	.000	.000	.000	.965	.000	.000	.965	.982



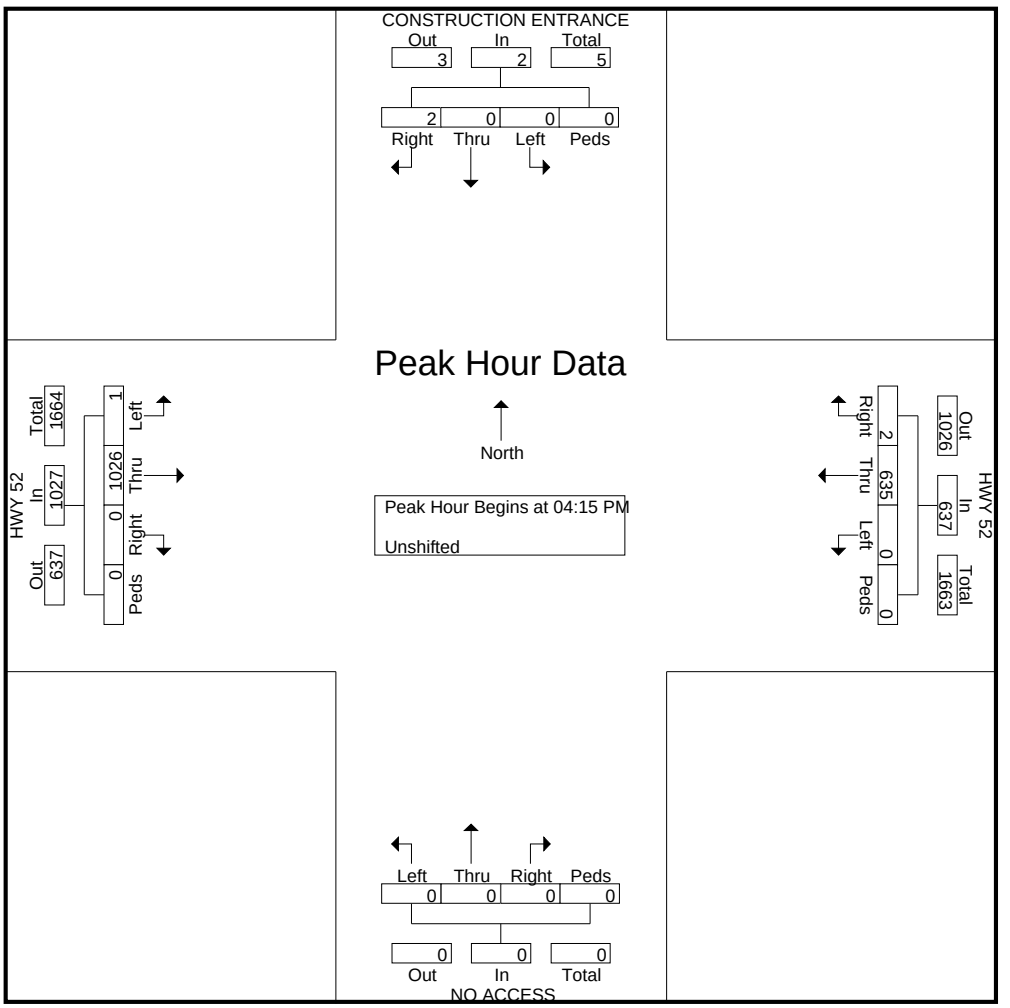
COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: CONSTRUCTION ENTRANCE
E/W STREET: HWY 52
CITY: ERIE
COUNTY: HWY 52

File Name : CONST. ENTRANCE HWY 52
Site Code : 00000020
Start Date : 8/20/2025
Page No : 3

	CONSTRUCTION ENTRANCE SOUTHBOUND					HWY 52 WESTBOUND					NO ACCESS NORTHBOUND					HWY 52 EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	0	0	0	0	**168**	0	0	**168**	0	0	0	0	0	**1**	249	0	0	250	418
04:30 PM	0	0	**2**	0	**2**	0	150	**2**	0	152	0	0	0	0	0	0	250	0	0	250	404
04:45 PM	0	0	0	0	0	0	166	0	0	166	0	0	0	0	0	0	**264**	0	0	**264**	**430**
05:00 PM	0	0	0	0	0	0	151	0	0	151	0	0	0	0	0	0	263	0	0	263	414
Total Volume	0	0	2	0	2	0	635	2	0	637	0	0	0	0	0	1	1026	0	0	1027	1666
% App. Total	0	0	100	0		0	99.7	0.3	0		0	0	0	0		0.1	99.9	0	0		
PHF	.000	.000	.250	.000	.250	.000	.945	.250	.000	.948	.000	.000	.000	.000	.000	.250	.972	.000	.000	.973	.969



COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: CR 3
E/W STREET: CR 12
CITY: ERIE
COUNTY: WELD

File Name : cr 3 cr 12
Site Code : 00000005
Start Date : 8/19/2025
Page No : 1

Groups Printed- Unshifted

	CR 3 SOUTHBOUND				CR 12 WESTBOUND				CR 3 NORTHBOUND				CONST ENTRANCE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30 AM	0	7	0	1	3	0	1	0	0	12	0	0	0	0	0	0	24
06:45 AM	0	8	1	0	4	0	1	0	0	14	2	0	0	0	0	0	30
Total	0	15	1	1	7	0	2	0	0	26	2	0	0	0	0	0	54
07:00 AM	3	14	0	0	6	0	1	0	0	14	0	0	1	0	0	0	39
07:15 AM	1	13	1	0	10	1	3	0	0	14	2	0	0	0	0	0	45
07:30 AM	1	38	0	0	18	0	1	0	0	14	2	0	1	0	1	0	76
07:45 AM	0	48	0	0	15	0	0	1	0	25	4	1	0	0	0	0	94
Total	5	113	1	0	49	1	5	1	0	67	8	1	2	0	1	0	254
08:00 AM	4	22	0	0	14	0	2	0	0	21	8	0	0	0	0	0	71
08:15 AM	0	28	0	0	10	0	1	0	0	13	1	0	0	0	0	0	53
Total	4	50	0	0	24	0	3	0	0	34	9	0	0	0	0	0	124
04:00 PM	2	13	0	0	7	0	1	0	0	20	11	0	0	0	0	0	54
04:15 PM	0	27	0	0	5	0	3	0	0	21	12	0	0	1	0	0	69
04:30 PM	4	19	0	0	10	0	4	0	0	21	8	1	0	0	0	0	67
04:45 PM	1	20	0	0	9	0	0	0	0	30	14	0	0	0	0	0	74
Total	7	79	0	0	31	0	8	0	0	92	45	1	0	1	0	0	264
05:00 PM	0	22	0	1	8	0	1	0	0	22	11	0	0	0	0	0	65
05:15 PM	3	26	0	0	5	0	6	0	0	19	6	0	0	0	0	0	65
05:30 PM	1	29	0	0	5	0	4	0	0	22	8	0	0	0	0	0	69
05:45 PM	3	28	0	0	6	0	3	0	0	17	3	0	0	0	0	0	60
Total	7	105	0	1	24	0	14	0	0	80	28	0	0	0	0	0	259
Grand Total	23	362	2	2	135	1	32	1	0	299	92	2	2	1	1	0	955
Apprch %	5.9	93.1	0.5	0.5	79.9	0.6	18.9	0.6	0	76.1	23.4	0.5	50	25	25	0	
Total %	2.4	37.9	0.2	0.2	14.1	0.1	3.4	0.1	0	31.3	9.6	0.2	0.2	0.1	0.1	0	

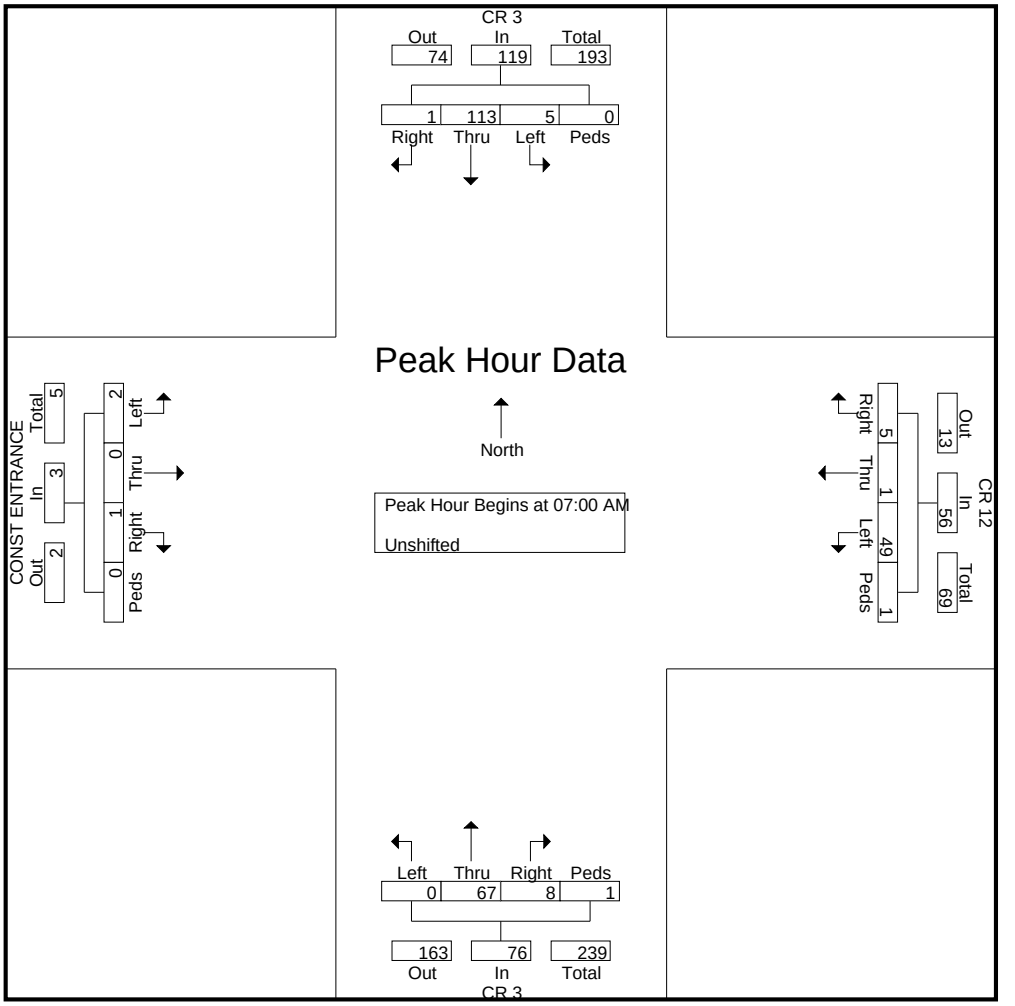
COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: CR 3
E/W STREET: CR 12
CITY: ERIE
COUNTY: WELD

File Name : cr 3 cr 12
Site Code : 00000005
Start Date : 8/19/2025
Page No : 2

	CR 3 SOUTHBOUND					CR 12 WESTBOUND					CR 3 NORTHBOUND					CONST ENTRANCE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	**3**	14	0	0	17	6	0	1	0	7	0	14	0	0	14	**1**	0	0	0	1	39
07:15 AM	1	13	**1**	0	15	10	**1**	**3**	0	14	0	14	2	0	16	0	0	0	0	0	45
07:30 AM	1	38	0	0	39	**18**	0	1	0	**19**	0	14	2	0	16	1	0	**1**	0	**2**	76
07:45 AM	0	**48**	0	0	**48**	15	0	0	**1**	16	0	**25**	**4**	**1**	**30**	0	0	0	0	0	**94**
Total Volume	5	113	1	0	119	49	1	5	1	56	0	67	8	1	76	2	0	1	0	3	254
% App. Total	4.2	95	0.8	0		87.5	1.8	8.9	1.8		0	88.2	10.5	1.3		66.7	0	33.3	0		
PHF	.417	.589	.250	.000	.620	.681	.250	.417	.250	.737	.000	.670	.500	.250	.633	.500	.000	.250	.000	.375	.676



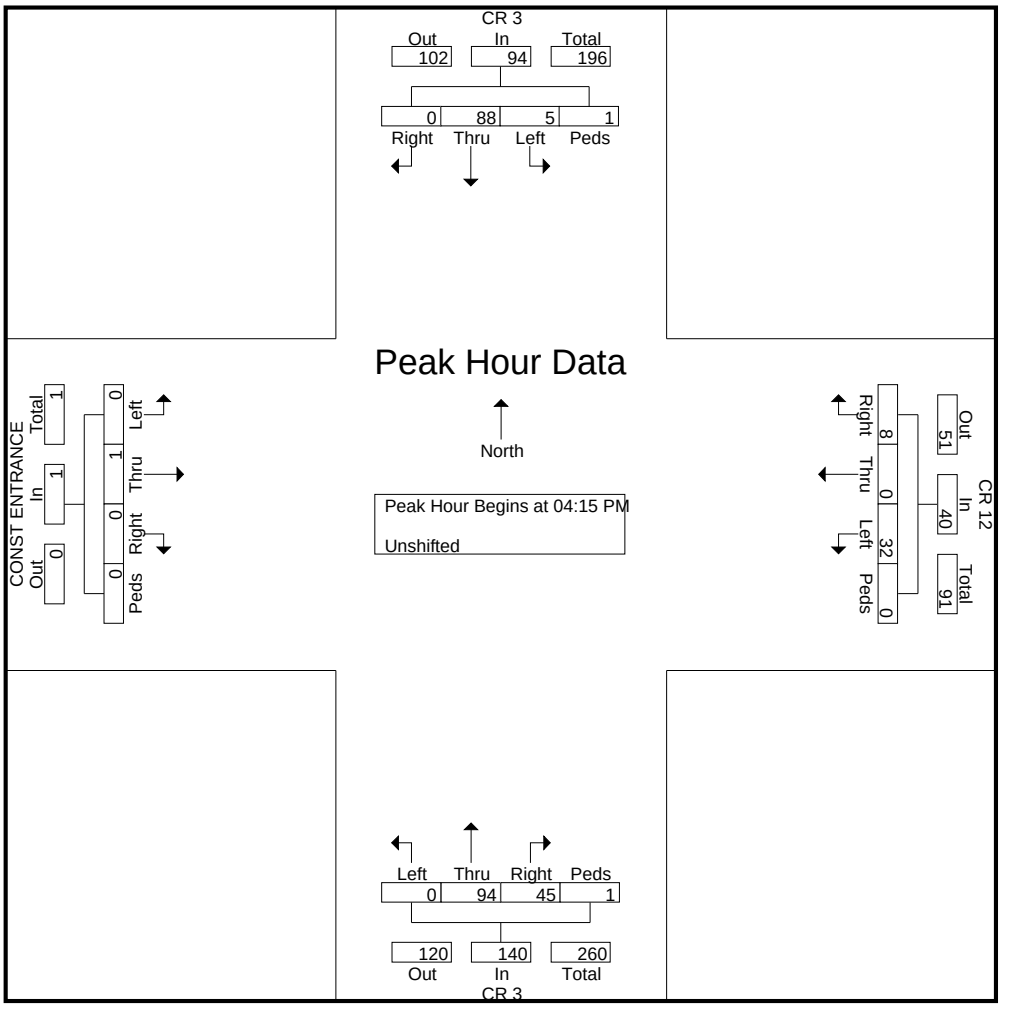
COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: CR 3
E/W STREET: CR 12
CITY: ERIE
COUNTY: WELD

File Name : cr 3 cr 12
Site Code : 00000005
Start Date : 8/19/2025
Page No : 3

	CR 3 SOUTHBOUND					CR 12 WESTBOUND					CR 3 NORTHBOUND					CONST ENTRANCE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	**27**	0	0	**27**	5	0	3	0	8	0	21	12	0	33	0	**1**	0	0	**1**	69
04:30 PM	**4**	19	0	0	23	**10**	0	**4**	0	**14**	0	21	8	**1**	30	0	0	0	0	0	67
04:45 PM	1	20	0	0	21	9	0	0	0	9	0	**30**	**14**	0	**44**	0	0	0	0	0	**74**
05:00 PM	0	22	0	**1**	23	8	0	1	0	9	0	22	11	0	33	0	0	0	0	0	65
Total Volume	5	88	0	1	94	32	0	8	0	40	0	94	45	1	140	0	1	0	0	1	275
% App. Total	5.3	93.6	0	1.1		80	0	20	0		0	67.1	32.1	0.7		0	100	0	0		
PHF	.313	.815	.000	.250	.870	.800	.000	.500	.000	.714	.000	.783	.804	.250	.795	.000	.250	.000	.000	.250	.929



COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: CR 3
E/W STREET: HWY 52
CITY: ERIE
COUNTY: WELD

File Name : CR 3 HWY 52
Site Code : 00000008
Start Date : 8/19/2025
Page No : 1

Groups Printed- Unshifted

	NO ACCESS SOUTHBOUND				HWY 52 WESTBOUND				CR 3 NORTHBOUND				HWY 52 EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30 AM	0	0	0	0	6	264	0	0	1	0	13	0	0	122	1	0	407
06:45 AM	0	0	0	0	31	190	0	0	8	0	8	0	0	114	26	0	377
Total	0	0	0	0	37	454	0	0	9	0	21	0	0	236	27	0	784
07:00 AM	0	0	0	0	7	243	0	0	6	0	9	0	0	133	9	0	407
07:15 AM	0	0	0	0	11	264	0	2	5	0	15	0	0	134	6	0	437
07:30 AM	0	0	0	0	36	227	0	0	6	1	15	0	0	155	6	0	446
07:45 AM	0	0	0	0	41	244	0	0	10	0	20	0	0	143	10	0	468
Total	0	0	0	0	95	978	0	2	27	1	59	0	0	565	31	0	1758
08:00 AM	0	0	0	0	13	206	0	0	8	0	18	0	0	154	6	0	405
08:15 AM	0	0	0	0	20	227	0	0	5	1	19	0	1	123	8	0	404
Total	0	0	0	0	33	433	0	0	13	1	37	0	1	277	14	0	809
04:00 PM	0	0	0	0	6	158	0	0	8	0	18	0	0	251	7	0	448
04:15 PM	0	0	0	0	14	176	0	0	10	3	12	0	0	225	11	0	451
04:30 PM	0	0	0	0	15	165	0	0	9	0	16	0	0	241	9	0	455
04:45 PM	0	0	0	0	20	143	0	1	14	0	19	0	0	222	7	0	426
Total	0	0	0	0	55	642	0	1	41	3	65	0	0	939	34	0	1780
05:00 PM	0	0	0	0	14	158	0	0	9	0	24	0	0	248	9	0	462
05:15 PM	0	0	0	0	28	130	0	0	18	0	11	0	0	204	7	0	398
05:30 PM	0	0	0	0	18	159	0	0	14	0	11	0	0	216	17	0	435
05:45 PM	0	0	0	0	19	120	0	0	18	2	9	0	0	193	16	0	377
Total	0	0	0	0	79	567	0	0	59	2	55	0	0	861	49	0	1672
Grand Total	0	0	0	0	299	3074	0	3	149	7	237	0	1	2878	155	0	6803
Apprch %	0	0	0	0	8.9	91.1	0	0.1	37.9	1.8	60.3	0	0	94.9	5.1	0	
Total %	0	0	0	0	4.4	45.2	0	0	2.2	0.1	3.5	0	0	42.3	2.3	0	

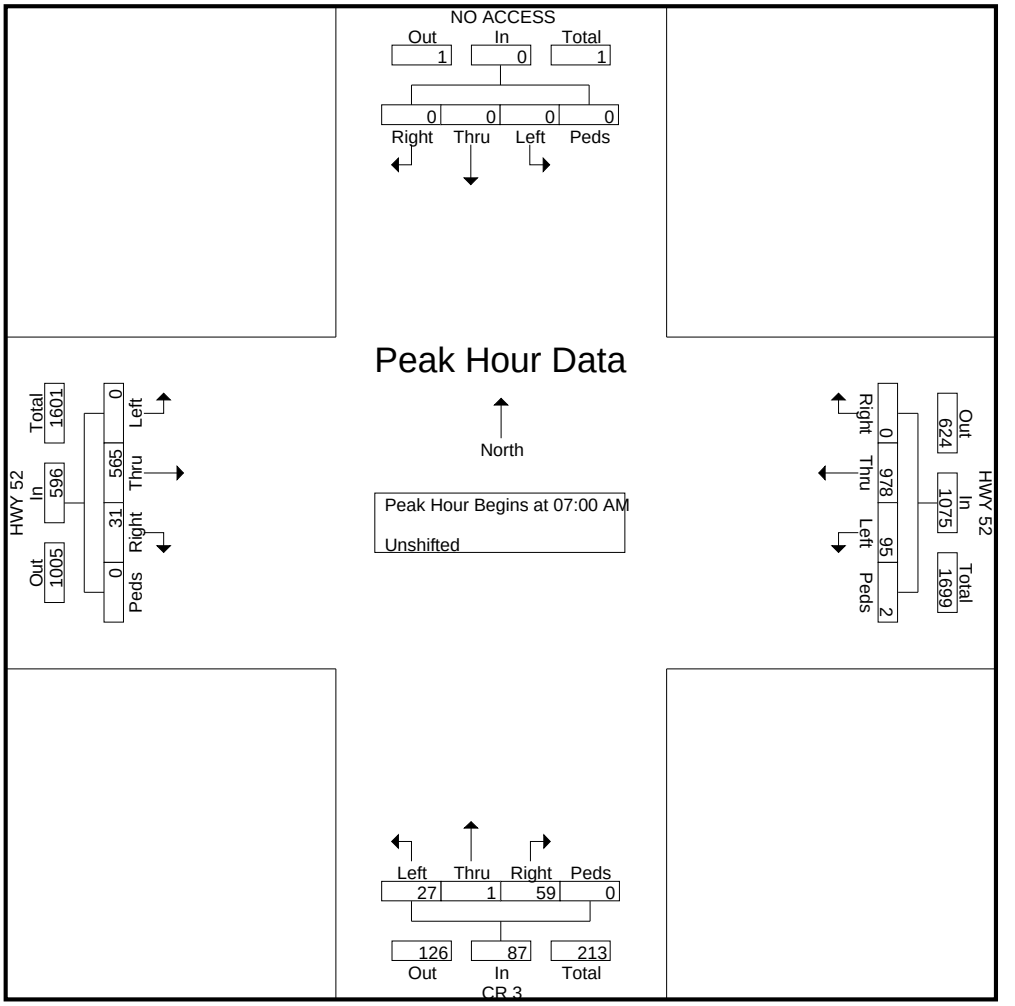
COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: CR 3
E/W STREET: HWY 52
CITY: ERIE
COUNTY: WELD

File Name : CR 3 HWY 52
Site Code : 00000008
Start Date : 8/19/2025
Page No : 2

	NO ACCESS SOUTHBOUND					HWY 52 WESTBOUND					CR 3 NORTHBOUND					HWY 52 EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	7	243	0	0	250	6	0	9	0	15	0	133	9	0	142	407
07:15 AM	0	0	0	0	0	11	**264**	0	**2**	277	5	0	15	0	20	0	134	6	0	140	437
07:30 AM	0	0	0	0	0	36	227	0	0	263	6	**1**	15	0	22	0	**155**	6	0	**161**	446
07:45 AM	0	0	0	0	0	**41**	244	0	0	**285**	**10**	0	**20**	0	**30**	0	143	**10**	0	153	**468**
Total Volume	0	0	0	0	0	95	978	0	2	1075	27	1	59	0	87	0	565	31	0	596	1758
% App. Total	0	0	0	0		8.8	91	0	0.2		31	1.1	67.8	0		0	94.8	5.2	0		
PHF	.000	.000	.000	.000	.000	.579	.926	.000	.250	.943	.675	.250	.738	.000	.725	.000	.911	.775	.000	.925	.939



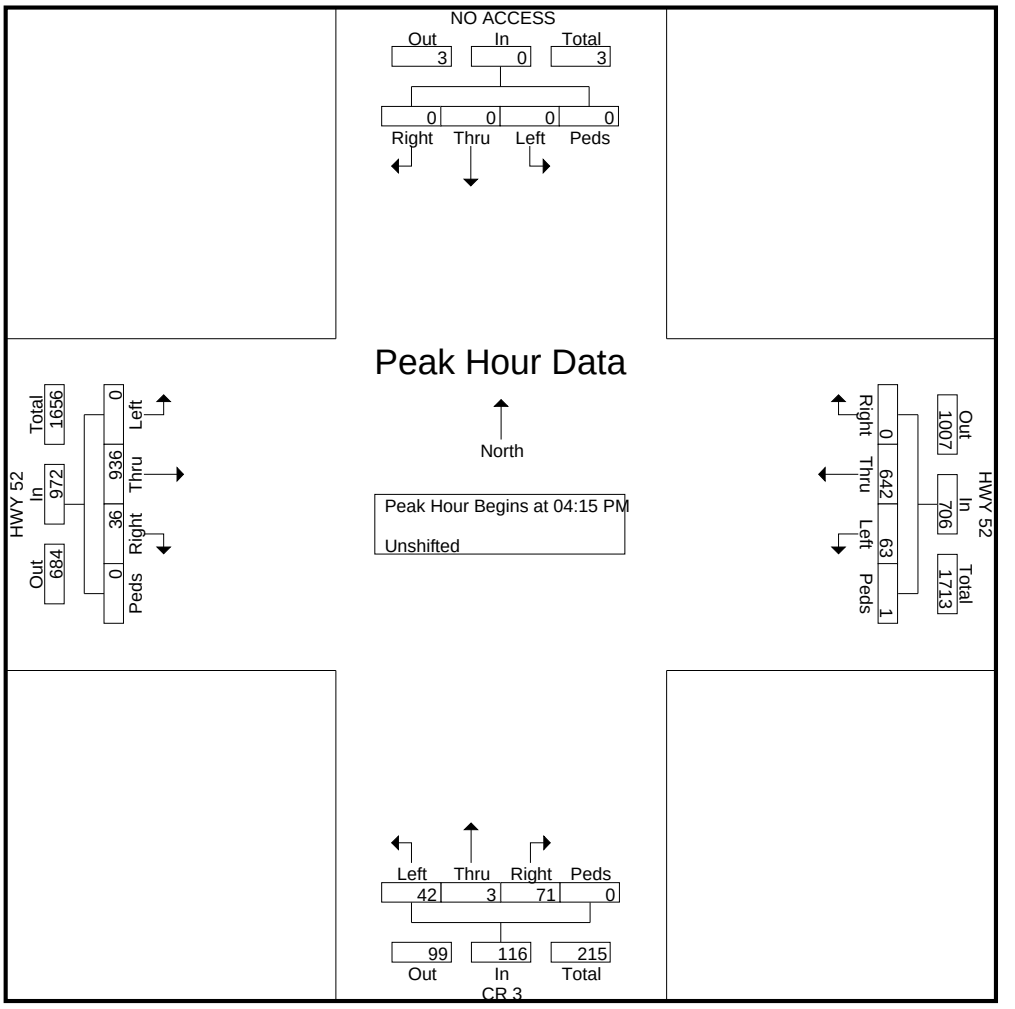
COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: CR 3
E/W STREET: HWY 52
CITY: ERIE
COUNTY: WELD

File Name : CR 3 HWY 52
Site Code : 00000008
Start Date : 8/19/2025
Page No : 3

	NO ACCESS SOUTHBOUND					HWY 52 WESTBOUND					CR 3 NORTHBOUND					HWY 52 EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	0	0	0	14	**176**	0	0	**190**	10	**3**	12	0	25	0	225	**11**	0	236	451
04:30 PM	0	0	0	0	0	15	165	0	0	180	9	0	16	0	25	0	241	9	0	250	455
04:45 PM	0	0	0	0	0	**20**	143	0	**1**	164	**14**	0	19	0	**33**	0	222	7	0	229	426
05:00 PM	0	0	0	0	0	14	158	0	0	172	9	0	**24**	0	33	0	**248**	9	0	**257**	**462**
Total Volume	0	0	0	0	0	63	642	0	1	706	42	3	71	0	116	0	936	36	0	972	1794
% App. Total	0	0	0	0		8.9	90.9	0	0.1		36.2	2.6	61.2	0		0	96.3	3.7	0		
PHF	.000	.000	.000	.000	.000	.788	.912	.000	.250	.929	.750	.250	.740	.000	.879	.000	.944	.818	.000	.946	.971



COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: NE COUNTY LINE RD
E/W STREET: HWY 52
CITY: ERIE
COUNTY: WELD

File Name : NE COUNTY LINE RD HWY52
Site Code : 00000005
Start Date : 9/3/2025
Page No : 1

Groups Printed- Unshifted

	NE COUNTY LINE RD SOUTHBOUND				HWY 52 WESTBOUND				NE COUNTY LINE RD NORTHBOUND				HWY 52 EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:30 AM	17	24	13	0	8	215	12	0	8	16	17	0	10	68	1	0	409
06:45 AM	28	20	20	0	15	223	10	0	7	14	11	0	12	100	5	0	465
Total	45	44	33	0	23	438	22	0	15	30	28	0	22	168	6	0	874
07:00 AM	29	31	32	0	9	214	3	0	11	30	3	0	2	94	10	0	468
07:15 AM	5	36	27	0	12	247	12	0	14	28	10	0	16	80	5	0	492
07:30 AM	26	23	47	0	16	254	14	0	27	43	18	0	11	107	9	0	595
07:45 AM	27	42	45	0	11	233	16	0	29	32	14	0	4	112	8	0	573
Total	87	132	151	0	48	948	45	0	81	133	45	0	33	393	32	0	2128
08:00 AM	24	39	42	0	19	233	13	0	29	47	9	0	12	91	9	0	567
08:15 AM	12	25	35	0	19	244	19	0	16	24	11	0	7	98	7	0	517
Total	36	64	77	0	38	477	32	0	45	71	20	0	19	189	16	0	1084
04:00 PM	25	37	5	0	11	145	35	0	23	66	10	0	32	259	22	0	670
04:15 PM	28	45	10	0	26	111	28	0	16	59	18	0	30	227	10	0	608
04:30 PM	19	41	6	0	28	156	31	0	14	53	14	0	24	248	12	0	646
04:45 PM	24	49	7	0	24	122	43	0	18	51	9	0	22	235	16	0	620
Total	96	172	28	0	89	534	137	0	71	229	51	0	108	969	60	0	2544
05:00 PM	31	30	9	0	21	138	36	0	19	62	26	0	26	222	10	0	630
05:15 PM	27	39	11	0	25	161	28	0	21	72	13	0	13	238	8	0	656
05:30 PM	28	47	14	0	32	141	24	0	26	66	18	0	15	226	12	0	649
05:45 PM	21	54	10	0	30	104	34	0	16	60	18	0	20	233	24	0	624
Total	107	170	44	0	108	544	122	0	82	260	75	0	74	919	54	0	2559
Grand Total	371	582	333	0	306	2941	358	0	294	723	219	0	256	2638	168	0	9189
Apprch %	28.8	45.3	25.9	0	8.5	81.6	9.9	0	23.8	58.5	17.7	0	8.4	86.2	5.5	0	
Total %	4	6.3	3.6	0	3.3	32	3.9	0	3.2	7.9	2.4	0	2.8	28.7	1.8	0	

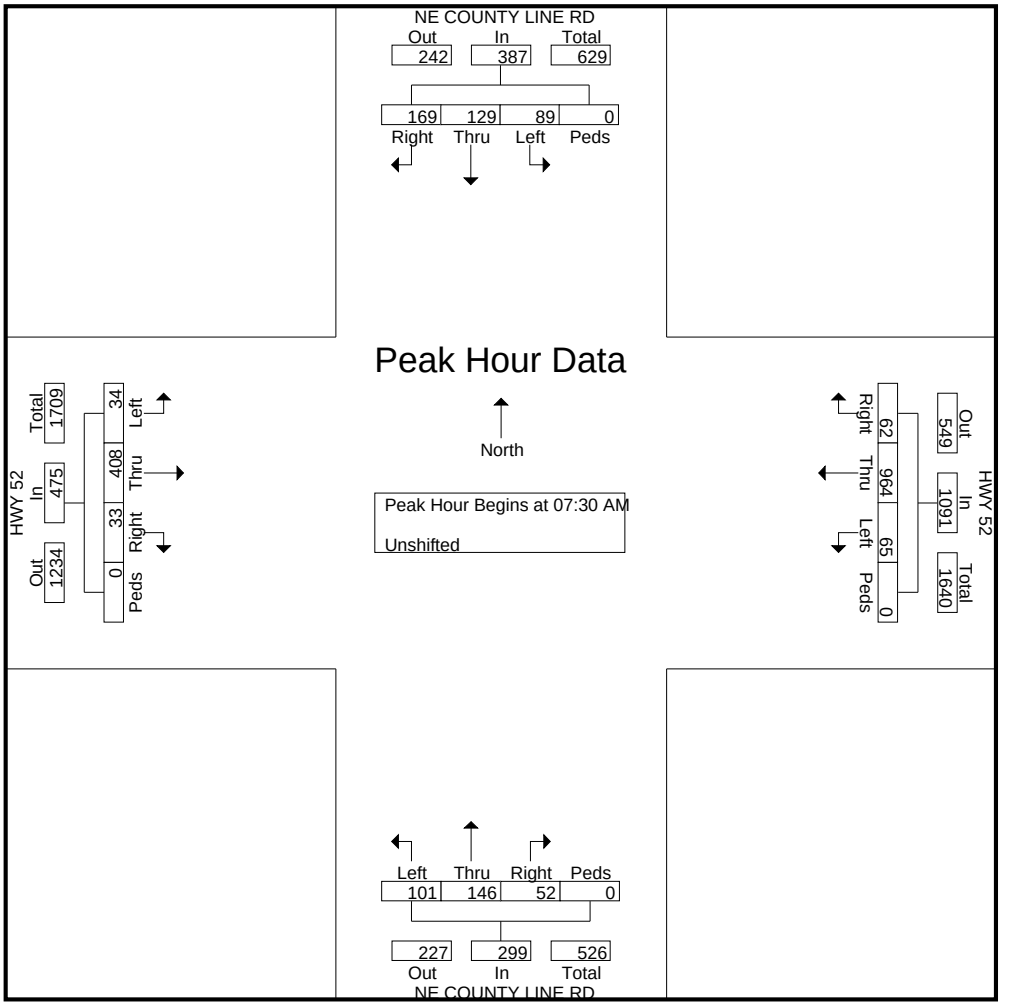
COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: NE COUNTY LINE RD
E/W STREET: HWY 52
CITY: ERIE
COUNTY: WELD

File Name : NE COUNTY LINE RD HWY52
Site Code : 00000005
Start Date : 9/3/2025
Page No : 2

	NE COUNTY LINE RD SOUTHBOUND					HWY 52 WESTBOUND					NE COUNTY LINE RD NORTHBOUND					HWY 52 EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	26	23	**47**	0	96	16	**254**	14	0	**284**	27	43	**18**	0	**88**	11	107	**9**	0	**127**	**595**
07:45 AM	**27**	**42**	45	0	**114**	11	233	16	0	260	**29**	32	14	0	75	4	**112**	8	0	124	573
08:00 AM	24	39	42	0	105	**19**	233	13	0	265	29	**47**	9	0	85	**12**	91	9	0	112	567
08:15 AM	12	25	35	0	72	19	244	**19**	0	282	16	24	11	0	51	7	98	7	0	112	517
Total Volume	89	129	169	0	387	65	964	62	0	1091	101	146	52	0	299	34	408	33	0	475	2252
% App. Total	23	33.3	43.7	0		6	88.4	5.7	0		33.8	48.8	17.4	0		7.2	85.9	6.9	0		
PHF	.824	.768	.899	.000	.849	.855	.949	.816	.000	.960	.871	.777	.722	.000	.849	.708	.911	.917	.000	.935	.946



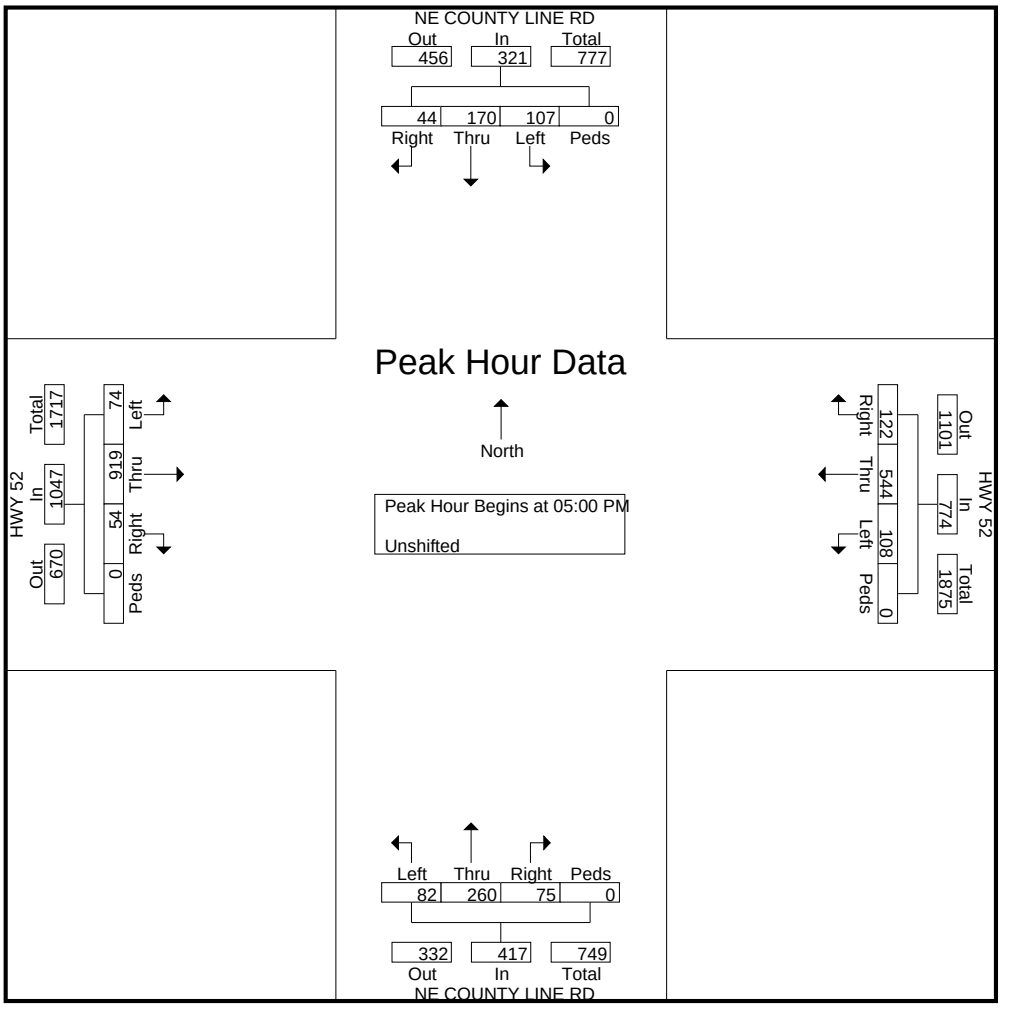
COUNTER MEASURES INC

1889 YORK ST
DENVER COLORADO
303-333-7409

N/S STREET: NE COUNTY LINE RD
E/W STREET: HWY 52
CITY: ERIE
COUNTY: WELD

File Name : NE COUNTY LINE RD HWY52
Site Code : 00000005
Start Date : 9/3/2025
Page No : 3

	NE COUNTY LINE RD SOUTHBOUND					HWY 52 WESTBOUND					NE COUNTY LINE RD NORTHBOUND					HWY 52 EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	**31**	30	9	0	70	21	138	**36**	0	195	19	62	**26**	0	107	**26**	222	10	0	258	630
05:15 PM	27	39	11	0	77	25	**161**	28	0	**214**	21	**72**	13	0	106	13	**238**	8	0	259	**656**
05:30 PM	28	47	**14**	0	**89**	**32**	141	24	0	197	**26**	66	18	0	**110**	15	226	12	0	253	649
05:45 PM	21	**54**	10	0	85	30	104	34	0	168	16	60	18	0	94	20	233	**24**	0	**277**	624
Total Volume	107	170	44	0	321	108	544	122	0	774	82	260	75	0	417	74	919	54	0	1047	2559
% App. Total	33.3	53	13.7	0		14	70.3	15.8	0		19.7	62.4	18	0		7.1	87.8	5.2	0		
PHF	.863	.787	.786	.000	.902	.844	.845	.847	.000	.904	.788	.903	.721	.000	.948	.712	.965	.563	.000	.945	.975



SPRING HILL UPDATE
Location: CR 3 S-O HWY 52
City: ERIE
County: WELD
Direction: NORTH/SOUTH

COUNTER MEASURES, INC.
TRAFFIC AND TRANSPORTATION FIELD DATA

Site Code:2508303
Site Code:2508303
Start Date: 08192025 8/19/2025
End Date: 08192025 8/20/2025
Longitude: 0.000000
Longitude: 0.000000

8/19/2025 Time	NORTH	SOUTH	Total
12:00 AM	*	*	0
1:00	*	*	0
2:00	*	*	0
3:00	*	*	0
4:00	*	*	0
5:00	*	*	0
6:00	19	28	47
7:00	48	121	169
8:00	84	113	197
9:00	78	103	181
10:00	71	91	162
11:00	66	78	144
12:00 PM	77	63	140
1:00	83	71	154
2:00	89	78	167
3:00	96	69	165
4:00	114	84	198
5:00	159	80	239
6:00	123	107	230
7:00	86	88	174
8:00	60	61	121
9:00	51	39	90
10:00	42	30	72
11:00	21	18	39
Total	1367	1322	2689
Percent	50.8%	49.2%	
AM Peak	8:00	7:00	8:00
Volume	84	121	197
PM Peak	5:00	6:00	5:00
Volume	159	107	239

SPRING HILL UPDATE
Location: CR 3 S-O HWY 52
City: ERIE
County: WELD
Direction: NORTH/SOUTH

COUNTER MEASURES, INC.
TRAFFIC AND TRANSPORTATION FIELD DATA

Site Code:2508303
Site Code:2508303
Start Date: 08192025 8/19/2025
End Date: 08192025 8/20/2025
Longitude: 0.000000
Longitude: 0.000000

8/20/2025	NORTH	SOUTH		
Time				Total
12:00 AM	17	14		31
1:00	10	7		17
2:00	9	9		18
3:00	11	16		27
4:00	18	20		38
5:00	20	24		44
6:00	27	32		59
7:00	53	112		165
8:00	80	106		186
9:00	72	108		180
10:00	76	84		160
11:00	70	72		142
12:00 PM	72	66		138
1:00	0	0		0
2:00	0	0		0
3:00	0	0		0
4:00	0	0		0
5:00	0	0		0
6:00	0	0		0
7:00	*	*		0
8:00	*	*		0
9:00	*	*		0
10:00	*	*		0
11:00	*	*		0
Total	535	670		1205
Percent	44.4%	55.6%		
AM Peak	8:00	7:00		8:00
Volume	80	112		186
PM Peak	12:00 PM	12:00 PM		12:00 PM
Volume	72	66		138
Grand Total	1902	1992		3894
Percent	48.8%	51.2%		
ADT		ADT: 2,859	AADT: 2,859	

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Spring Hill Update	**Organization:**	LSC Transportation Consultants, Inc.
Project Location:	Erie, CO	**Performed By:**	KDF
Scenario Description:	Buildout	**Date:**	9/18/2025
Analysis Year:	2045	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: 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		
Retail				127	79	48
Restaurant				0		
Cinema/Entertainment				0		
Residential				393	104	289
Hotel				0		
All Other Land Uses[2]				292	158	134
				812	341	471

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						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

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		0	0	2	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	3	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	812	341	471
Internal Capture Percentage	1%	1%	1%
External Vehicle-Trips[5]	802	336	466
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	4%	4%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	1%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, 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 *Trip Generation Manual*).

[4]Enter 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.

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

[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:	Spring Hill Update
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	1.00	79	79	1.00	48	48
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	104	104	1.00	289	289
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
Retail	14		6	0	7	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	6	3	58	0		0
Hotel	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		25	0	0	0	0
Retail	0		0	0	2	0
Restaurant	0	6		0	5	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	13	0	0		0
Hotel	0	3	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	3	76	79	76	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	2	102	104	102	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	158	158	158	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	2	46	48	46	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	3	286	289	286	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	134	134	134	0	0

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

[2]Person-Trips

[3]Total 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:	Spring Hill Update	**Organization:**	LSC Transportation Consultants, Inc.
Project Location:	Erie, CO	**Performed By:**	KDF
Scenario Description:	Buildout	**Date:**	9/18/2025
Analysis Year:	2045	**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		
Retail				381	187	194
Restaurant				0		
Cinema/Entertainment				0		
Residential				495	302	193
Hotel				0		
All Other Land Uses[2]				64	29	35
				940	518	422

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						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		1320	1320		1320	
Retail					1320	
Restaurant					1320	
Cinema/Entertainment					1320	
Residential		1320	1320			
Hotel					1320	

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		0	0	42	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	12	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	940	518	422
Internal Capture Percentage	11%	10%	13%
External Vehicle-Trips[5]	832	464	368
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	6%	22%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	14%	6%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, 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 *Trip Generation Manual*).

[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:	Spring Hill Update
Analysis Period:	**3**

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	1.00	187	187	1.00	194	194
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	302	302	1.00	193	193
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
Retail	4		56	8	42	10
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	8	54	27	0		6
Hotel	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		10	0	0	12	0
Retail	0		0	0	139	0
Restaurant	0	94		0	48	0
Cinema/Entertainment	0	7	0		12	0
Residential	0	12	0	0		0
Hotel	0	4	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	12	175	187	175	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	42	260	302	260	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	29	29	29	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	42	152	194	152	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	12	181	193	181	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	35	35	35	0	0

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

[2]Person-Trips

[3]Total 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.

LEVEL OF SERVICE DEFINITIONS

From *Highway Capacity Manual*, Transportation Research Board

SIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS)

LOS	Average Vehicle Delay sec/vehicle	Operational Characteristics
A	<10 seconds	Describes operations with low control delay, up to 10 sec/veh. This LOS occurs when progression is extremely favorable and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.
B	10 to 20 seconds	Describes operations with control delay greater than 10 seconds and up to 20 sec/veh. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of delay.
C	20 to 35 seconds	Describes operations with control delay greater than 20 and up to 35 sec/veh. These higher delays may result from only fair progression, longer cycle length, or both. Individual cycle failures may begin to appear at this level. Cycle failure occurs when a given green phase does not serve queued vehicles, and overflows occur. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.
D	35 to 55 seconds	Describes operations with control delay greater than 35 and up to 55 sec/veh. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	55 to 80 seconds	Describes operations with control delay greater than 55 and up to 80 sec/veh. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent.
F	>80 seconds	Describes operations with control delay in excess of 80 sec/veh. This level, considered unacceptable to most drivers, often occurs with over-saturation, that is, when arrival flow rates exceed the capacity of lane groups. It may also occur at high v/c ratios with many individual cycle failures. Poor progression and long cycle lengths may also contribute significantly to high delay levels.

LEVEL OF SERVICE DEFINITIONS

From *Highway Capacity Manual*, Transportation Research Board

UNSIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS)

Applicable to Two-Way Stop Control, All-Way Stop Control, and Roundabouts

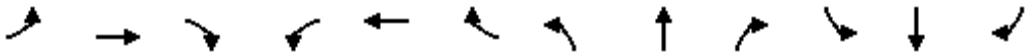
LOS	Average Vehicle Control Delay	Operational Characteristics
A	<10 seconds	Normally, vehicles on the stop-controlled approach only have to wait up to 10 seconds before being able to clear the intersection. Left-turning vehicles on the uncontrolled street do not have to wait to make their turn.
B	10 to 15 seconds	Vehicles on the stop-controlled approach will experience delays before being able to clear the intersection. The delay could be up to 15 seconds. Left-turning vehicles on the uncontrolled street may have to wait to make their turn.
C	15 to 25 seconds	Vehicles on the stop-controlled approach can expect delays in the range of 15 to 25 seconds before clearing the intersection. Motorists may begin to take chances due to the long delays, thereby posing a safety risk to through traffic. Left-turning vehicles on the uncontrolled street will now be required to wait to make their turn causing a queue to be created in the turn lane.
D	25 to 35 seconds	This is the point at which a traffic signal may be warranted for this intersection. The delays for the stop-controlled intersection are not considered to be excessive. The length of the queue may begin to block other public and private access points.
E	35 to 50 seconds	The delays for all critical traffic movements are considered to be unacceptable. The length of the queues for the stop-controlled approaches as well as the left-turn movements are extremely long. There is a high probability that this intersection will meet traffic signal warrants. The ability to install a traffic signal is affected by the location of other existing traffic signals. Consideration may be given to restricting the accesses by eliminating the left-turn movements from and to the stop-controlled approach.
F	>50 seconds	The delay for the critical traffic movements are probably in excess of 100 seconds. The length of the queues are extremely long. Motorists are selecting alternative routes due to the long delays. The only remedy for these long delays is installing a traffic signal or restricting the accesses. The potential for accidents at this intersection are extremely high due to motorist taking more risky chances. If the median permits, motorists begin making two-stage left-turns.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	34	408	33	65	964	101	146	89	129
Future Volume (vph)	34	408	33	65	964	101	146	89	129
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	5	2		1	6	3	8	7	4
Permitted Phases	2		2	6		8		4	
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	5.0	10.0	5.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	10.0	20.0	10.0	20.0
Total Split (s)	10.0	75.0	75.0	10.0	75.0	10.0	25.0	10.0	25.0
Total Split (%)	8.3%	62.5%	62.5%	8.3%	62.5%	8.3%	20.8%	8.3%	20.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Min	None	Min
Act Effct Green (s)	72.0	68.0	68.0	73.0	70.1	25.0	20.0	25.0	20.0
Actuated g/C Ratio	0.62	0.59	0.59	0.63	0.60	0.22	0.17	0.22	0.17
v/c Ratio	0.26	0.39	0.04	0.12	0.97	0.76	0.65	0.47	0.94
Control Delay	11.7	14.6	0.1	7.7	43.5	70.3	53.4	44.9	78.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.7	14.6	0.1	7.7	43.5	70.3	53.4	44.9	78.2
LOS	B	B	A	A	D	E	D	D	E
Approach Delay		13.4			41.4		59.1		70.6
Approach LOS		B			D		E		E

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 116	
Natural Cycle: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.97	
Intersection Signal Delay: 42.8	Intersection LOS: D
Intersection Capacity Utilization 89.7%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: E County Line Rd & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	408	33	65	964	62	101	146	52	89	129	169
Future Volume (veh/h)	34	408	33	65	964	62	101	146	52	89	129	169
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	36	429	35	68	1015	65	106	154	55	94	136	178
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	122	1089	923	553	1027	66	136	222	79	205	124	162
Arrive On Green	0.03	0.58	0.58	0.04	0.59	0.59	0.04	0.17	0.17	0.04	0.17	0.17
Sat Flow, veh/h	1781	1870	1585	1781	1739	111	1781	1316	470	1781	735	962
Grp Volume(v), veh/h	36	429	35	68	0	1080	106	0	209	94	0	314
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1850	1781	0	1786	1781	0	1697
Q Serve(g_s), s	0.9	14.7	1.1	1.8	0.0	68.0	5.0	0.0	13.1	5.0	0.0	20.0
Cycle Q Clear(g_c), s	0.9	14.7	1.1	1.8	0.0	68.0	5.0	0.0	13.1	5.0	0.0	20.0
Prop In Lane	1.00		1.00	1.00		0.06	1.00		0.26	1.00		0.57
Lane Grp Cap(c), veh/h	122	1089	923	553	0	1093	136	0	302	205	0	287
V/C Ratio(X)	0.30	0.39	0.04	0.12	0.00	0.99	0.78	0.00	0.69	0.46	0.00	1.10
Avail Cap(c_a), veh/h	145	1105	937	561	0	1093	136	0	302	205	0	287
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	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	29.0	13.4	10.6	9.9	0.0	23.8	43.3	0.0	46.3	40.1	0.0	49.2
Incr Delay (d2), s/veh	1.3	0.2	0.0	0.1	0.0	24.2	24.6	0.0	6.7	1.6	0.0	81.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	5.5	0.4	0.6	0.0	31.9	1.5	0.0	6.1	2.3	0.0	14.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.3	13.6	10.6	10.0	0.0	48.0	67.8	0.0	53.0	41.7	0.0	130.5
LnGrp LOS	C	B	B	A	A	D	E	A	D	D	A	F
Approach Vol, veh/h		500			1148			315			408	
Approach Delay, s/veh		14.6			45.8			58.0			110.0	
Approach LOS		B			D			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.5	74.0	10.0	25.0	8.5	75.0	10.0	25.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	70.0	5.0	20.0	5.0	70.0	5.0	20.0
Max Q Clear Time (g_c+I1), s	3.8	16.7	7.0	22.0	2.9	70.0	7.0	15.1
Green Ext Time (p_c), s	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	51.9
HCM 6th LOS	D

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	595	1000	4	1	0
Future Vol, veh/h	0	595	1000	4	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	607	1020	4	1	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1024	0	-	0	1629	1022
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	607	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	678	-	-	-	112	287
Stage 1	-	-	-	-	347	-
Stage 2	-	-	-	-	544	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	678	-	-	-	112	287
Mov Cap-2 Maneuver	-	-	-	-	112	-
Stage 1	-	-	-	-	347	-
Stage 2	-	-	-	-	544	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	37.4
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	678	-	-	-	112
HCM Lane V/C Ratio	-	-	-	-	0.009
HCM Control Delay (s)	0	-	-	-	37.4
HCM Lane LOS	A	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	565	31	95	978	27	59
Future Vol, veh/h	565	31	95	978	27	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	90
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	601	33	101	1040	29	63

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	634	0	1860	618
Stage 1	-	-	-	-	618	-
Stage 2	-	-	-	-	1242	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	949	-	81	489
Stage 1	-	-	-	-	538	-
Stage 2	-	-	-	-	272	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	949	-	61	489
Mov Cap-2 Maneuver	-	-	-	-	61	-
Stage 1	-	-	-	-	538	-
Stage 2	-	-	-	-	203	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	43.2
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	61	489	-	-	949	-
HCM Lane V/C Ratio	0.471	0.128	-	-	0.106	-
HCM Control Delay (s)	108.3	13.4	-	-	9.2	0
HCM Lane LOS	F	B	-	-	A	A
HCM 95th %tile Q(veh)	1.8	0.4	-	-	0.4	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	0	1	49	1	5	0	67	8	5	113	1
Future Vol, veh/h	2	0	1	49	1	5	0	67	8	5	113	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	68	68	68	68	68	68	68	68	68
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	0	1	72	1	7	0	99	12	7	166	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	290	292	167	286	286	105	167	0	0	111	0	0
Stage 1	181	181	-	105	105	-	-	-	-	-	-	-
Stage 2	109	111	-	181	181	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	662	619	877	666	623	949	1411	-	-	1479	-	-
Stage 1	821	750	-	901	808	-	-	-	-	-	-	-
Stage 2	896	804	-	821	750	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	653	616	877	663	620	949	1411	-	-	1479	-	-
Mov Cap-2 Maneuver	653	616	-	663	620	-	-	-	-	-	-	-
Stage 1	821	746	-	901	808	-	-	-	-	-	-	-
Stage 2	887	804	-	816	746	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.1	11	0	0.3
HCM LOS	B	B		

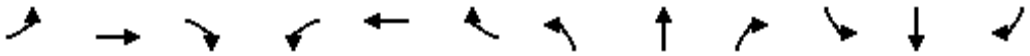
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1411	-	-	714	681	1479	-	-
HCM Lane V/C Ratio	-	-	-	0.006	0.119	0.005	-	-
HCM Control Delay (s)	0	-	-	10.1	11	7.4	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.4	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	74	919	54	108	544	82	260	107	170
Future Volume (vph)	74	919	54	108	544	82	260	107	170
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	5	2		1	6	3	8	7	4
Permitted Phases	2		2	6		8		4	
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	5.0	10.0	5.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	10.0	20.0	10.0	20.0
Total Split (s)	10.0	70.0	70.0	10.0	70.0	10.0	30.0	10.0	30.0
Total Split (%)	8.3%	58.3%	58.3%	8.3%	58.3%	8.3%	25.0%	8.3%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Min	None	Min
Act Effct Green (s)	65.4	60.3	60.3	66.6	62.8	28.6	23.6	29.9	26.0
Actuated g/C Ratio	0.57	0.53	0.53	0.58	0.55	0.25	0.21	0.26	0.23
v/c Ratio	0.25	0.95	0.06	0.77	0.68	0.33	0.90	0.73	0.52
Control Delay	11.0	45.8	0.1	52.4	23.1	36.0	70.9	62.7	44.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.0	45.8	0.1	52.4	23.1	36.0	70.9	62.7	44.3
LOS	B	D	A	D	C	D	E	E	D
Approach Delay		41.0			27.2		64.0		50.4
Approach LOS		D			C		E		D

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 114.2	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 41.8	Intersection LOS: D
Intersection Capacity Utilization 95.2%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: E County Line Rd & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	74	919	54	108	544	122	82	260	75	107	170	44
Future Volume (veh/h)	74	919	54	108	544	122	82	260	75	107	170	44
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	938	55	110	555	124	84	265	77	109	173	45
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	327	989	838	173	789	176	256	288	84	163	296	77
Arrive On Green	0.04	0.53	0.53	0.04	0.53	0.53	0.04	0.21	0.21	0.04	0.21	0.21
Sat Flow, veh/h	1781	1870	1585	1781	1480	331	1781	1393	405	1781	1431	372
Grp Volume(v), veh/h	76	938	55	110	0	679	84	0	342	109	0	218
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1811	1781	0	1798	1781	0	1803
Q Serve(g_s), s	2.2	53.8	1.9	3.2	0.0	31.8	4.2	0.0	21.1	5.0	0.0	12.4
Cycle Q Clear(g_c), s	2.2	53.8	1.9	3.2	0.0	31.8	4.2	0.0	21.1	5.0	0.0	12.4
Prop In Lane	1.00		1.00	1.00		0.18	1.00		0.23	1.00		0.21
Lane Grp Cap(c), veh/h	327	989	838	173	0	965	256	0	372	163	0	373
V/C Ratio(X)	0.23	0.95	0.07	0.64	0.00	0.70	0.33	0.00	0.92	0.67	0.00	0.58
Avail Cap(c_a), veh/h	334	1071	908	173	0	1037	256	0	396	163	0	397
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	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.8	25.3	13.1	26.0	0.0	19.8	34.1	0.0	44.1	37.8	0.0	40.6
Incr Delay (d2), s/veh	0.4	16.0	0.0	7.5	0.0	2.0	0.7	0.0	25.5	9.9	0.0	2.0
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	0.8	24.8	0.6	1.7	0.0	12.2	1.8	0.0	11.6	2.7	0.0	5.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.2	41.3	13.1	33.5	0.0	21.8	34.9	0.0	69.6	47.7	0.0	42.6
LnGrp LOS	B	D	B	C	A	C	C	A	E	D	A	D
Approach Vol, veh/h		1069			789			426			327	
Approach Delay, s/veh		38.0			23.5			62.7			44.3	
Approach LOS		D			C			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.0	65.0	10.0	28.5	9.5	65.5	10.0	28.5
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	65.0	5.0	25.0	5.0	65.0	5.0	25.0
Max Q Clear Time (g_c+I1), s	5.2	55.8	6.2	14.4	4.2	33.8	7.0	23.1
Green Ext Time (p_c), s	0.0	4.2	0.0	0.7	0.0	4.4	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	38.4
HCM 6th LOS	D

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	972	680	2	0	2
Future Vol, veh/h	1	972	680	2	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1002	701	2	0	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	703	0	-	0	1706	702
Stage 1	-	-	-	-	702	-
Stage 2	-	-	-	-	1004	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	895	-	-	-	100	438
Stage 1	-	-	-	-	491	-
Stage 2	-	-	-	-	354	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	895	-	-	-	100	438
Mov Cap-2 Maneuver	-	-	-	-	100	-
Stage 1	-	-	-	-	490	-
Stage 2	-	-	-	-	354	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	895	-	-	-	438
HCM Lane V/C Ratio	0.001	-	-	-	0.005
HCM Control Delay (s)	9	0	-	-	13.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	3.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	936	36	63	642	42	71
Future Vol, veh/h	936	36	63	642	42	71
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	90
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	965	37	65	662	43	73

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1002	0	1776	984
Stage 1	-	-	-	-	984	-
Stage 2	-	-	-	-	792	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	691	-	91	301
Stage 1	-	-	-	-	362	-
Stage 2	-	-	-	-	446	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	691	-	77	301
Mov Cap-2 Maneuver	-	-	-	-	77	-
Stage 1	-	-	-	-	362	-
Stage 2	-	-	-	-	380	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	50.2
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	77	301	-	-	691	-
HCM Lane V/C Ratio	0.562	0.243	-	-	0.094	-
HCM Control Delay (s)	100	20.8	-	-	10.8	0
HCM Lane LOS	F	C	-	-	B	A
HCM 95th %tile Q(veh)	2.4	0.9	-	-	0.3	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	1	0	32	0	8	0	94	45	5	88	0
Future Vol, veh/h	0	1	0	32	0	8	0	94	45	5	88	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	0	34	0	9	0	101	48	5	95	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	235	254	95	231	230	125	95	0	0	149	0	0
Stage 1	105	105	-	125	125	-	-	-	-	-	-	-
Stage 2	130	149	-	106	105	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	720	650	962	724	670	926	1499	-	-	1432	-	-
Stage 1	901	808	-	879	792	-	-	-	-	-	-	-
Stage 2	874	774	-	900	808	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	711	647	962	721	667	926	1499	-	-	1432	-	-
Mov Cap-2 Maneuver	711	647	-	721	667	-	-	-	-	-	-	-
Stage 1	901	805	-	879	792	-	-	-	-	-	-	-
Stage 2	866	774	-	895	805	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	10.1	0	0.4
HCM LOS	B	B		

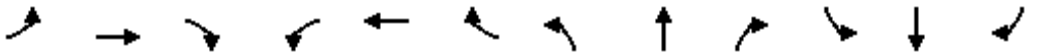
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1499	-	-	647	754	1432	-	-
HCM Lane V/C Ratio	-	-	-	0.002	0.057	0.004	-	-
HCM Control Delay (s)	0	-	-	10.6	10.1	7.5	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.2	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	39	540	38	74	1025	115	167	102	147
Future Volume (vph)	39	540	38	74	1025	115	167	102	147
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	5	2		1	6	3	8	7	4
Permitted Phases	2		2	6		8		4	
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	5.0	10.0	5.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	10.0	20.0	10.0	20.0
Total Split (s)	10.0	70.0	70.0	10.0	70.0	10.0	30.0	10.0	30.0
Total Split (%)	8.3%	58.3%	58.3%	8.3%	58.3%	8.3%	25.0%	8.3%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Min	None	Min
Act Effct Green (s)	69.1	65.2	65.2	69.1	65.2	28.8	23.7	28.8	23.7
Actuated g/C Ratio	0.59	0.56	0.56	0.59	0.56	0.25	0.20	0.25	0.20
v/c Ratio	0.30	0.55	0.04	0.20	1.12	0.86	0.64	0.50	0.93
Control Delay	14.4	19.7	0.1	10.1	93.5	84.8	49.2	42.3	71.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.4	19.7	0.1	10.1	93.5	84.8	49.2	42.3	71.0
LOS	B	B	A	B	F	F	D	D	E
Approach Delay		18.2			88.2		61.2		64.4
Approach LOS		B			F		E		E

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 116.8	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.12	
Intersection Signal Delay: 63.7	Intersection LOS: E
Intersection Capacity Utilization 99.9%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: E County Line Rd & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	540	38	74	1025	71	115	167	59	102	147	193
Future Volume (veh/h)	39	540	38	74	1025	71	115	167	59	102	147	193
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	41	568	40	78	1079	75	121	176	62	107	155	203
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	116	1010	856	406	947	66	136	278	98	238	155	203
Arrive On Green	0.03	0.54	0.54	0.04	0.55	0.55	0.04	0.21	0.21	0.04	0.21	0.21
Sat Flow, veh/h	1781	1870	1585	1781	1729	120	1781	1321	465	1781	735	962
Grp Volume(v), veh/h	41	568	40	78	0	1154	121	0	238	107	0	358
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1849	1781	0	1787	1781	0	1697
Q Serve(g_s), s	1.2	23.8	1.4	2.3	0.0	65.0	5.0	0.0	14.4	5.0	0.0	25.0
Cycle Q Clear(g_c), s	1.2	23.8	1.4	2.3	0.0	65.0	5.0	0.0	14.4	5.0	0.0	25.0
Prop In Lane	1.00		1.00	1.00		0.06	1.00		0.26	1.00		0.57
Lane Grp Cap(c), veh/h	116	1010	856	406	0	1012	136	0	376	238	0	357
V/C Ratio(X)	0.35	0.56	0.05	0.19	0.00	1.14	0.89	0.00	0.63	0.45	0.00	1.00
Avail Cap(c_a), veh/h	136	1024	868	411	0	1012	136	0	376	238	0	357
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	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.5	18.0	12.9	13.7	0.0	26.9	42.3	0.0	42.7	37.6	0.0	46.9
Incr Delay (d2), s/veh	1.8	0.7	0.0	0.2	0.0	75.1	46.5	0.0	3.4	1.3	0.0	48.0
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	0.6	9.3	0.5	0.8	0.0	45.6	2.8	0.0	6.5	2.5	0.0	14.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.3	18.7	12.9	13.9	0.0	102.0	88.8	0.0	46.1	39.0	0.0	94.9
LnGrp LOS	C	B	B	B	A	F	F	A	D	D	A	F
Approach Vol, veh/h		649			1232			359			465	
Approach Delay, s/veh		19.1			96.4			60.5			82.0	
Approach LOS		B			F			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.6	69.1	10.0	30.0	8.7	70.0	10.0	30.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	65.0	5.0	25.0	5.0	65.0	5.0	25.0
Max Q Clear Time (g_c+I1), s	4.3	25.8	7.0	27.0	3.2	67.0	7.0	16.4
Green Ext Time (p_c), s	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	70.6
HCM 6th LOS	E

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	700	1170	4	1	1
Future Vol, veh/h	1	700	1170	4	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	714	1194	4	1	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1198	0	-	0	1912	1196
Stage 1	-	-	-	-	1196	-
Stage 2	-	-	-	-	716	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	583	-	-	-	75	227
Stage 1	-	-	-	-	287	-
Stage 2	-	-	-	-	484	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	583	-	-	-	75	227
Mov Cap-2 Maneuver	-	-	-	-	75	-
Stage 1	-	-	-	-	286	-
Stage 2	-	-	-	-	484	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	37.4
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	583	-	-	-	113
HCM Lane V/C Ratio	0.002	-	-	-	0.018
HCM Control Delay (s)	11.2	0	-	-	37.4
HCM Lane LOS	B	A	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	2	2	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	750	1323	120	95
Demand Flow Rate, veh/h	766	1349	122	97
Vehicles Circulating, veh/h	177	78	766	1362
Vehicles Exiting, veh/h	1282	738	177	65
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	6.2	8.5	6.4	11.6
Approach LOS	A	A	A	B

Lane	Left	Right	Left	Right	Left	Bypass	Left
Designated Moves	LT	TR	LT	TR	LT	R	LTR
Assumed Moves	LT	TR	LT	TR	LT	R	LTR
RT Channelized						Yield	
Lane Util	0.470	0.530	0.470	0.530	1.000		1.000
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.535		2.535
Critical Headway, s	4.645	4.328	4.645	4.328	4.328	72	4.328
Entry Flow, veh/h	360	406	634	715	50	650	97
Cap Entry Lane, veh/h	1147	1222	1256	1329	740	0.980	446
Entry HV Adj Factor	0.980	0.979	0.981	0.981	0.974	71	0.975
Flow Entry, veh/h	353	398	622	701	49	637	95
Cap Entry, veh/h	1124	1197	1232	1304	721	0.111	435
V/C Ratio	0.314	0.332	0.505	0.538	0.068	6.9	0.217
Control Delay, s/veh	6.2	6.2	8.4	8.6	5.7	A	11.6
LOS	A	A	A	A	A	0	B
95th %tile Queue, veh	1	1	3	3	0		1

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	1	1	56	1	6	1	105	9	6	155	1
Future Vol, veh/h	2	1	1	56	1	6	1	105	9	6	155	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	92	92	92	68	92	92	92	92	68
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	1	1	61	1	7	1	114	10	7	168	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	308	309	169	305	304	119	169	0	0	124	0	0
Stage 1	183	183	-	121	121	-	-	-	-	-	-	-
Stage 2	125	126	-	184	183	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	644	605	875	647	609	933	1409	-	-	1463	-	-
Stage 1	819	748	-	883	796	-	-	-	-	-	-	-
Stage 2	879	792	-	818	748	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	636	601	875	642	605	933	1409	-	-	1463	-	-
Mov Cap-2 Maneuver	636	601	-	642	605	-	-	-	-	-	-	-
Stage 1	818	744	-	882	795	-	-	-	-	-	-	-
Stage 2	871	791	-	811	744	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.4	11.1	0.1	0.3
HCM LOS	B	B		

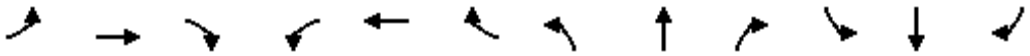
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1409	-	-	672	661	1463	-	-
HCM Lane V/C Ratio	0.001	-	-	0.009	0.104	0.004	-	-
HCM Control Delay (s)	7.6	0	-	10.4	11.1	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	85	950	32	123	560	94	297	122	194
Future Volume (vph)	85	950	32	123	560	94	297	122	194
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	5	2		1	6	3	8	7	4
Permitted Phases	2		2	6		8		4	
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	5.0	10.0	5.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	10.0	20.0	10.0	20.0
Total Split (s)	10.0	65.0	65.0	15.0	70.0	10.0	30.0	10.0	30.0
Total Split (%)	8.3%	54.2%	54.2%	12.5%	58.3%	8.3%	25.0%	8.3%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Min	None	Min
Act Effct Green (s)	65.0	60.0	60.0	73.4	65.9	30.0	25.0	30.0	25.0
Actuated g/C Ratio	0.55	0.50	0.50	0.62	0.55	0.25	0.21	0.25	0.21
v/c Ratio	0.30	1.03	0.04	0.65	0.71	0.45	1.01	0.91	0.64
Control Delay	12.2	67.5	0.1	35.9	24.4	40.3	94.5	93.6	50.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.2	67.5	0.1	35.9	24.4	40.3	94.5	93.6	50.0
LOS	B	E	A	D	C	D	F	F	D
Approach Delay		61.1			26.1		83.8		64.5
Approach LOS		E			C		F		E

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 118.9	
Natural Cycle: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.03	
Intersection Signal Delay: 55.0	Intersection LOS: D
Intersection Capacity Utilization 101.1%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 1: E County Line Rd & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	950	32	123	560	139	94	297	86	122	194	50
Future Volume (veh/h)	85	950	32	123	560	139	94	297	86	122	194	50
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	87	969	33	126	571	142	96	303	88	124	198	51
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	297	967	820	154	764	190	240	300	87	139	309	80
Arrive On Green	0.04	0.52	0.52	0.05	0.53	0.53	0.04	0.22	0.22	0.04	0.22	0.22
Sat Flow, veh/h	1781	1870	1585	1781	1446	360	1781	1393	405	1781	1434	369
Grp Volume(v), veh/h	87	969	33	126	0	713	96	0	391	124	0	249
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1806	1781	0	1798	1781	0	1804
Q Serve(g_s), s	2.6	60.0	1.2	4.0	0.0	35.7	4.9	0.0	25.0	5.0	0.0	14.6
Cycle Q Clear(g_c), s	2.6	60.0	1.2	4.0	0.0	35.7	4.9	0.0	25.0	5.0	0.0	14.6
Prop In Lane	1.00		1.00	1.00		0.20	1.00		0.23	1.00		0.20
Lane Grp Cap(c), veh/h	297	967	820	154	0	954	240	0	387	139	0	389
V/C Ratio(X)	0.29	1.00	0.04	0.82	0.00	0.75	0.40	0.00	1.01	0.89	0.00	0.64
Avail Cap(c_a), veh/h	302	967	820	216	0	1012	240	0	387	139	0	389
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	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.7	28.0	13.8	28.4	0.0	21.3	34.7	0.0	45.5	41.0	0.0	41.4
Incr Delay (d2), s/veh	0.5	29.3	0.0	15.3	0.0	2.9	1.1	0.0	48.1	46.1	0.0	3.5
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	1.0	31.0	0.4	2.2	0.0	13.9	2.1	0.0	15.8	2.8	0.0	6.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.2	57.4	13.8	43.7	0.0	24.2	35.8	0.0	93.6	87.0	0.0	44.9
LnGrp LOS	B	F	B	D	A	C	D	A	F	F	A	D
Approach Vol, veh/h		1089			839			487			373	
Approach Delay, s/veh		52.9			27.2			82.2			58.9	
Approach LOS		D			C			F			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.0	65.0	10.0	30.0	9.7	66.3	10.0	30.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	60.0	5.0	25.0	5.0	65.0	5.0	25.0
Max Q Clear Time (g_c+I1), s	6.0	62.0	6.9	16.6	4.6	37.7	7.0	27.0
Green Ext Time (p_c), s	0.1	0.0	0.0	0.7	0.0	4.6	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	51.1
HCM 6th LOS	D

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	1160	820	2	1	2
Future Vol, veh/h	1	1160	820	2	1	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1196	845	2	1	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	847	0	-	0	2044	846
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	1198	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	790	-	-	-	62	362
Stage 1	-	-	-	-	421	-
Stage 2	-	-	-	-	286	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	790	-	-	-	62	362
Mov Cap-2 Maneuver	-	-	-	-	62	-
Stage 1	-	-	-	-	419	-
Stage 2	-	-	-	-	286	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	31.5
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	790	-	-	-	139
HCM Lane V/C Ratio	0.001	-	-	-	0.022
HCM Control Delay (s)	9.6	0	-	-	31.5
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	2	2	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1210	879	164	134
Demand Flow Rate, veh/h	1234	896	168	137
Vehicles Circulating, veh/h	165	148	1254	898
Vehicles Exiting, veh/h	870	1188	145	146
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.9	6.6	11.1	8.0
Approach LOS	A	A	B	A

Lane	Left	Right	Left	Right	Left	Bypass	Left
Designated Moves	LT	TR	LT	TR	LT	R	LTR
Assumed Moves	LT	TR	LT	TR	LT	R	LTR
RT Channelized						Yield	
Lane Util	0.470	0.530	0.470	0.530	1.000		1.000
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.535		2.535
Critical Headway, s	4.645	4.328	4.645	4.328	4.328	86	4.328
Entry Flow, veh/h	580	654	421	475	82	411	137
Cap Entry Lane, veh/h	1160	1234	1178	1252	489	0.980	662
Entry HV Adj Factor	0.980	0.981	0.981	0.981	0.980	84	0.982
Flow Entry, veh/h	569	641	413	466	80	403	134
Cap Entry, veh/h	1137	1210	1156	1228	479	0.209	650
V/C Ratio	0.500	0.530	0.357	0.379	0.168	12.3	0.207
Control Delay, s/veh	8.8	8.9	6.6	6.6	9.9	B	8.0
LOS	A	A	A	A	A	1	A
95th %tile Queue, veh	3	3	2	2	1		1

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	1	1	37	1	9	1	145	51	6	130	1
Future Vol, veh/h	1	1	1	37	1	9	1	145	51	6	130	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	1	1	40	1	10	1	156	55	6	140	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	344	366	141	340	339	184	141	0	0	211	0	0
Stage 1	153	153	-	186	186	-	-	-	-	-	-	-
Stage 2	191	213	-	154	153	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	610	562	907	614	582	858	1442	-	-	1360	-	-
Stage 1	849	771	-	816	746	-	-	-	-	-	-	-
Stage 2	811	726	-	848	771	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	600	559	907	610	579	858	1442	-	-	1360	-	-
Mov Cap-2 Maneuver	600	559	-	610	579	-	-	-	-	-	-	-
Stage 1	848	767	-	815	745	-	-	-	-	-	-	-
Stage 2	800	725	-	842	767	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.5	11.1	0	0.3
HCM LOS	B	B		

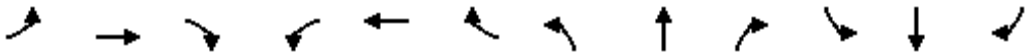
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1442	-	-	658	645	1360	-	-
HCM Lane V/C Ratio	0.001	-	-	0.005	0.078	0.005	-	-
HCM Control Delay (s)	7.5	0	-	10.5	11.1	7.7	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	39	576	38	74	1105	115	167	111	147
Future Volume (vph)	39	576	38	74	1105	115	167	111	147
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	5	2		1	6	3	8	7	4
Permitted Phases	2		2	6		8		4	
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	5.0	10.0	5.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	10.0	20.0	10.0	20.0
Total Split (s)	10.0	70.0	70.0	10.0	70.0	10.0	30.0	10.0	30.0
Total Split (%)	8.3%	58.3%	58.3%	8.3%	58.3%	8.3%	25.0%	8.3%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Min	None	Min
Act Effct Green (s)	69.1	65.2	65.2	69.1	65.2	28.8	23.7	28.8	23.7
Actuated g/C Ratio	0.59	0.56	0.56	0.59	0.56	0.25	0.20	0.25	0.20
v/c Ratio	0.30	0.58	0.04	0.21	1.22	0.86	0.64	0.54	0.93
Control Delay	14.4	20.6	0.1	10.3	134.5	84.8	49.2	44.5	71.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.4	20.6	0.1	10.3	134.5	84.8	49.2	44.5	71.0
LOS	B	C	A	B	F	F	D	D	E
Approach Delay		19.0			127.3		61.2		64.5
Approach LOS		B			F		E		E

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 116.8	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.22	
Intersection Signal Delay: 82.5	Intersection LOS: F
Intersection Capacity Utilization 102.0%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 1: E County Line Rd & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	576	38	74	1105	90	115	167	59	111	147	193
Future Volume (veh/h)	39	576	38	74	1105	90	115	167	59	111	147	193
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	41	606	40	78	1163	95	121	176	62	117	155	203
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	116	1010	856	381	934	76	136	278	98	238	155	203
Arrive On Green	0.03	0.54	0.54	0.04	0.55	0.55	0.04	0.21	0.21	0.04	0.21	0.21
Sat Flow, veh/h	1781	1870	1585	1781	1706	139	1781	1321	465	1781	735	962
Grp Volume(v), veh/h	41	606	40	78	0	1258	121	0	238	117	0	358
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1845	1781	0	1787	1781	0	1697
Q Serve(g_s), s	1.2	26.2	1.4	2.3	0.0	65.0	5.0	0.0	14.4	5.0	0.0	25.0
Cycle Q Clear(g_c), s	1.2	26.2	1.4	2.3	0.0	65.0	5.0	0.0	14.4	5.0	0.0	25.0
Prop In Lane	1.00		1.00	1.00		0.08	1.00		0.26	1.00		0.57
Lane Grp Cap(c), veh/h	116	1010	856	381	0	1010	136	0	376	238	0	357
V/C Ratio(X)	0.35	0.60	0.05	0.20	0.00	1.25	0.89	0.00	0.63	0.49	0.00	1.00
Avail Cap(c_a), veh/h	136	1024	868	386	0	1010	136	0	376	238	0	357
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	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.5	18.6	12.9	14.2	0.0	26.9	42.3	0.0	42.7	38.9	0.0	46.9
Incr Delay (d2), s/veh	1.8	1.0	0.0	0.3	0.0	118.7	46.5	0.0	3.4	1.6	0.0	48.0
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	0.6	10.3	0.5	0.8	0.0	57.7	2.8	0.0	6.5	0.8	0.0	14.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.3	19.5	12.9	14.5	0.0	145.5	88.8	0.0	46.1	40.5	0.0	94.9
LnGrp LOS	C	B	B	B	A	F	F	A	D	D	A	F
Approach Vol, veh/h		687			1336			359			475	
Approach Delay, s/veh		19.8			137.9			60.5			81.5	
Approach LOS		B			F			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.6	69.1	10.0	30.0	8.7	70.0	10.0	30.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	65.0	5.0	25.0	5.0	65.0	5.0	25.0
Max Q Clear Time (g_c+I1), s	4.3	28.2	7.0	27.0	3.2	67.0	7.0	16.4
Green Ext Time (p_c), s	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	90.4
HCM 6th LOS	F

Intersection	
Int Delay, s/veh	19.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	724	21	6	1211	4	58	0	17	1	0	1
Future Vol, veh/h	1	724	21	6	1211	4	58	0	17	1	0	1
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	200	-	200	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	85	85	98	98	85	85	85	98	85	98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	739	25	7	1236	4	68	0	20	1	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1240	0	0	764	0	0	1994	1995	739	2016	2018	1238
Stage 1	-	-	-	-	-	-	741	741	-	1252	1252	-
Stage 2	-	-	-	-	-	-	1253	1254	-	764	766	-
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	562	-	-	849	-	-	~ 45	60	417	43	58	214
Stage 1	-	-	-	-	-	-	408	423	-	211	244	-
Stage 2	-	-	-	-	-	-	211	243	-	396	412	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	562	-	-	849	-	-	~ 44	59	417	41	57	214
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 44	59	-	41	57	-
Stage 1	-	-	-	-	-	-	407	422	-	211	242	-
Stage 2	-	-	-	-	-	-	208	241	-	376	411	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	$ 462.8	58.8
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	55	562	-	-	849	-	-	69
HCM Lane V/C Ratio	1.604	0.002	-	-	0.008	-	-	0.03
HCM Control Delay (s)	$ 462.8	11.4	-	-	9.3	-	-	58.8
HCM Lane LOS	F	B	-	-	A	-	-	F
HCM 95th %tile Q(veh)	8.2	0	-	-	0	-	-	0.1

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	8.8
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	2	2	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	794	1383	282	95
Demand Flow Rate, veh/h	810	1410	288	97
Vehicles Circulating, veh/h	231	123	784	1468
Vehicles Exiting, veh/h	1334	756	257	65
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	6.9	9.6	8.7	13.0
Approach LOS	A	A	A	B

Lane	Left	Right	Left	Right	Left	Bypass	Left
Designated Moves	LT	TR	LT	TR	LT	R	LTR
Assumed Moves	LT	TR	LT	TR	LT	R	LTR
RT Channelized						Yield	
Lane Util	0.470	0.530	0.470	0.530	1.000		1.000
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.535		2.535
Critical Headway, s	4.645	4.328	4.645	4.328	4.328	193	4.328
Entry Flow, veh/h	381	429	663	747	95	638	97
Cap Entry Lane, veh/h	1091	1167	1205	1279	729	0.980	408
Entry HV Adj Factor	0.979	0.981	0.981	0.981	0.976	189	0.975
Flow Entry, veh/h	373	421	650	733	93	626	95
Cap Entry, veh/h	1069	1145	1182	1255	711	0.302	398
V/C Ratio	0.349	0.368	0.550	0.584	0.130	9.7	0.238
Control Delay, s/veh	6.9	6.8	9.5	9.7	6.5	A	13.0
LOS	A	A	A	A	A	1	B
95th %tile Queue, veh	2	2	3	4	0		1

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	1	1	56	1	21	1	188	9	29	274	1
Future Vol, veh/h	2	1	1	56	1	21	1	188	9	29	274	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	92	92	92	68	92	92	92	92	68
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	1	1	61	1	23	1	204	10	32	298	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	586	579	299	575	574	209	299	0	0	214	0	0
Stage 1	363	363	-	211	211	-	-	-	-	-	-	-
Stage 2	223	216	-	364	363	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	422	426	741	429	429	831	1262	-	-	1356	-	-
Stage 1	656	625	-	791	728	-	-	-	-	-	-	-
Stage 2	780	724	-	655	625	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	400	414	741	417	417	831	1262	-	-	1356	-	-
Mov Cap-2 Maneuver	400	414	-	417	417	-	-	-	-	-	-	-
Stage 1	655	608	-	790	727	-	-	-	-	-	-	-
Stage 2	757	723	-	634	608	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13	14.1	0.1	0.7
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1262	-	-	456	482	1356	-	-
HCM Lane V/C Ratio	0.001	-	-	0.013	0.176	0.023	-	-
HCM Control Delay (s)	7.9	0	-	13	14.1	7.7	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.6	0.1	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	64	17	6	203	211	23
Future Vol, veh/h	64	17	6	203	211	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	100
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	70	18	7	221	229	25

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	464	229	254	0	-	0
Stage 1	229	-	-	-	-	-
Stage 2	235	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	556	810	1311	-	-	-
Stage 1	809	-	-	-	-	-
Stage 2	804	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	553	810	1311	-	-	-
Mov Cap-2 Maneuver	553	-	-	-	-	-
Stage 1	805	-	-	-	-	-
Stage 2	804	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.8	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1311	-	553	810	-	-
HCM Lane V/C Ratio	0.005	-	0.126	0.023	-	-
HCM Control Delay (s)	7.8	-	12.4	9.5	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.4	0.1	-	-

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	88	125	92	121	177	51
Future Vol, veh/h	88	125	92	121	177	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	100
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	96	136	100	132	192	55

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	524	192	247	0	-	0
Stage 1	192	-	-	-	-	-
Stage 2	332	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	514	850	1319	-	-	-
Stage 1	841	-	-	-	-	-
Stage 2	727	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	475	850	1319	-	-	-
Mov Cap-2 Maneuver	475	-	-	-	-	-
Stage 1	777	-	-	-	-	-
Stage 2	727	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.9	3.4	0
HCM LOS	B		

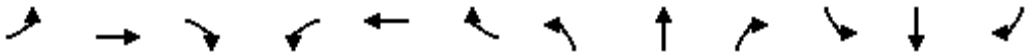
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1319	-	475	850	-	-
HCM Lane V/C Ratio	0.076	-	0.201	0.16	-	-
HCM Control Delay (s)	8	-	14.5	10	-	-
HCM Lane LOS	A	-	B	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.7	0.6	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	85	1025	32	123	608	94	297	141	194
Future Volume (vph)	85	1025	32	123	608	94	297	141	194
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	5	2		1	6	3	8	7	4
Permitted Phases	2		2	6		8		4	
Detector Phase	5	2	2	1	6	3	8	7	4
Switch Phase									
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	5.0	10.0	5.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	10.0	20.0	10.0	20.0
Total Split (s)	10.0	65.0	65.0	15.0	70.0	10.0	30.0	10.0	30.0
Total Split (%)	8.3%	54.2%	54.2%	12.5%	58.3%	8.3%	25.0%	8.3%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Min	None	Min
Act Effct Green (s)	65.0	60.0	60.0	73.4	65.9	30.0	25.0	30.0	25.0
Actuated g/C Ratio	0.55	0.50	0.50	0.62	0.55	0.25	0.21	0.25	0.21
v/c Ratio	0.35	1.11	0.04	0.65	0.77	0.45	1.01	1.05	0.64
Control Delay	13.6	94.8	0.1	35.9	27.1	40.3	94.5	130.1	50.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	94.8	0.1	35.9	27.1	40.3	94.5	130.1	50.0
LOS	B	F	A	D	C	D	F	F	D
Approach Delay		86.1			28.4		83.8		79.3
Approach LOS		F			C		F		E

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 118.9	
Natural Cycle: 120	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.11	
Intersection Signal Delay: 67.2	Intersection LOS: E
Intersection Capacity Utilization 106.1%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 1: E County Line Rd & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	1025	32	123	608	152	94	297	86	141	194	50
Future Volume (veh/h)	85	1025	32	123	608	152	94	297	86	141	194	50
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	87	1046	33	126	620	155	96	303	88	144	198	51
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	255	967	820	154	763	191	240	300	87	139	309	80
Arrive On Green	0.04	0.52	0.52	0.05	0.53	0.53	0.04	0.22	0.22	0.04	0.22	0.22
Sat Flow, veh/h	1781	1870	1585	1781	1444	361	1781	1393	405	1781	1434	369
Grp Volume(v), veh/h	87	1046	33	126	0	775	96	0	391	144	0	249
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1805	1781	0	1798	1781	0	1804
Q Serve(g_s), s	2.6	60.0	1.2	4.0	0.0	41.1	4.9	0.0	25.0	5.0	0.0	14.6
Cycle Q Clear(g_c), s	2.6	60.0	1.2	4.0	0.0	41.1	4.9	0.0	25.0	5.0	0.0	14.6
Prop In Lane	1.00		1.00	1.00		0.20	1.00		0.23	1.00		0.20
Lane Grp Cap(c), veh/h	255	967	820	154	0	954	240	0	387	139	0	389
V/C Ratio(X)	0.34	1.08	0.04	0.82	0.00	0.81	0.40	0.00	1.01	1.04	0.00	0.64
Avail Cap(c_a), veh/h	260	967	820	216	0	1012	240	0	387	139	0	389
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	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.7	28.0	13.8	28.4	0.0	22.6	34.7	0.0	45.5	42.8	0.0	41.4
Incr Delay (d2), s/veh	0.8	53.5	0.0	15.3	0.0	4.9	1.1	0.0	48.1	86.6	0.0	3.5
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	1.0	37.5	0.4	2.2	0.0	16.5	2.1	0.0	15.8	4.8	0.0	6.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.5	81.5	13.8	43.7	0.0	27.5	35.8	0.0	93.6	129.4	0.0	44.9
LnGrp LOS	C	F	B	D	A	C	D	A	F	F	A	D
Approach Vol, veh/h		1166			901			487			393	
Approach Delay, s/veh		75.0			29.7			82.2			75.9	
Approach LOS		E			C			F			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.0	65.0	10.0	30.0	9.7	66.3	10.0	30.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	60.0	5.0	25.0	5.0	65.0	5.0	25.0
Max Q Clear Time (g_c+I1), s	6.0	62.0	6.9	16.6	4.6	43.1	7.0	27.0
Green Ext Time (p_c), s	0.1	0.0	0.0	0.7	0.0	4.9	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	62.5
HCM 6th LOS	E

Intersection	
Int Delay, s/veh	11.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1193	61	18	842	2	39	0	12	1	0	2
Future Vol, veh/h	1	1193	61	18	842	2	39	0	12	1	0	2
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	200	-	200	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	85	85	97	97	85	85	85	97	85	97
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	1230	72	21	868	2	46	0	14	1	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	870	0	0	1302	0	0	2144	2144	1230	2186	2215	869
Stage 1	-	-	-	-	-	-	1232	1232	-	911	911	-
Stage 2	-	-	-	-	-	-	912	912	-	1275	1304	-
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	775	-	-	532	-	-	~ 35	49	217	33	44	351
Stage 1	-	-	-	-	-	-	217	249	-	328	353	-
Stage 2	-	-	-	-	-	-	328	353	-	205	230	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	775	-	-	532	-	-	~ 34	47	217	30	42	351
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 34	47	-	30	42	-
Stage 1	-	-	-	-	-	-	217	249	-	328	339	-
Stage 2	-	-	-	-	-	-	313	339	-	191	230	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.3	$ 440.9	53.7
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	42	775	-	-	532	-	-	77
HCM Lane V/C Ratio	1.429	0.001	-	-	0.04	-	-	0.04
HCM Control Delay (s)	$ 440.9	9.7	-	-	12	-	-	53.7
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	6	0	-	-	0.1	-	-	0.1

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	10.0
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	2	2	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1256	1005	258	134
Demand Flow Rate, veh/h	1281	1026	263	137
Vehicles Circulating, veh/h	276	171	1266	1051
Vehicles Exiting, veh/h	912	1200	291	146
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	11.1	7.6	14.3	9.4
Approach LOS	B	A	B	A

Lane	Left	Right	Left	Right	Left	Bypass	Left	
Designated Moves	LT	TR	LT	TR	LT	R	LTR	
Assumed Moves	LT	TR	LT	TR	LT	R	LTR	
RT Channelized						Yield		
Lane Util	0.470	0.530	0.470	0.530	1.000		1.000	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.535		2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.328	158	4.328	
Entry Flow, veh/h	602	679	482	544	105	406	137	
Cap Entry Lane, veh/h	1047	1123	1153	1228	484	0.980	581	
Entry HV Adj Factor	0.980	0.980	0.980	0.980	0.985	155	0.982	
Flow Entry, veh/h	590	666	473	533	103	398	134	
Cap Entry, veh/h	1027	1101	1131	1203	477	0.390	570	
V/C Ratio	0.575	0.605	0.418	0.443	0.217	16.7	0.236	
Control Delay, s/veh	11.0	11.2	7.5	7.6	10.7	C	9.4	
LOS	B	B	A	A	B	2	A	
95th %tile Queue, veh	4	4	2	2	1		1	

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	1	1	37	1	26	1	231	51	18	191	1
Future Vol, veh/h	1	1	1	37	1	26	1	231	51	18	191	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	1	1	40	1	28	1	248	55	19	205	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	536	549	206	523	522	276	206	0	0	303	0	0
Stage 1	244	244	-	278	278	-	-	-	-	-	-	-
Stage 2	292	305	-	245	244	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	455	443	835	465	459	763	1365	-	-	1258	-	-
Stage 1	760	704	-	728	680	-	-	-	-	-	-	-
Stage 2	716	662	-	759	704	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	431	435	835	457	451	763	1365	-	-	1258	-	-
Mov Cap-2 Maneuver	431	435	-	457	451	-	-	-	-	-	-	-
Stage 1	759	692	-	727	679	-	-	-	-	-	-	-
Stage 2	688	661	-	744	692	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12	12.5	0	0.7
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1365	-	-	516	546	1258	-	-
HCM Lane V/C Ratio	0.001	-	-	0.006	0.126	0.015	-	-
HCM Control Delay (s)	7.6	0	-	12	12.5	7.9	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.4	0	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	42	12	18	204	206	67
Future Vol, veh/h	42	12	18	204	206	67
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	100
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	46	13	20	222	224	73

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	486	224	297	0	-	0
Stage 1	224	-	-	-	-	-
Stage 2	262	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	540	815	1264	-	-	-
Stage 1	813	-	-	-	-	-
Stage 2	782	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	531	815	1264	-	-	-
Mov Cap-2 Maneuver	531	-	-	-	-	-
Stage 1	800	-	-	-	-	-
Stage 2	782	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.8	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1264	-	531	815	-	-
HCM Lane V/C Ratio	0.015	-	0.086	0.016	-	-
HCM Control Delay (s)	7.9	-	12.4	9.5	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	0	-	-

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	49	61	85	173	147	71
Future Vol, veh/h	49	61	85	173	147	71
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	100
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	53	66	92	188	160	77

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	532	160	237	0	-	0
Stage 1	160	-	-	-	-	-
Stage 2	372	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	508	885	1330	-	-	-
Stage 1	869	-	-	-	-	-
Stage 2	697	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	473	885	1330	-	-	-
Mov Cap-2 Maneuver	473	-	-	-	-	-
Stage 1	809	-	-	-	-	-
Stage 2	697	-	-	-	-	-

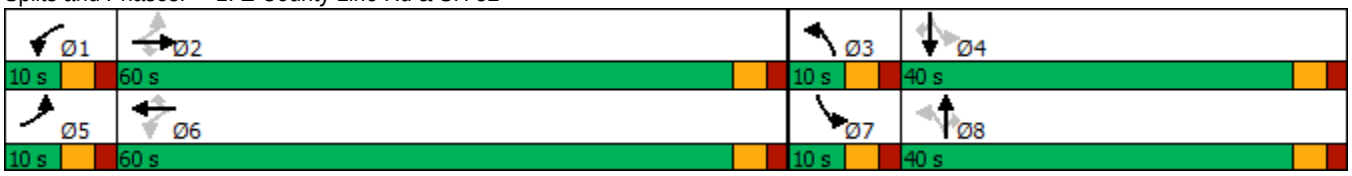
Approach	EB	NB	SB
HCM Control Delay, s	11.3	2.6	0
HCM LOS	B		

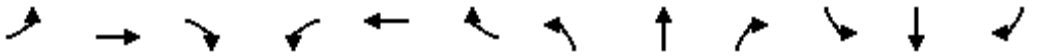
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1330	-	473	885	-	-
HCM Lane V/C Ratio	0.069	-	0.113	0.075	-	-
HCM Control Delay (s)	7.9	-	13.6	9.4	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.4	0.2	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	810	55	110	1535	105	170	250	90	150	220	285
Future Volume (vph)	60	810	55	110	1535	105	170	250	90	150	220	285
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	20.0	10.0	20.0	20.0	10.0	20.0	20.0
Total Split (s)	10.0	60.0	60.0	10.0	60.0	60.0	10.0	40.0	40.0	10.0	40.0	40.0
Total Split (%)	8.3%	50.0%	50.0%	8.3%	50.0%	50.0%	8.3%	33.3%	33.3%	8.3%	33.3%	33.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	Min
Act Effct Green (s)	56.1	51.0	51.0	57.4	53.6	53.6	25.0	19.9	19.9	25.0	19.9	19.9
Actuated g/C Ratio	0.55	0.50	0.50	0.57	0.53	0.53	0.25	0.20	0.20	0.25	0.20	0.20
v/c Ratio	0.39	0.48	0.07	0.35	0.86	0.13	0.77	0.72	0.24	0.76	0.64	0.75
Control Delay	17.1	18.0	0.4	12.9	28.5	3.5	55.2	50.6	6.6	56.2	46.4	36.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.1	18.0	0.4	12.9	28.5	3.5	55.2	50.6	6.6	56.2	46.4	36.7
LOS	B	B	A	B	C	A	E	D	A	E	D	D
Approach Delay		16.9			26.0			44.3			44.4	
Approach LOS		B			C			D			D	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 101.5	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 29.4	Intersection LOS: C
Intersection Capacity Utilization 84.7%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: E County Line Rd & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	810	55	110	1535	105	170	250	90	150	220	285
Future Volume (veh/h)	60	810	55	110	1535	105	170	250	90	150	220	285
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	63	853	58	116	1616	111	179	263	95	158	232	300
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	164	1751	781	358	1779	793	249	410	348	248	410	348
Arrive On Green	0.04	0.49	0.49	0.05	0.50	0.50	0.05	0.22	0.22	0.05	0.22	0.22
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	63	853	58	116	1616	111	179	263	95	158	232	300
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	1.8	16.7	2.0	3.3	43.4	3.9	5.0	13.3	5.2	5.0	11.5	19.0
Cycle Q Clear(g_c), s	1.8	16.7	2.0	3.3	43.4	3.9	5.0	13.3	5.2	5.0	11.5	19.0
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	164	1751	781	358	1779	793	249	410	348	248	410	348
V/C Ratio(X)	0.38	0.49	0.07	0.32	0.91	0.14	0.72	0.64	0.27	0.64	0.57	0.86
Avail Cap(c_a), veh/h	178	1876	837	358	1876	837	249	628	533	248	628	533
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.8	17.6	13.9	13.4	23.8	14.0	37.0	36.9	33.8	35.7	36.2	39.2
Incr Delay (d2), s/veh	1.5	0.2	0.0	0.5	6.8	0.1	9.5	1.7	0.4	5.3	1.2	9.0
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	0.7	6.0	0.7	1.2	17.2	1.3	2.5	5.9	1.9	1.6	5.1	7.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.2	17.8	14.0	13.9	30.6	14.1	46.5	38.6	34.2	41.0	37.5	48.2
LnGrp LOS	C	B	B	B	C	B	D	D	C	D	D	D
Approach Vol, veh/h		974			1843			537			690	
Approach Delay, s/veh		18.0			28.5			40.5			42.9	
Approach LOS		B			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.0	56.3	10.0	27.8	9.2	57.1	10.0	27.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	55.0	5.0	35.0	5.0	55.0	5.0	35.0
Max Q Clear Time (g_c+I1), s	5.3	18.7	7.0	21.0	3.8	45.4	7.0	15.3
Green Ext Time (p_c), s	0.0	6.0	0.0	1.9	0.0	6.7	0.0	1.5

Intersection Summary	
HCM 6th Ctrl Delay	30.0
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	1050	1750	4	1	1
Future Vol, veh/h	1	1050	1750	4	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	200	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1071	1786	4	1	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1790	0	-	0	2326	895
Stage 1	-	-	-	-	1788	-
Stage 2	-	-	-	-	538	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	342	-	-	-	31	284
Stage 1	-	-	-	-	119	-
Stage 2	-	-	-	-	549	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	342	-	-	-	31	284
Mov Cap-2 Maneuver	-	-	-	-	31	-
Stage 1	-	-	-	-	119	-
Stage 2	-	-	-	-	549	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	71.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	342	-	-	-	56
HCM Lane V/C Ratio	0.003	-	-	-	0.036
HCM Control Delay (s)	15.6	-	-	-	71.7
HCM Lane LOS	C	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Intersection Delay, s/veh	13.9
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	2	2	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1123	1968	175	155
Demand Flow Rate, veh/h	1145	2007	178	158
Vehicles Circulating, veh/h	271	114	1150	2028
Vehicles Exiting, veh/h	1855	1106	206	93
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.9	17.6	3.4	15.7
Approach LOS	A	C	A	C

Lane	Left	Right	Bypass	Left	Right	Left	Bypass	Left	Bypass
Designated Moves	LT	TR	R	LT	TR	LT	R	LT	R
Assumed Moves	LT	TR	R	LT	TR	LT	R	LT	R
RT Channelized			Yield				Free		Free
Lane Util	0.470	0.530		0.470	0.530	1.000		1.000	
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.535		2.535	
Critical Headway, s	4.645	4.328	60	4.645	4.328	4.328	108	4.328	60
Entry Flow, veh/h	510	575	1118	943	1064	70	1938	98	1938
Cap Entry Lane, veh/h	1052	1128	0.980	1215	1289	534	0.980	253	0.980
Entry HV Adj Factor	0.980	0.980	59	0.981	0.980	0.980	106	0.983	59
Flow Entry, veh/h	500	564	1096	925	1043	69	1900	96	1900
Cap Entry, veh/h	1031	1106	0.054	1192	1263	523	0.056	249	0.031
V/C Ratio	0.485	0.510	3.7	0.776	0.825	0.131	0.0	0.387	0.0
Control Delay, s/veh	9.2	9.1	A	16.4	18.7	8.6	A	25.2	A
LOS	A	A	0	C	C	A	0	D	0
95th %tile Queue, veh	3	3		8	10	0		2	

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	2	2	80	2	10	2	150	15	10	230	2
Future Vol, veh/h	2	2	2	80	2	10	2	150	15	10	230	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	92	92	92	68	92	92	92	92	68
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	3	3	87	2	11	3	163	16	11	250	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	458	459	252	454	452	171	253	0	0	179	0	0
Stage 1	274	274	-	177	177	-	-	-	-	-	-	-
Stage 2	184	185	-	277	275	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	513	499	787	516	503	873	1312	-	-	1397	-	-
Stage 1	732	683	-	825	753	-	-	-	-	-	-	-
Stage 2	818	747	-	729	683	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	500	493	787	507	497	873	1312	-	-	1397	-	-
Mov Cap-2 Maneuver	500	493	-	507	497	-	-	-	-	-	-	-
Stage 1	730	677	-	823	751	-	-	-	-	-	-	-
Stage 2	803	745	-	717	677	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.5	13.3	0.1	0.3
HCM LOS	B	B		

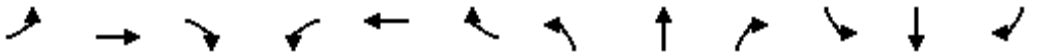
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1312	-	-	566	531	1397	-	-
HCM Lane V/C Ratio	0.002	-	-	0.016	0.188	0.008	-	-
HCM Control Delay (s)	7.8	0	-	11.5	13.3	7.6	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.7	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	1435	90	185	850	205	140	440	125	180	290	75
Future Volume (vph)	125	1435	90	185	850	205	140	440	125	180	290	75
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	20.0	10.0	20.0	20.0	10.0	20.0	20.0
Total Split (s)	10.0	59.0	59.0	15.0	64.0	64.0	11.0	35.0	35.0	11.0	35.0	35.0
Total Split (%)	8.3%	49.2%	49.2%	12.5%	53.3%	53.3%	9.2%	29.2%	29.2%	9.2%	29.2%	29.2%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	Min
Act Effct Green (s)	57.4	52.4	52.4	67.4	57.4	57.4	35.7	29.7	29.7	35.7	29.7	29.7
Actuated g/C Ratio	0.49	0.44	0.44	0.57	0.49	0.49	0.30	0.25	0.25	0.30	0.25	0.25
v/c Ratio	0.44	0.93	0.12	0.89	0.50	0.24	0.58	0.96	0.27	1.20	0.63	0.16
Control Delay	18.1	43.1	2.8	66.1	21.9	2.9	40.4	77.5	10.8	169.6	46.8	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.1	43.1	2.8	66.1	21.9	2.9	40.4	77.5	10.8	169.6	46.8	3.4
LOS	B	D	A	E	C	A	D	E	B	F	D	A
Approach Delay		39.0			25.4			58.3			81.4	
Approach LOS		D			C			E			F	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 118.1	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.20	
Intersection Signal Delay: 43.8	Intersection LOS: D
Intersection Capacity Utilization 99.7%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: E County Line Rd & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	1435	90	185	850	205	140	440	125	180	290	75
Future Volume (veh/h)	125	1435	90	185	850	205	140	440	125	180	290	75
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	128	1464	92	189	867	209	143	449	128	184	296	77
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	302	1585	707	217	1703	760	269	476	403	169	476	403
Arrive On Green	0.04	0.45	0.45	0.08	0.48	0.48	0.05	0.25	0.25	0.05	0.25	0.25
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	128	1464	92	189	867	209	143	449	128	184	296	77
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	4.6	45.2	4.0	6.8	19.6	9.2	6.0	27.4	7.6	6.0	16.3	4.4
Cycle Q Clear(g_c), s	4.6	45.2	4.0	6.8	19.6	9.2	6.0	27.4	7.6	6.0	16.3	4.4
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	302	1585	707	217	1703	760	269	476	403	169	476	403
V/C Ratio(X)	0.42	0.92	0.13	0.87	0.51	0.28	0.53	0.94	0.32	1.09	0.62	0.19
Avail Cap(c_a), veh/h	302	1649	735	234	1802	804	269	482	409	169	482	409
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.8	30.4	19.0	27.5	20.9	18.2	33.8	42.6	35.2	40.4	38.4	34.0
Incr Delay (d2), s/veh	0.9	9.0	0.1	26.8	0.2	0.2	2.0	27.2	0.4	93.8	2.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	19.3	1.4	4.2	7.4	3.2	3.0	15.6	2.9	6.3	7.5	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.7	39.4	19.0	54.4	21.1	18.4	35.8	69.8	35.6	134.2	40.9	34.2
LnGrp LOS	B	D	B	D	C	B	D	E	D	F	D	C
Approach Vol, veh/h		1684			1265			720			557	
Approach Delay, s/veh		36.7			25.6			57.0			70.8	
Approach LOS		D			C			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.9	56.9	11.0	34.6	10.0	60.8	11.0	34.6
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	54.0	6.0	30.0	5.0	59.0	6.0	30.0
Max Q Clear Time (g_c+I1), s	8.8	47.2	8.0	18.3	6.6	21.6	8.0	29.4
Green Ext Time (p_c), s	0.1	4.7	0.0	1.3	0.0	6.8	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	41.3
HCM 6th LOS	D

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	1740	1240	2	1	2
Future Vol, veh/h	1	1740	1240	2	1	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	200	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1794	1278	2	1	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1280	0	-	0	2178	640
Stage 1	-	-	-	-	1279	-
Stage 2	-	-	-	-	899	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	538	-	-	-	39	418
Stage 1	-	-	-	-	225	-
Stage 2	-	-	-	-	358	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	538	-	-	-	39	418
Mov Cap-2 Maneuver	-	-	-	-	39	-
Stage 1	-	-	-	-	225	-
Stage 2	-	-	-	-	358	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	42.5
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	538	-	-	-	99
HCM Lane V/C Ratio	0.002	-	-	-	0.031
HCM Control Delay (s)	11.7	-	-	-	42.5
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Intersection Delay, s/veh	14.1
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	2	2	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1761	1308	247	216
Demand Flow Rate, veh/h	1796	1334	252	221
Vehicles Circulating, veh/h	252	234	1838	1341
Vehicles Exiting, veh/h	1231	1730	147	227
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	17.5	10.8	11.6	8.6
Approach LOS	C	B	B	A

Lane	Left	Right	Bypass	Left	Right	Left	Bypass	Left	Bypass
Designated Moves	LT	TR	R	LT	TR	LT	R	LT	R
Assumed Moves	LT	TR	R	LT	TR	LT	R	LT	R
RT Channelized			Yield				Free		Free
Lane Util	0.470	0.530		0.470	0.530	1.000		1.000	
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.535		2.535	
Critical Headway, s	4.645	4.328	63	4.645	4.328	4.328	126	4.328	79
Entry Flow, veh/h	815	918	1188	627	707	126	1938	142	1938
Cap Entry Lane, veh/h	1071	1146	0.980	1088	1164	298	0.980	454	0.980
Entry HV Adj Factor	0.980	0.981	62	0.981	0.981	0.977	124	0.981	77
Flow Entry, veh/h	799	901	1164	615	693	123	1900	139	1900
Cap Entry, veh/h	1049	1124	0.053	1068	1142	291	0.065	445	0.041
V/C Ratio	0.761	0.801	3.5	0.576	0.607	0.423	0.0	0.313	0.0
Control Delay, s/veh	17.2	18.6	A	10.7	10.9	23.3	A	13.3	A
LOS	C	C	0	B	B	C	0	B	0
95th %tile Queue, veh	8	9		4	4	2		1	

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	2	2	50	2	15	2	220	75	10	185	2
Future Vol, veh/h	2	2	2	50	2	15	2	220	75	10	185	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	2	2	54	2	16	2	237	81	11	199	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	513	544	200	506	505	278	201	0	0	318	0	0
Stage 1	222	222	-	282	282	-	-	-	-	-	-	-
Stage 2	291	322	-	224	223	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	472	446	841	477	470	761	1371	-	-	1242	-	-
Stage 1	780	720	-	725	678	-	-	-	-	-	-	-
Stage 2	717	651	-	779	719	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	456	441	841	470	464	761	1371	-	-	1242	-	-
Mov Cap-2 Maneuver	456	441	-	470	464	-	-	-	-	-	-	-
Stage 1	778	713	-	724	677	-	-	-	-	-	-	-
Stage 2	698	650	-	767	712	-	-	-	-	-	-	-

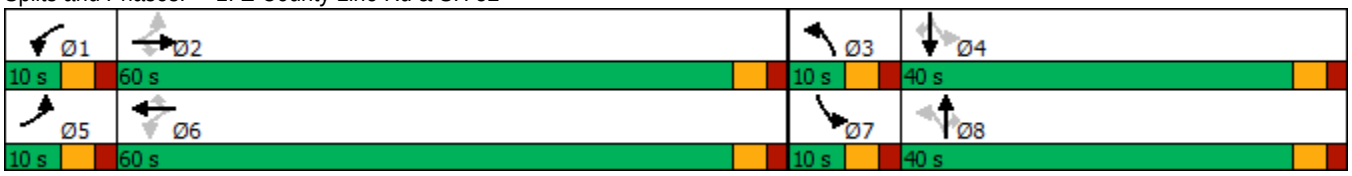
Approach	EB	WB	NB	SB
HCM Control Delay, s	11.9	13.1	0.1	0.4
HCM LOS	B	B		

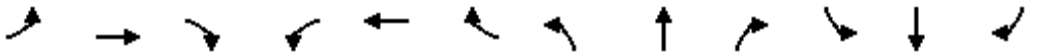
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1371	-	-	531	514	1242	-	-
HCM Lane V/C Ratio	0.002	-	-	0.012	0.14	0.009	-	-
HCM Control Delay (s)	7.6	0	-	11.9	13.1	7.9	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.5	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	859	55	110	1621	125	170	250	90	162	220	285
Future Volume (vph)	60	859	55	110	1621	125	170	250	90	162	220	285
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	20.0	10.0	20.0	20.0	10.0	20.0	20.0
Total Split (s)	10.0	60.0	60.0	10.0	60.0	60.0	10.0	40.0	40.0	10.0	40.0	40.0
Total Split (%)	8.3%	50.0%	50.0%	8.3%	50.0%	50.0%	8.3%	33.3%	33.3%	8.3%	33.3%	33.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	Min
Act Effct Green (s)	58.2	53.1	53.1	59.3	55.5	55.5	25.1	20.0	20.0	25.1	20.0	20.0
Actuated g/C Ratio	0.56	0.51	0.51	0.57	0.54	0.54	0.24	0.19	0.19	0.24	0.19	0.19
v/c Ratio	0.40	0.50	0.07	0.37	0.90	0.15	0.80	0.73	0.24	0.85	0.64	0.76
Control Delay	17.5	18.2	0.4	13.3	31.0	4.7	58.6	51.7	6.5	69.3	47.2	37.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.5	18.2	0.4	13.3	31.0	4.7	58.6	51.7	6.5	69.3	47.2	37.9
LOS	B	B	A	B	C	A	E	D	A	E	D	D
Approach Delay		17.2			28.2			46.0			48.6	
Approach LOS		B			C			D			D	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 103.4	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 31.2	Intersection LOS: C
Intersection Capacity Utilization 87.8%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: E County Line Rd & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	859	55	110	1621	125	170	250	90	162	220	285
Future Volume (veh/h)	60	859	55	110	1621	125	170	250	90	162	220	285
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	63	904	58	116	1706	132	179	263	95	171	232	300
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	151	1778	793	344	1804	805	245	408	346	244	408	346
Arrive On Green	0.04	0.50	0.50	0.05	0.51	0.51	0.05	0.22	0.22	0.05	0.22	0.22
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	63	904	58	116	1706	132	179	263	95	171	232	300
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	1.8	18.2	2.0	3.4	48.5	4.8	5.0	13.6	5.3	5.0	11.8	19.5
Cycle Q Clear(g_c), s	1.8	18.2	2.0	3.4	48.5	4.8	5.0	13.6	5.3	5.0	11.8	19.5
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	151	1778	793	344	1804	805	245	408	346	244	408	346
V/C Ratio(X)	0.42	0.51	0.07	0.34	0.95	0.16	0.73	0.64	0.27	0.70	0.57	0.87
Avail Cap(c_a), veh/h	164	1832	817	344	1832	817	245	614	520	244	614	520
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.5	17.9	13.8	13.6	24.9	14.1	38.3	37.9	34.7	38.1	37.2	40.2
Incr Delay (d2), s/veh	1.8	0.2	0.0	0.6	10.8	0.1	10.6	1.7	0.4	8.7	1.2	9.8
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	0.8	6.6	0.7	1.2	20.1	1.6	2.7	6.1	2.0	2.4	5.3	8.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.3	18.1	13.9	14.2	35.6	14.2	48.9	39.6	35.1	46.8	38.4	50.0
LnGrp LOS	C	B	B	B	D	B	D	D	D	D	D	D
Approach Vol, veh/h		1025			1954			537			703	
Approach Delay, s/veh		18.3			32.9			41.9			45.4	
Approach LOS		B			C			D			D	

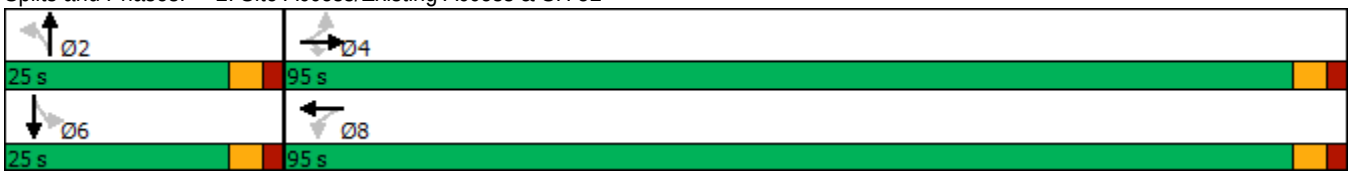
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.0	58.4	10.0	28.3	9.2	59.2	10.0	28.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	55.0	5.0	35.0	5.0	55.0	5.0	35.0
Max Q Clear Time (g_c+I1), s	5.4	20.2	7.0	21.5	3.8	50.5	7.0	15.6
Green Ext Time (p_c), s	0.0	6.4	0.0	1.8	0.0	3.7	0.0	1.5

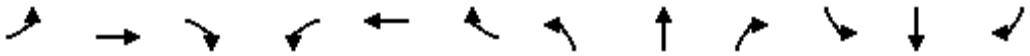
Intersection Summary	
HCM 6th Ctrl Delay	32.6
HCM 6th LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	1	1090	21	6	1798	58	0	1	0
Future Volume (vph)	1	1090	21	6	1798	58	0	1	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	15.0	15.0	15.0	15.0	15.0	5.0	5.0	5.0	5.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	95.0	95.0	95.0	95.0	95.0	25.0	25.0	25.0	25.0
Total Split (%)	79.2%	79.2%	79.2%	79.2%	79.2%	20.8%	20.8%	20.8%	20.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0		5.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	42.8	42.8	42.8	42.8	42.8		8.9		8.9
Actuated g/C Ratio	0.69	0.69	0.69	0.69	0.69		0.14		0.14
v/c Ratio	0.01	0.46	0.02	0.02	0.76		0.38		0.01
Control Delay	3.0	5.0	1.5	3.3	8.7		28.9		0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	3.0	5.0	1.5	3.3	8.7		28.9		0.0
LOS	A	A	A	A	A		C		A
Approach Delay		5.0			8.7		28.9		
Approach LOS		A			A		C		

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 62.4	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 7.8	Intersection LOS: A
Intersection Capacity Utilization 64.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 2: Site Access/Existing Access & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1090	21	6	1798	4	58	0	17	1	0	1
Future Volume (veh/h)	1	1090	21	6	1798	4	58	0	17	1	0	1
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	1	1112	23	7	1835	4	63	0	18	1	0	1
Peak Hour Factor	0.98	0.98	0.92	0.92	0.98	0.98	0.92	0.92	0.92	0.98	0.92	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	243	2555	1140	427	2616	6	221	6	31	152	26	78
Arrive On Green	0.72	0.72	0.72	0.72	0.72	0.72	0.09	0.00	0.09	0.09	0.00	0.09
Sat Flow, veh/h	252	3554	1585	496	3638	8	1078	63	326	539	279	818
Grp Volume(v), veh/h	1	1112	23	7	896	943	81	0	0	2	0	0
Grp Sat Flow(s),veh/h/ln	252	1777	1585	496	1777	1869	1466	0	0	1637	0	0
Q Serve(g_s), s	0.1	6.9	0.2	0.3	15.4	15.4	2.6	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	15.5	6.9	0.2	7.2	15.4	15.4	2.8	0.0	0.0	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.78		0.22	0.50		0.50
Lane Grp Cap(c), veh/h	243	2555	1140	427	1278	1344	258	0	0	256	0	0
V/C Ratio(X)	0.00	0.44	0.02	0.02	0.70	0.70	0.31	0.00	0.00	0.01	0.00	0.00
Avail Cap(c_a), veh/h	484	5954	2656	901	2977	3131	661	0	0	668	0	0
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	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.7	3.1	2.2	4.6	4.3	4.3	23.3	0.0	0.0	22.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.7	0.7	0.7	0.0	0.0	0.0	0.0	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	0.0	0.2	0.0	0.0	0.6	0.6	1.0	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.7	3.2	2.2	4.6	5.0	5.0	23.9	0.0	0.0	22.0	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	C	A	A	C	A	A
Approach Vol, veh/h		1136			1846			81			2	
Approach Delay, s/veh		3.2			5.0			23.9			22.0	
Approach LOS		A			A			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		10.1		43.6		10.1		43.6				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		20.0		90.0		20.0		90.0				
Max Q Clear Time (g_c+I1), s		4.8		17.5		2.1		17.4				
Green Ext Time (p_c), s		0.3		9.0		0.0		21.2				

Intersection Summary												
HCM 6th Ctrl Delay			4.8									
HCM 6th LOS			A									

Intersection	
Intersection Delay, s/veh	18.6
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	2	2	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1184	2056	380	155
Demand Flow Rate, veh/h	1208	2097	387	158
Vehicles Circulating, veh/h	370	182	1162	2186
Vehicles Exiting, veh/h	1914	1118	305	93
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	10.2	26.1	3.8	19.4
Approach LOS	B	D	A	C

Lane	Left	Right	Bypass	Left	Right	Left	Bypass	Left	Bypass
Designated Moves	LT	TR	R	LT	TR	LT	R	LT	R
Assumed Moves	LT	TR	R	LT	TR	LT	R	LT	R
RT Channelized			Yield				Free		Free
Lane Util	0.470	0.530		0.470	0.530	1.000		1.000	
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.535		2.535	
Critical Headway, s	4.645	4.328	111	4.645	4.328	4.328	249	4.328	60
Entry Flow, veh/h	516	581	1011	986	1111	138	1938	98	1938
Cap Entry Lane, veh/h	960	1037	0.980	1142	1217	529	0.980	221	0.980
Entry HV Adj Factor	0.979	0.981	109	0.980	0.981	0.983	244	0.983	59
Flow Entry, veh/h	505	570	991	966	1090	136	1900	96	1900
Cap Entry, veh/h	941	1017	0.110	1119	1193	520	0.128	218	0.031
V/C Ratio	0.537	0.560	4.6	0.864	0.913	0.261	0.0	0.443	0.0
Control Delay, s/veh	10.9	10.8	A	23.7	28.3	10.7	A	31.3	A
LOS	B	B	0	C	D	B	0	D	0
95th %tile Queue, veh	3	4		12	15	1		2	

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	2	2	2	80	2	28	2	240	15	34	352	2
Future Vol, veh/h	2	2	2	80	2	28	2	240	15	34	352	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	100	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	92	92	92	68	92	92	92	92	68
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	3	3	87	2	30	3	261	16	37	383	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	750	742	385	729	727	261	386	0	0	277	0	0
Stage 1	459	459	-	267	267	-	-	-	-	-	-	-
Stage 2	291	283	-	462	460	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	328	344	663	338	351	778	1172	-	-	1286	-	-
Stage 1	582	566	-	738	688	-	-	-	-	-	-	-
Stage 2	717	677	-	580	566	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	306	333	663	326	340	778	1172	-	-	1286	-	-
Mov Cap-2 Maneuver	306	333	-	326	340	-	-	-	-	-	-	-
Stage 1	580	550	-	736	686	-	-	-	-	-	-	-
Stage 2	685	675	-	558	550	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.5	18.6	0.1	0.7
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1172	-	-	386	383	1286	-	-
HCM Lane V/C Ratio	0.003	-	-	0.023	0.312	0.029	-	-
HCM Control Delay (s)	8.1	-	-	14.5	18.6	7.9	-	-
HCM Lane LOS	A	-	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.3	0.1	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	4	0	357	315	63
Future Vol, veh/h	0	4	0	357	315	63
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	200
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	4	0	388	342	68

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	342	-	0	-	0
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	701	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	701	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	701	-	-
HCM Lane V/C Ratio	-	0.006	-	-
HCM Control Delay (s)	-	10.2	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	105	18	17	252	294	25
Future Vol, veh/h	105	18	17	252	294	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	100
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	114	20	18	274	320	27

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	630	320	347	0	-	0
Stage 1	320	-	-	-	-	-
Stage 2	310	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	446	721	1212	-	-	-
Stage 1	736	-	-	-	-	-
Stage 2	744	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	439	721	1212	-	-	-
Mov Cap-2 Maneuver	439	-	-	-	-	-
Stage 1	725	-	-	-	-	-
Stage 2	744	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.2	0.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1212	-	439	721	-	-
HCM Lane V/C Ratio	0.015	-	0.26	0.027	-	-
HCM Control Delay (s)	8	-	16.1	10.1	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0	-	1	0.1	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	88	125	92	181	261	51
Future Vol, veh/h	88	125	92	181	261	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	100
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	96	136	100	197	284	55

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	681	284	339	0	-	0
Stage 1	284	-	-	-	-	-
Stage 2	397	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	416	755	1220	-	-	-
Stage 1	764	-	-	-	-	-
Stage 2	679	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	382	755	1220	-	-	-
Mov Cap-2 Maneuver	382	-	-	-	-	-
Stage 1	701	-	-	-	-	-
Stage 2	679	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.6	2.8	0
HCM LOS	B		

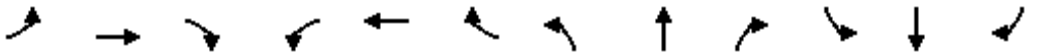
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1220	-	382	755	-	-
HCM Lane V/C Ratio	0.082	-	0.25	0.18	-	-
HCM Control Delay (s)	8.2	-	17.5	10.8	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0.3	-	1	0.7	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	1536	90	185	919	223	140	440	125	206	290	75
Future Volume (vph)	125	1536	90	185	919	223	140	440	125	206	290	75
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	20.0	10.0	20.0	20.0	10.0	20.0	20.0
Total Split (s)	10.0	59.0	59.0	15.0	64.0	64.0	11.0	35.0	35.0	11.0	35.0	35.0
Total Split (%)	8.3%	49.2%	49.2%	12.5%	53.3%	53.3%	9.2%	29.2%	29.2%	9.2%	29.2%	29.2%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	Min
Act Effct Green (s)	59.0	54.0	54.0	69.0	59.0	59.0	35.9	29.9	29.9	35.9	29.9	29.9
Actuated g/C Ratio	0.49	0.45	0.45	0.58	0.49	0.49	0.30	0.25	0.25	0.30	0.25	0.25
v/c Ratio	0.48	0.98	0.12	0.90	0.54	0.26	0.59	0.97	0.27	1.39	0.64	0.16
Control Delay	19.5	51.9	2.8	69.7	22.5	2.9	41.2	79.3	10.8	240.9	47.4	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.5	51.9	2.8	69.7	22.5	2.9	41.2	79.3	10.8	240.9	47.4	3.4
LOS	B	D	A	E	C	A	D	E	B	F	D	A
Approach Delay		47.1			25.8			59.6			111.3	
Approach LOS		D			C			E			F	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 119.9	
Natural Cycle: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.39	
Intersection Signal Delay: 51.0	Intersection LOS: D
Intersection Capacity Utilization 103.9%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 1: E County Line Rd & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	1536	90	185	919	223	140	440	125	206	290	75
Future Volume (veh/h)	125	1536	90	185	919	223	140	440	125	206	290	75
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	128	1567	92	189	938	228	143	449	128	210	296	77
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	283	1599	713	213	1747	779	259	468	396	160	468	396
Arrive On Green	0.04	0.45	0.45	0.08	0.49	0.49	0.05	0.25	0.25	0.05	0.25	0.25
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	128	1567	92	189	938	228	143	449	128	210	296	77
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	4.7	52.1	4.1	8.2	21.9	10.2	6.0	28.4	7.9	6.0	16.9	4.6
Cycle Q Clear(g_c), s	4.7	52.1	4.1	8.2	21.9	10.2	6.0	28.4	7.9	6.0	16.9	4.6
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	283	1599	713	213	1747	779	259	468	396	160	468	396
V/C Ratio(X)	0.45	0.98	0.13	0.89	0.54	0.29	0.55	0.96	0.32	1.31	0.63	0.19
Avail Cap(c_a), veh/h	283	1599	713	213	1747	779	259	468	396	160	468	396
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.3	32.5	19.3	34.2	21.1	18.1	35.9	44.4	36.7	41.6	40.1	35.5
Incr Delay (d2), s/veh	1.1	17.9	0.1	32.9	0.3	0.2	2.5	31.5	0.5	177.9	2.8	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	24.1	1.4	4.3	8.3	3.5	1.0	16.6	3.0	9.7	7.8	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.4	50.3	19.3	67.1	21.4	18.3	38.5	76.0	37.2	219.5	42.9	35.7
LnGrp LOS	B	D	B	E	C	B	D	E	D	F	D	D
Approach Vol, veh/h		1787			1355			720			583	
Approach Delay, s/veh		46.5			27.2			61.6			105.6	
Approach LOS		D			C			E			F	

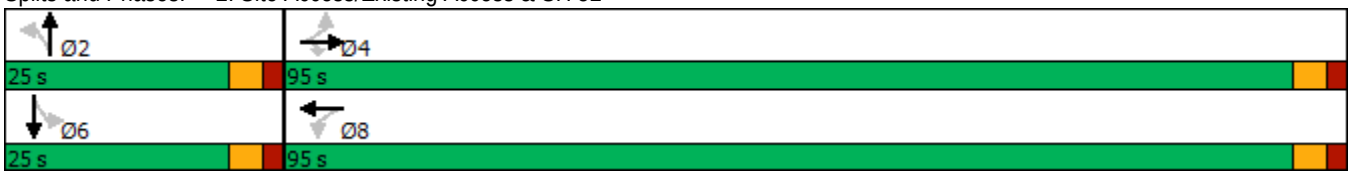
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.0	59.0	11.0	35.0	10.0	64.0	11.0	35.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	54.0	6.0	30.0	5.0	59.0	6.0	30.0
Max Q Clear Time (g_c+I1), s	10.2	54.1	8.0	18.9	6.7	23.9	8.0	30.4
Green Ext Time (p_c), s	0.0	0.0	0.0	1.3	0.0	7.5	0.0	0.0

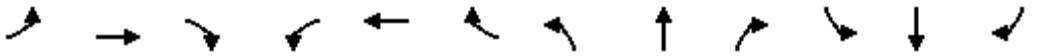
Intersection Summary	
HCM 6th Ctrl Delay	50.8
HCM 6th LOS	D

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	1	1806	61	18	1288	39	0	1	0
Future Volume (vph)	1	1806	61	18	1288	39	0	1	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	95.0	95.0	95.0	95.0	95.0	25.0	25.0	25.0	25.0
Total Split (%)	79.2%	79.2%	79.2%	79.2%	79.2%	20.8%	20.8%	20.8%	20.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0		5.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	42.3	42.3	42.3	42.3	42.3		7.7		7.7
Actuated g/C Ratio	0.70	0.70	0.70	0.70	0.70		0.13		0.13
v/c Ratio	0.00	0.75	0.06	0.16	0.54		0.28		0.01
Control Delay	3.0	7.9	0.9	6.3	5.1		25.7		0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	3.0	7.9	0.9	6.3	5.1		25.7		0.0
LOS	A	A	A	A	A		C		A
Approach Delay		7.7			5.2		25.7		
Approach LOS		A			A		C		

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 60.6	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 7.0	Intersection LOS: A
Intersection Capacity Utilization 64.2%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 2: Site Access/Existing Access & SH 52





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1806	61	18	1288	2	39	0	12	1	0	2
Future Volume (veh/h)	1	1806	61	18	1288	2	39	0	12	1	0	2
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	1	1862	66	20	1328	2	42	0	13	1	0	2
Peak Hour Factor	0.97	0.97	0.92	0.92	0.97	0.97	0.92	0.92	0.92	0.97	0.92	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	368	2632	1174	237	2696	4	195	13	30	105	25	92
Arrive On Green	0.74	0.74	0.74	0.74	0.74	0.74	0.09	0.00	0.09	0.09	0.00	0.09
Sat Flow, veh/h	412	3554	1585	246	3641	5	986	152	352	248	284	1064
Grp Volume(v), veh/h	1	1862	66	20	648	682	55	0	0	3	0	0
Grp Sat Flow(s),veh/h/ln	412	1777	1585	246	1777	1869	1490	0	0	1596	0	0
Q Serve(g_s), s	0.1	16.5	0.7	2.8	8.6	8.6	1.4	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	8.7	16.5	0.7	19.3	8.6	8.6	1.9	0.0	0.0	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.76		0.24	0.33		0.67
Lane Grp Cap(c), veh/h	368	2632	1174	237	1316	1384	239	0	0	221	0	0
V/C Ratio(X)	0.00	0.71	0.06	0.08	0.49	0.49	0.23	0.00	0.00	0.01	0.00	0.00
Avail Cap(c_a), veh/h	704	5533	2468	438	2766	2910	615	0	0	615	0	0
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	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	4.8	4.1	2.0	9.3	3.1	3.1	25.0	0.0	0.0	24.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.2	0.3	0.3	0.5	0.0	0.0	0.0	0.0	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	0.0	0.4	0.0	0.1	0.2	0.3	0.7	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	4.8	4.4	2.1	9.5	3.4	3.3	25.5	0.0	0.0	24.2	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	C	A	A	C	A	A
Approach Vol, veh/h		1929			1350			55			3	
Approach Delay, s/veh		4.4			3.4			25.5			24.2	
Approach LOS		A			A			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		10.0		47.8		10.0		47.8				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		20.0		90.0		20.0		90.0				
Max Q Clear Time (g_c+I1), s		3.9		18.5		2.1		21.3				
Green Ext Time (p_c), s		0.2		24.3		0.0		11.3				

Intersection Summary												
HCM 6th Ctrl Delay			4.4									
HCM 6th LOS			A									

Intersection	
Intersection Delay, s/veh	24.5
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	2	2	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1841	1491	473	216
Demand Flow Rate, veh/h	1878	1520	482	221
Vehicles Circulating, veh/h	458	322	1827	1615
Vehicles Exiting, veh/h	1299	1719	353	227
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	34.4	16.0	18.2	12.0
Approach LOS	D	C	C	B

Lane	Left	Right	Bypass	Left	Right	Left	Bypass	Left	Bypass
Designated Moves	LT	TR	R	LT	TR	LT	R	LT	R
Assumed Moves	LT	TR	R	LT	TR	LT	R	LT	R
RT Channelized			Yield				Free		Free
Lane Util	0.470	0.530		0.470	0.530	1.000		1.000	
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.535		2.535	
Critical Headway, s	4.645	4.328	156	4.645	4.328	4.328	268	4.328	79
Entry Flow, veh/h	809	913	963	714	806	214	1938	142	1938
Cap Entry Lane, veh/h	886	962	0.980	1004	1080	300	0.980	360	0.980
Entry HV Adj Factor	0.981	0.980	153	0.981	0.980	0.982	263	0.981	77
Flow Entry, veh/h	794	895	944	701	790	210	1900	139	1900
Cap Entry, veh/h	869	943	0.162	985	1059	295	0.138	353	0.041
V/C Ratio	0.913	0.949	5.4	0.711	0.746	0.712	0.0	0.395	0.0
Control Delay, s/veh	34.9	39.1	A	15.7	16.4	41.0	A	18.7	A
LOS	D	E	1	C	C	E	0	C	0
95th %tile Queue, veh	13	16		6	7	5		2	

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	2	2	50	2	38	2	322	75	26	259	2
Future Vol, veh/h	2	2	2	50	2	38	2	322	75	26	259	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	100	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	2	2	54	2	41	2	346	81	28	278	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	747	766	279	687	686	346	280	0	0	427	0	0
Stage 1	335	335	-	350	350	-	-	-	-	-	-	-
Stage 2	412	431	-	337	336	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	329	333	760	361	370	697	1283	-	-	1132	-	-
Stage 1	679	643	-	666	633	-	-	-	-	-	-	-
Stage 2	617	583	-	677	642	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	302	324	760	351	360	697	1283	-	-	1132	-	-
Mov Cap-2 Maneuver	302	324	-	351	360	-	-	-	-	-	-	-
Stage 1	678	627	-	665	632	-	-	-	-	-	-	-
Stage 2	578	582	-	656	626	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.4	15.4	0	0.7
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1283	-	-	389	444	1132	-	-
HCM Lane V/C Ratio	0.002	-	-	0.017	0.218	0.025	-	-
HCM Control Delay (s)	7.8	-	-	14.4	15.4	8.3	-	-
HCM Lane LOS	A	-	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.8	0.1	-	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	17	0	459	335	144
Future Vol, veh/h	0	17	0	459	335	144
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	200
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	18	0	499	364	157

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	364	-	0	-	0
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	681	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	681	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	681	-	-
HCM Lane V/C Ratio	-	0.027	-	-
HCM Control Delay (s)	-	10.4	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0.1	-	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	174	15	44	285	280	72
Future Vol, veh/h	174	15	44	285	280	72
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	100
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	189	16	48	310	304	78

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	710	304	382	0	-	0
Stage 1	304	-	-	-	-	-
Stage 2	406	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	400	736	1176	-	-	-
Stage 1	748	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	384	736	1176	-	-	-
Mov Cap-2 Maneuver	384	-	-	-	-	-
Stage 1	717	-	-	-	-	-
Stage 2	673	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22.1	1.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1176	-	384	736	-	-
HCM Lane V/C Ratio	0.041	-	0.493	0.022	-	-
HCM Control Delay (s)	8.2	-	23.1	10	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	2.6	0.1	-	-

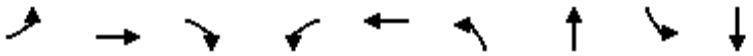
Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	49	61	85	280	224	71
Future Vol, veh/h	49	61	85	280	224	71
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	100
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	53	66	92	304	243	77

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	731	243	320	0	-	0
Stage 1	243	-	-	-	-	-
Stage 2	488	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	389	796	1240	-	-	-
Stage 1	797	-	-	-	-	-
Stage 2	617	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	360	796	1240	-	-	-
Mov Cap-2 Maneuver	360	-	-	-	-	-
Stage 1	738	-	-	-	-	-
Stage 2	617	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.9	1.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1240	-	360	796	-	-
HCM Lane V/C Ratio	0.075	-	0.148	0.083	-	-
HCM Control Delay (s)	8.1	-	16.7	9.9	-	-
HCM Lane LOS	A	-	C	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.5	0.3	-	-

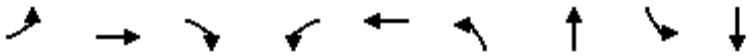


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	41	606	40	78	1258	121	238	117	358
v/c Ratio	0.30	0.58	0.04	0.21	1.22	0.86	0.64	0.54	0.93
Control Delay	14.4	20.6	0.1	10.3	134.5	84.8	49.2	44.5	71.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.4	20.6	0.1	10.3	134.5	84.8	49.2	44.5	71.0
Queue Length 50th (ft)	11	306	0	22	~1227	71	160	69	238
Queue Length 95th (ft)	25	422	0	42	#1492	#152	248	119	#417
Internal Link Dist (ft)		1293			2713		924		671
Turn Bay Length (ft)	360		465	530		115		90	
Base Capacity (vph)	138	1040	932	372	1031	140	394	216	405
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.58	0.04	0.21	1.22	0.86	0.60	0.54	0.88

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

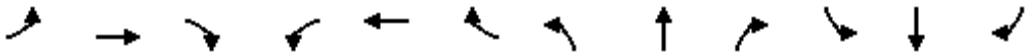


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	87	1046	33	126	775	96	391	144	249
v/c Ratio	0.35	1.11	0.04	0.65	0.77	0.45	1.01	1.05	0.64
Control Delay	13.6	94.8	0.1	35.9	27.1	40.3	94.5	130.1	50.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	94.8	0.1	35.9	27.1	40.3	94.5	130.1	50.0
Queue Length 50th (ft)	25	~930	0	43	451	55	~305	~92	170
Queue Length 95th (ft)	46	#1188	0	108	630	101	#512	#204	262
Internal Link Dist (ft)		1293			2713		924		671
Turn Bay Length (ft)	360		465	530		115		90	
Base Capacity (vph)	246	940	853	210	1016	214	387	137	387
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	1.11	0.04	0.60	0.76	0.45	1.01	1.05	0.64

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	63	904	58	116	1706	132	179	263	95	171	232	300
v/c Ratio	0.40	0.50	0.07	0.37	0.90	0.15	0.80	0.73	0.24	0.85	0.64	0.76
Control Delay	17.5	18.2	0.4	13.3	31.0	4.7	58.6	51.7	6.5	69.3	47.2	37.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.5	18.2	0.4	13.3	31.0	4.7	58.6	51.7	6.5	69.3	47.2	37.9
Queue Length 50th (ft)	15	194	0	29	527	7	95	168	0	91	145	124
Queue Length 95th (ft)	40	298	2	66	#833	42	#163	254	33	#177	224	220
Internal Link Dist (ft)		1293			2713			924			671	
Turn Bay Length (ft)	360		465	530		200	115			90		
Base Capacity (vph)	157	1899	899	316	1899	899	224	636	612	200	636	612
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.48	0.06	0.37	0.90	0.15	0.80	0.41	0.16	0.85	0.36	0.49

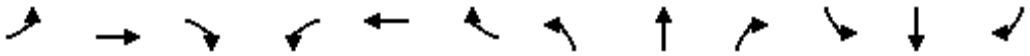
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	1	1112	23	7	1839	81	2
v/c Ratio	0.01	0.46	0.02	0.02	0.76	0.38	0.01
Control Delay	3.0	5.0	1.5	3.3	8.7	28.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.0	5.0	1.5	3.3	8.7	28.9	0.0
Queue Length 50th (ft)	0	74	0	1	175	21	0
Queue Length 95th (ft)	1	137	6	4	324	75	0
Internal Link Dist (ft)		2713			2280	440	378
Turn Bay Length (ft)	200		200	200			
Base Capacity (vph)	173	3539	1583	432	3539	490	532
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.31	0.01	0.02	0.52	0.17	0.00

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	128	1567	92	189	938	228	143	449	128	210	296	77
v/c Ratio	0.48	0.98	0.12	0.90	0.54	0.26	0.59	0.97	0.27	1.39	0.64	0.16
Control Delay	19.5	51.9	2.8	69.7	22.5	2.9	41.2	79.3	10.8	240.9	47.4	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.5	51.9	2.8	69.7	22.5	2.9	41.2	79.3	10.8	240.9	47.4	3.4
Queue Length 50th (ft)	43	617	0	95	256	0	79	345	11	~164	206	0
Queue Length 95th (ft)	73	#793	22	#235	317	41	131	#553	61	#325	303	19
Internal Link Dist (ft)		1293			2713			924			671	
Turn Bay Length (ft)	360		465	530		200	115			90		
Base Capacity (vph)	267	1593	772	209	1741	894	243	465	477	151	465	477
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.98	0.12	0.90	0.54	0.26	0.59	0.97	0.27	1.39	0.64	0.16

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	1	1862	66	20	1330	55	3
v/c Ratio	0.00	0.75	0.06	0.16	0.54	0.28	0.01
Control Delay	3.0	7.9	0.9	6.3	5.1	25.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.0	7.9	0.9	6.3	5.1	25.7	0.0
Queue Length 50th (ft)	0	161	0	2	87	12	0
Queue Length 95th (ft)	1	287	8	10	155	53	1
Internal Link Dist (ft)		2713			2280	440	378
Turn Bay Length (ft)	200		200	200			
Base Capacity (vph)	326	3539	1583	177	3539	500	549
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.53	0.04	0.11	0.38	0.11	0.01

Intersection Summary

Spring Hill

Phase II Drainage Report

JUNE 2025

Approved For One Year From This Date	
City Engineer	Date
Water Department	Date

PREPARED FOR:

ME ERIE, LLC.

CENTENNIAL, CO 80112

PREPARED BY: Westwood

Westwood

Phase II Drainage Report

Spring Hill

Erie, Colorado

Prepared For:

ME ERIE, LLC.
7353 South Alton Way
Centennial, CO 80112
(303) 440-9111
Contact: Matt Janke

Prepared By:

Mark Scheurer, PE
Westwood Professional Services
10333 E. Dry Creek Road, Suite 400
Englewood, CO 90112
(720) 249-3545

Date: June 2025

*I hereby certify that this **Phase II Drainage Report** for the design of **Spring Hill** was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Erie Standards and Specifications for Design and Construction for the owners therof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report.*

_____

Registered Professional Engineer

_____

Signature

_____

Colorado P.E. License No.

_____

Seal and Date

TOWN ACCEPTANCE

This report has been reviewed and found to be in general compliance with the *Town of Erie Standards and Specification for Design and Construction* and other Town requirements. **THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUALITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOOSE STAMP AND SIGNATURE APPEAR HEAREON**.

Accepted by: _____

_____

Town Engineer Date

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Table 19: Basin E Design Point Summary 25

The following narrative and supporting calculations provide the drainage design associated with the *Spring Hill Phase II Drainage Report*. The report primarily addresses drainage concepts related to conceptual drainage and pond and storm system infrastructure sizing. This report will contain all required information per Town of Erie Engineering Standards and Specifications, 2025, for a Phase II Drainage Report. Additional design aspects such as storm pipe sizing, overflow paths, and more will be completed in the Phase III drainage report.

I. GENERAL LOCATION AND DESCRIPTION

The purpose of this report is to describe the preliminary design of the Spring Hill subdivision development. This report covers all aspects of design except for channel design; please refer to the *Spring Hill Conceptual Drainage Channel Design Memorandum June 2025* for details on the channel design.

A. LOCATION

The Spring Hill Property is located in the East half of Section 6, Township 1 North, Range 68 West of the 6th Principal Meridian, Weld County, Colorado. More generally, the site occupies approximately the northeastern quarter of the land located between East County Line Road and County Road 3 to the West and East, respectively, and Highway 52 and County Road 12 to the North and South, respectively. The East boundary of the site lies approximately 3 miles to the West of Interstate 25.

The overall site is bounded on the North by Highway 52 and large lot County residential parcels. The site is bounded on the East by Weld County Road 3 and large lot County residential parcels, Highview Ranch Planned Unit Development (PUD). The Park Lands Estates Subdivision is located to the Southeast of the site. The South edge of the property is bounded by undeveloped agricultural land, which is the future Morgan Hill subdivision. The site is bounded on the West by unplanted agricultural land and the Westview Estates Subdivision.

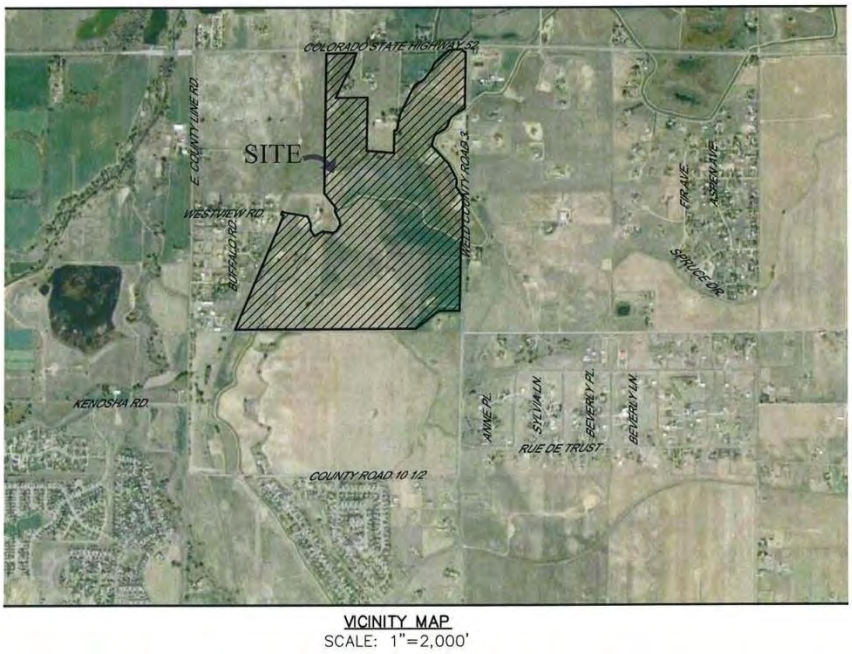


FIGURE 1: VICINITY MAP

B. DESCRIPTION OF PROPERTY

The overall Spring Hill Farm Property consists of approximately 313 acres along the northern end of Erie city limits and is currently undeveloped agricultural land and isolated farmhouse lots. Most of the land surrounding Spring Hill is undeveloped, agricultural land and large lots.

An existing drainageway (Reach BC 110) runs through the site, beginning in the east central area and traveling to the west. It exits the site through the central western portion. In addition to this drainageway, several irrigation ditches traverse the property, including the Lower Boulder Ditch, which traverses the central and western portion of the site. After looping offsite, the Lower Boulder Ditch crosses Weld County Road 3 (WCR 3) and defines the eastern property boundary for roughly 2000 feet before again traveling under WCR 3 and traveling offsite. The Boulder & Weld County Ditch enters the site near the southwest corner and travels generally to the northeast before exiting the site and crossing Highway 52 near the northeast property corner. The Cottonwood Extension Ditch enters the site near the southwest corner and moves in a half-circle before exiting the site near the southeast corner. Most of the site is currently used for farming, and is accordingly covered with different types of crops, depending on the time of year. There are also native grasses and vegetation occupying some portions of the property.

The area south of the Lower Boulder Ditch (Southern Parcel) generally slopes to the north, west and east at grades ranging from approximately one percent to almost ten percent. The highest point on the land is located on the southern property line near the middle. From here, a small ridge extends across the property to the northeast, thus splitting the runoff in roughly an east-west split. The existing terrain in the area north of the Lower Boulder Ditch (Northern Parcel)

generally slopes to the northwest, with an existing drainageway that flows to the northwest, and is tributary to Coal Creek. Most of the land is fairly flat, having grades of one to three percent. However, there are some portions of the site that have higher slopes, some reaching above six percent. These steeper sections of land tend to be on either side of the major drainageway that runs through the property, particularly on its north and east banks. Other steep grades can be found along the slopes of the various irrigation ditches that traverse the property. Spring Hill is presently used primarily for farming but is also partially covered with native vegetation.

Based on information provided in the USDA's Web Soil Survey [Ref 2], there are three soil types on the Southern Parcel: First, there is a large area of Olney fine sandy loam with one to three percent slopes (hydrologic soil group B). This soil type is located all along the east and southeast portions of the land, and there is also a small amount on the western edge of the property. Next, there is a large area occupied by Otero sandy loams with one to nine percent slopes (hydrologic soil group A). These Otero sandy loams occupy over half the total surface of the property and are in the central and south regions of the land. A small area of Aquolls and Aquepts (hydrologic soil group D) can be found in the extreme northwest of the property.

There are three soil types representing two different hydrologic soil groups on the Northern Parcel: Most of the site is occupied by Olney fine sandy loam with one to five percent slopes (Hydrologic Soil Group B). A thin strip of Otero sandy loam with 3 to 5 percent slopes (Hydrologic Soil Group A) traverses the property from the southeast to the northwest, closely matching the path of the drainageway that travels through the property. Finally, a thin strip of Aquolls and Aquepts (Hydrologic Soil Group D) is located just to the south of the Otero sandy loam strip that traverses the property.

The Spring Hill development is planned to be developed for single and multi-family residential lots, schoolyards, and parks. There two prominent wetlands on the central eastern portion of the site, which add up to a total of about 12.6 acres. Neither of these wetlands will be developed on or utilized as part of the drainage design. Please see Appendix A for the wetlands map.

II. DRAINAGE BASINS

Spring Hill is built on a large sub-catchment basin and receives varying annual precipitation; it is necessary to analyze historic precipitation and landscape data to design proper drainage facilities. The pre-developed site has an existing channel, from which the location will be utilized to design a new channel to carry runoff through and off the site. This development will build around the proposed channel which will be designed in well as around the existing Lower Boulder, & Boulder & Weld County irrigation ditches.

A. MAJOR BASIN DESCRIPTION

Merrick & Company has completed a Phase I drainage study (in the form of an outfall systems planning, or OSP report) for the Town of Erie [Ref 3]. This OSP proposes an outfall system for

the Boulder Creek watershed to effectively manage stormwater during both the major (100-year) and minor (10-year) storm events, based on the assumption that the imperviousness of the contributing watersheds will increase appreciably in the future. The location of the Spring Hill site in relation to the OSP can be found in Appendix A to this report. The site is within the "Boulder Creek Tributaries" region of the OSP. This area encompasses the offsite basins tributary to the project as shown on the included Phase I Drainage Plan. The OSP identifies an offsite regional detention facility just south of Weld County Road 12.

According to the *Federal Emergency Management Agencies (FEMA) Flood Emergency Rate Map (FIRM),* the proposed development area lies almost entirely within “Zone X” which is described as an area determined to be outside of the 500-year floodplain limits or shallow flooding areas with average depths of less than one foot or drainage areas less than one square mile. A small portion of Proposed Pond E exists within “Zone A” which is defined as an area subject to inundation by the 1-percent-annual-chance-flood event generally determined using approximate methodologies, due to that sections’ proximity to the 500-year Boulder Creek floodplain. The section within Zone A does not have any lots and is therefore not relevant for flood insurance issuances.

About 2/3 of the property is planned to be single family lots while 1/3 will be multi-family residential. Refer to the drainage maps in the appendices for additional zoning information.

The Spring Hill development exists on two MHFD defined major basins, designated UDFCD_ID’s Boulder Creek (3001) and 3003, respectively. These are shown in Figures 2 - 4. Basin 3003 encapsulates an elongated narrow area spanning from the intersection of County Road 8 & County Road 5 north-westwards to the intersection of Panama Gulch and Boulder Creek. Boulder Creek (3001)1 major basin covers the entirety of the vicinity of Boulder Creek as it meanders north-west from the town of Boulder itself 20 miles and joins with Dry Creek to become St. Vrain River near Highway 119. Five detention ponds will be designed to capture runoff to discharge to the designed channel built along BC110 drainageway.

The northwestern corner of the site is partially encompassed by the Boulder Creek Floodplain limits. A CLOMR will be submitted at the time of the Phase III Drainage Report to verify no proposed improvements will impact the floodplain. A CLOMR will only be required if the floodplain is impacted, and it will be required to be approved by FEMA prior to construction of these improvements.

There are no on-site existing lakes or ponds which either influence or may be influenced by the local drainage.

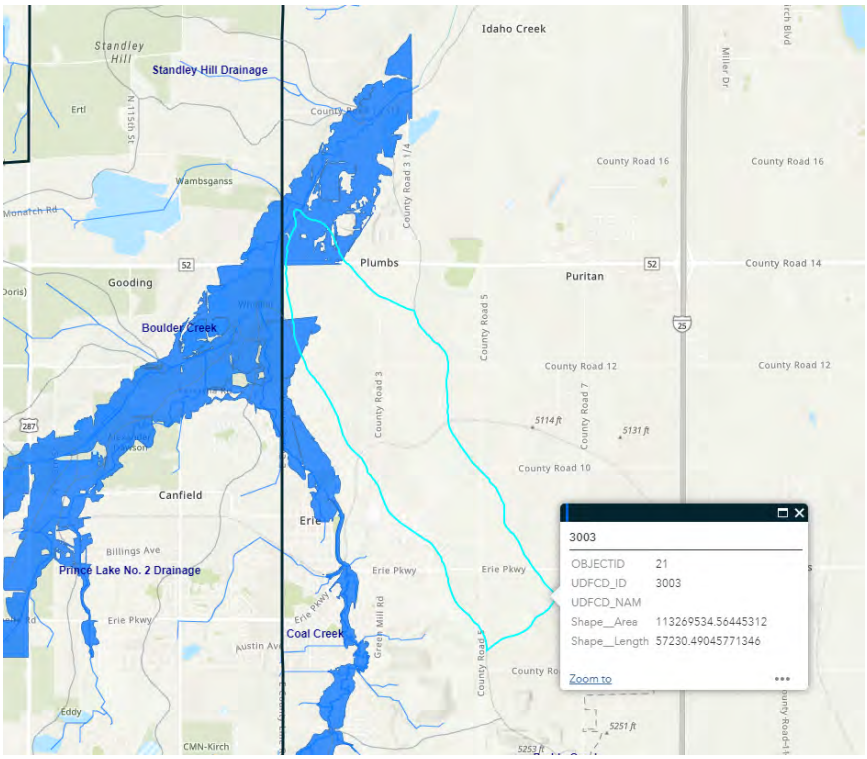


FIGURE 3: UDFCD_ID 3003 MHFD MAJOR BASIN

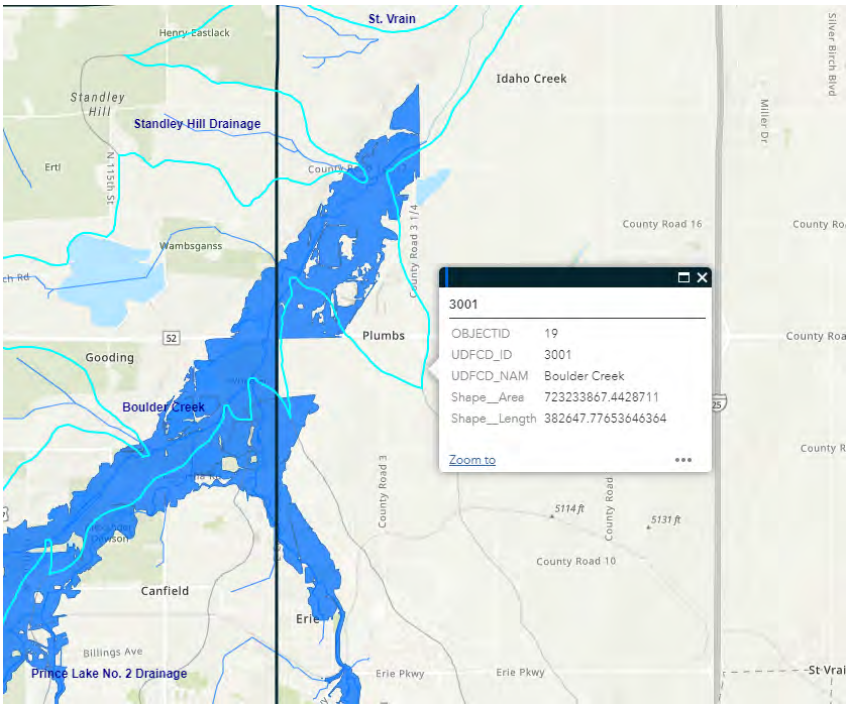


FIGURE 2: BOULDER CREEK MHFD MAJOR BASIN CLOSE UP (UDFCD_ID 3001)

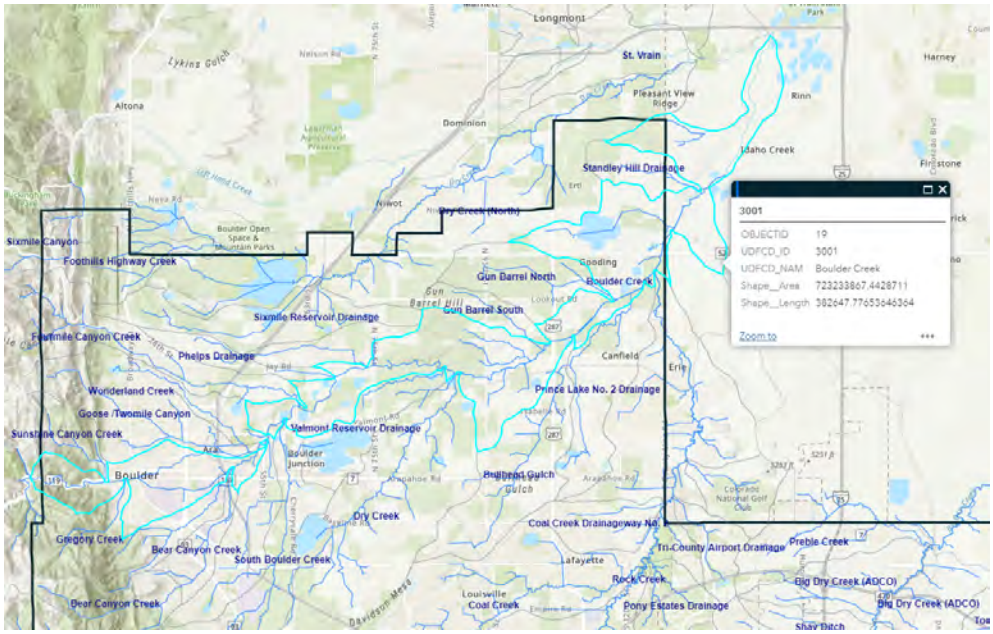


FIGURE 4: BOULDER CREEK MHFD BASIN (UDFCD_ID 3001)

B. SUB-BASIN DESCRIPTION

The Merrick & Company Phase I Drainage Study also specifies the drainageway that traverses the Spring Hill property as a regional drainageway (Reach BC 110). Currently the drainageway consists of a small natural low-flow channel with flat field overbanks. This drainageway may require improvements for ultimate stabilization. The OSP has proposed differing levels of channel improvements depending upon the area the channel is passing through. The improved channel, as per the OSP recommendations, would consist of a grass lined channel with drop structures, ditch overflows, and a spreader weir. The channel that will be designed as part of the conceptual drainage report for this site will have improvements. New specifications will include a grass lined channel with buried riprap, a trickle channel, a maintenance access path, and grouted boulder drop structures. Additional channel design specs can be found in the technical memorandum to be submitted following this report. Refer to Appendix A for excerpt pages from the preliminary design presented in Reference 3.

Downstream flow patterns are dictated by Reach BC110 channel, shown in the OSP maps. The newly designed channel will occupy the same space as the existing channel with additional improvements to account for increased peak flow stormwater runoff values from the additional impervious areas. The increased peak flows will be safely conveyed from the site to Boulder Creek without affecting downstream properties.

III. DRAINAGE DESIGN CRITERIA

A. DESIGN CONSTRAINTS

This drainage design acknowledges the OSP [Ref 3] for location and history of Reach BC110 and will attempt to utilize as many recommendations as possible in redesigning the channel. However, improvements along with the recommendations from the OSP are necessary, as the peak outflow going through the channel will increase significantly due to the increased imperviousness from the development.

Adjacent properties will not impact or be impacted by this development. Runoff from the site will be conveyed to onsite ponds where the water will be treated and released into the channel at historic rates. From there, the runoff goes off-site through the proposed channel to its ultimate outfall into Boulder Creek.

Adjacent collector and arterial streets to the property, such as Highway 52 and County Road 3 act as boundaries to the site but have their own existing water flow paths and designed outfalls. They will not be utilized or affected by the development. Existing structures only are present directly outside of the designated property boundary and therefore will not be affected. There are significant utility lines on the project, but these will be avoided with the storm sewer placement.

As mentioned in section I.B., there are two prominent wetlands on the central eastern portion of the site, which add up to a total of about 12.6 acres. Neither of these wetlands will be developed on or utilized as part of the drainage design. Please see Appendix A for the wetlands map.

B. HYDROLOGICAL CRITERIA

Spring Hill is classified as a Residential Land Use zone, and therefore will use the 2-year as the initial storm and 100-year as the major storm (See Table 800-1 in Reference 5, also listed on the next page). One-hour rainfall depths for Spring Hill were pulled from Section 800 of the Town of Erie Engineering Standards ([Ref 5], also listed on the next page). From this table, the 2-year 0.81-inch rainfall depth was used for the minor storm and the 100-year 2.68-inch rainfall depth was used for the major storm. Peak flow runoff for Spring Hill is calculated using the UDFCD SF-1, SF-2 form, which utilize a modified rational method.

TABLE 1: DESIGN STORM RETURN PERIODS

TABLE 800-1
DESIGN STORM RETURN PERIODS

Land Use or Zoning	Design Storm Return Period	
	Initial Storm	Major Storm
Residential	2-year	100-year
Commercial and Business	5-year	100-year
Public Building Areas	5-year	100-year
Parks, Greenbelts, etc.	2-year	100-year

TABLE 2: ONE-HOUR RAINFALL DEPTH

Table 800-2
TOWN OF ERIE
ONE-HOUR RAINFALL DEPTH

Design Storm	Rainfall Depth (in.)
2-Year	0.81
5-Year	1.11
10-Year	1.39
25-Year	1.84
50-Year	2.24
100-Year	2.68
500-Year	3.89

C. HYDRAULIC CRITERIA

The "Urban Storm Drainage Criteria Manual, Volumes 1, 2, and 3" (USDCM) [Ref. 1] and the "Town of Erie Engineering Standards and Specifications" [Ref. 5] are the design guidelines for the design and analyses provided in this report. Inlets and streets are designed in this report, which utilizes the 2-year and 100-year design storm events respectively as the basis of the minor and major storm events. Urban Drainage and Flood Control District's UD-Inlet.xls software is employed to evaluate the streets and inlets capacity. UD-Detention_V4.04 was used to size detention ponds.

In the Phase III drainage report, SewerGEMS software will be used to determine the Hydraulic Grade Line and to size pipes for the storm sewer networks. A general location for the storm-sewer pipe network as well as inlet locations are presented in this report and in the drainage maps.

For inlet design purposes, the street capacities & inlet calculations for the minor and major storms are made based on the criteria specified in Tables 800-7 & 800-8 within the Town of Erie Engineering Standards and Specifications, as can be seen on the next page.

TABLE 3: ALLOWABLE PAVEMENT ENCROACHMENT

TABLE 800-7
ALLOWABLE PAVEMENT ENCROACHMENT AND DEPTH OF FLOW FOR INITIAL STORM RUNOFF

Street Classification	Maximum Encroachment*
Local	No curb overtopping; flow may spread to crown of street.
Collector	No curb overtopping; flow spread must leave the equivalent of one 10-foot driving lane clear of water.
Arterials	No curb overtopping; flow spread must leave the equivalent of two 10-foot driving lanes clear of water - one lane in each direction.
Freeways	No encroachment is allowed on any traffic lane.

* Where no curbing exists, encroachment will not extend past property lines.

The storm sewer system will commence at the point where the maximum allowable encroachment occurs.

TABLE 4: ALLOWABLE FLOW DEPTHS

TABLE 800-8
ALLOWABLE DEPTH OF FLOW AND INUNDATED AREA FOR MAJOR STORM RUNOFF

Street Classification	Allowable Depth and Inundated Areas
Local & Collector	Residential dwellings and public, commercial, and industrial buildings shall be no less than 12 inches above the 100-year flood at the ground line or lowest water entry of the building. The depth of water over the gutter flow line must not exceed 12 inches.
Arterial & Freeway	Residential dwellings and public, commercial, and industrial buildings must be no less than 12 inches above the 100-year flood at the ground line or lowest water entry of the building. The depth of water must not exceed the street crown to allow operation of emergency vehicles. The depth of water over gutter flow line must not exceed twelve (12).inches

D. ADAPTATIONS FROM CRITERIA

There are no adaptions from the UDFCD and Town of Erie Criteria.

IV. DRAINAGE FACILITY DESIGN

The aim of this drainage plan is to direct runoff less than or equal to the 100-year storm event of 2.68-inches over 1-hour safely from the site into the detention ponds. The site will be divided into multiple "sub-basins", where the rational method can be applied to calculate time of concentration and Q_{peak} values for the storm event runoff. Water will flow overland and street flow to sump-inlets at local low points, which tie into a proposed storm-sewer system. On-grade inlets will be placed in necessary sub-basins where a downstream sump-inlet would otherwise be overloaded, or the street capacity busts. Additional water conveyance infrastructure such as channel modifications and culverts will be discussed in the section or in referenced reports.

A. GENERAL CONCEPT

Spring Hill development consists of a total 634 lots; 415 single family residential and 217 multi-family residential lots. The site has a delegated school area, and multiple parks and trails. The Spring Hill development is subdivided into 5 sub-catchment areas, each of which feed to individual detention ponds. Sub-basins with designations "A" drain to Pond A, sub-basins with designations "B" drain to Pond B, etc. The site is delineated into 99 sub-basins and 3 off-site basins. The detention ponds will release water to the regional channel at a modified rate using restrictor plates. Off-site undeveloped areas will be routed around the site using swales and culverts, bypassing the ponds and going directly into the channel.

Spring Hill will utilize the existing location of Reach BC110 to make modifications to the conveyance channel to carry water off the site. Downstream developments are already built around this drainageway, so they will not be impacted by runoff from the Spring Hill development. The proposed channel design will have a HEC model completed for floodplain analysis within the *Spring Hill Conceptual Drainage Report March 2021*.

Ponds were designed with MHFD-Detention software. The rational method SF-1, SF-2, SF-3 presented in the UDFCD criteria was used for the interior street capacity, inlet, and storm sewer design. HY-8 was used for culvert design. Bentley software FlowMaster was used for swale design. Calculations completed for this report can be seen in Appendix A & B.

There two prominent wetlands on the central eastern portion of the site, which add up to a total of about 12.6 acres. Neither of these wetlands will be developed on or utilized as part of the drainage design, therefore, there will be no necessary wetland mitigation or replacement. Please see Appendix A for the wetlands map.

The existing site does not have any existing drainage problems with the current undeveloped areas. Reach BC110 adequately carries existing ground stormwater runoff off-site.

B. SPECIFIC DETAILS

One dilemma this site encountered was with the storm network and irrigation ditch crossings. Due to water rights issues, both the Lower Boulder Ditch and the Boulder and Weld County Ditch are unmodifiable. In order to get water from the outfall of Pond B to the designed channel, the outfall pipe must pass under the ditch completely. The pipes crown will be lowered greater than 18" beneath the ditch invert elevation to avoid the irrigation ditch.

The Cottonwood Extension ditch enters the site from the south-west end, flows in a semi-circle through the southern edge, and then exits through the south-east end. In order to develop this section of the site, the ditch will be rerouted through a storm-pipe eastward to meet up with the ditch as it loops back-around. The section of the existing ditch in the developed area will be graded over.

Best Management Practices (BMPs) will be implemented onsite where lots partially drain towards open spaces (Type B Lots). The open spaces behind those lots are in place to capture the runoff from the backyards or back of lots and treat it for water quality before it is conveyed via swale to an onsite pond or channel.

Aspects of the design like pipe sizing, easements, and drainage tracts will discussed and designed in the Phase III drainage report.

Maintenance access trails will be provided for all detention ponds. The ponds are designed according to section 814 in the Town of Erie Engineering Standards and Specifications [Ref 5], and will have adequate freeboard, embankment slopes, trickle flow channels, outlet configurations, embankment protection, and release rates. Operations and maintenance responsibility for all on-site infrastructure will be the responsibility of the Metro District.

Pond A is a sub-regional facility with a drainage area of 56.40 acres. The weighted average imperviousness is 55.0%. On all ponds, the weighted average impervious value has been rounded up to the nearest 5% to allow for appropriate sizing for any changes that may occur during the Phase III Drainage Report. The pond provides full spectrum detention per MHFD requirements. The MHFD-UD-Detention spreadsheet was utilized to determine the WQCV, EURV, and 100-year volumes of the pond. The outlet will discharge the 100-year peak inflow of 183.00 CFS into a pipe which goes underneath the Lower Boulder Ditch and into the regional outflow channel. The outlet structure has been sized but is not yet designed. The outlet works for Pond A will be designed in the Phase III drainage report.

The table on the following page summarizes the Pond A design. Calculations for the design of Pond A can be seen in the appendix.

TABLE 5: POND A DESIGN SUMMARY

POND A DESIGN SUMMARY			
STAGE	RELATIVE DEPTH	ELEVATION	VOLUME
	(FT)	(FT)	(AC-FT)
STAGE 0	-	4996.58	-
WQCV	2.55	4999.13	1.04
EURV	4.59	5001.17	3.37
100-YEAR	6.36	5002.94	5.73
SPILLWAY INVERT	6.6	5003.18	-

Pond B is a sub-regional facility with a drainage area of 63.1 acres. The weighted average imperviousness is 55.0%. The pond provides full spectrum detention per MHFD requirements. The MHFD-UD-Detention spreadsheet was utilized to determine the WQCV, EURV, and 100-year volumes of the pond. The outlet discharges the 100-year peak inflow of 140.0 CFS into a pipe which goes under the Lower Boulder Ditch, connects with the outflow from Pond C, and is brought northwards to meet with the regional outflow channel. The outlet structure has been sized but is not yet designed. The emergency spillway and the outlet works for Pond B will be designed in the Phase III drainage report.

The table on this page summarizes the Pond B design. Calculations for the design of Pond B can be seen in the appendix.

TABLE 6: POND B DESIGN SUMMARY

POND B DESIGN SUMMARY			
STAGE	RELATIVE DEPTH	ELEVATION	VOLUME
	(FT)	(FT)	(AC-FT)
STAGE 0	-	5001.5	
WQCV	2.95	5004.45	1.16
EURV	5.32	5006.82	4.05
100-YEAR	7.25	5008.75	6.72
SPILLWAY INVERT	7.5	5009	-

Pond C is an onsite detention facility with a drainage area of 17.00 acres. The weighted average imperviousness is 45.0%. The pond provides full spectrum detention per MHFD requirements. The MHFD-UD-Detention spreadsheet was utilized to determine the WQCV, EURV, and 100-year volumes of the pond. The outlet discharges the 100-year peak inflow of 40.50 CFS into a pipe which connects to the same outflow pipe from Pond B and is brought to the regional outflow channel. The outlet structure has been sized but is not yet designed. The outlet works for Pond C will be designed in the Phase III drainage report.

The table on this page summarizes the Pond C design. Calculations for the design of Pond C can be seen in the appendix.

TABLE 7: POND C DESIGN SUMMARY

POND C DESIGN SUMMARY			
STAGE	RELATIVE DEPTH	ELEVATION	VOLUME
	(FT)	(FT)	(AC-FT)
STAGE 0	-	4974.3	-
WQCV	1.68	4975.98	0.28
EURV	2.57	4976.87	0.83
100-YEAR	3.69	4977.99	1.8
SPILLWAY INVERT	3.9	4978.2	-

Pond D is an onsite detention facility with a drainage area of 14.90 acres. The weighted average imperviousness is 45.0%. The pond provides full spectrum detention per MHFD requirements. The MHFD-UD-Detention spreadsheet was utilized to determine the WQCV, EURV, and 100-year volumes of the pond. The CUHP/SWMM with calculated allowable release rates from MHFD was utilized to determine the 100-year volume. The outlet discharges the 100-year peak inflow of 35.50 CFS into the regional outflow channel. The outlet structure has been sized but is not yet designed. The outlet works for Pond D will be designed in the Phase III drainage report.

The table on this page summarizes the Pond D design. Calculations for the design of Pond D can be seen in the appendix.

TABLE 8: POND D DESIGN SUMMARY

POND D DESIGN SUMMARY			
STAGE	RELATIVE DEPTH	ELEVATION	VOLUME
	(FT)	(FT)	(AC-FT)
STAGE 0	-	4974.3	-
WQCV	1.6	4975.9	0.24
EURV	2.42	4976.72	0.72
100-YEAR	3.69	4977.99	1.8
SPILLWAY INVERT	3.8	4978.1	-

Pond E is an onsite detention facility with a drainage area of 17.70 acres. The weighted average imperviousness is 60.0%. The pond provides full spectrum detention per MHFD requirements. The MHFD-UD-Detention spreadsheet was utilized to determine the WQCV, EURV, and 100-year volumes of the pond. The CUHP/SWMM with calculated allowable release rates from MHFD was utilized to determine the 100-year volume. The outlet discharges the 100-year peak inflow of 38.40 CFS into the regional outflow channel. The outlet structure has been sized but is not yet designed. The outlet works for Pond E will be designed in the Phase III drainage report.

The table on this page summarizes the Pond E design. Calculations for the design of Pond E can be seen in the appendix.

TABLE 9: POND E DESIGN SUMMARY

POND E DESIGN SUMMARY			
STAGE	RELATIVE DEPTH	ELEVATION	VOLUME
	(FT)	(FT)	(AC-FT)
STAGE 0	-	4950.5	-
WQCV	1.66	4952.16	0.35
EURV	2.85	4953.35	1.14
100-YEAR	4.09	4954.59	2.13
SPILLWAY INVERT	4.2	4954.7	-

Sub-basin delineation is based on the final grading of lots in a subdivision. Contours shown on the plans reflect pre-built grading. Pre-built grading does not reflect the final grading of the site, merely what is presented to the master developer. Builders will purchase lots from the master developer and finalize the lot grading. The lot grading within the Spring Hill development will be graded to fit one of four types: A, B, Walkout, and Transition. Type A's are graded to pass stormwater runoff unidirectionally, typically towards an adjacent street. Type B's are graded to direct bidirectionally. Walkouts function the same as type B, while adding a back-end drop and retaining wall which allows for placement on a steep slope. Transition lots have delineation which switches from a "B" lot half-width through to connect to the far corner.

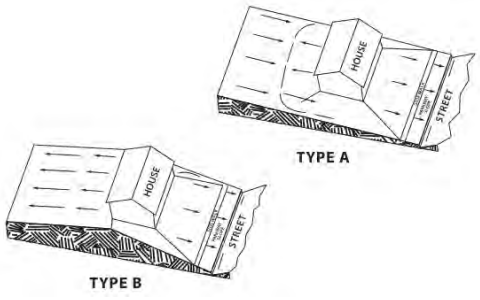


FIGURE 5: LOT TYPES

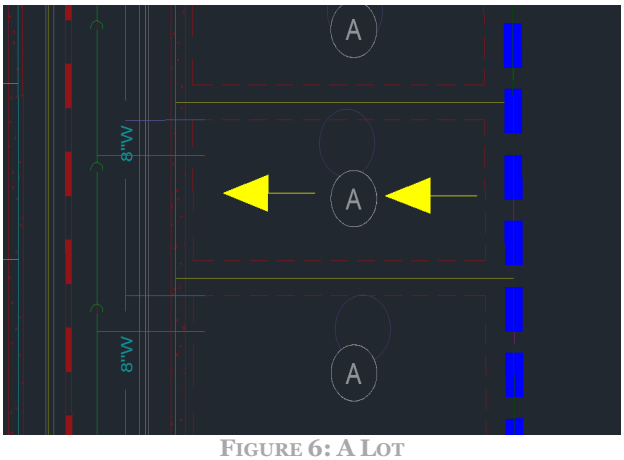


FIGURE 6: A LOT

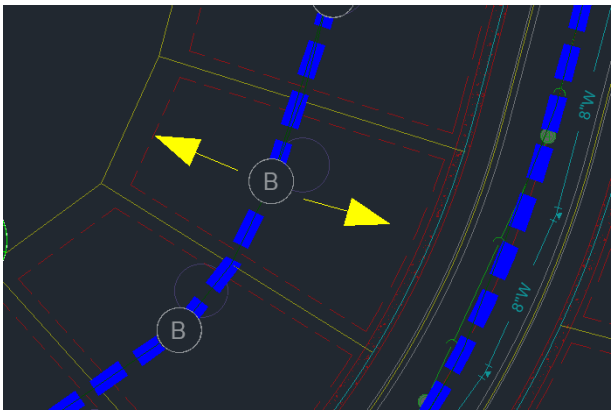


FIGURE 7: B LOT

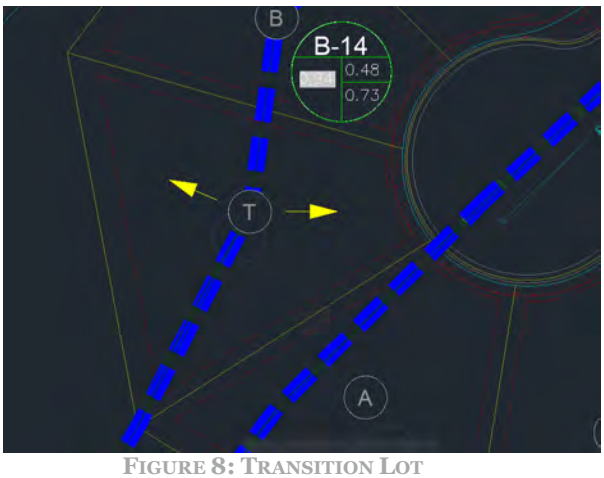


FIGURE 8: TRANSITION LOT

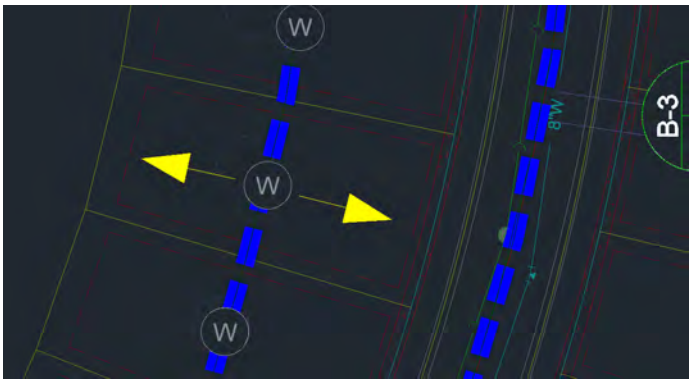


FIGURE 9: WALKAWAY LOT

Spring Hill basin tables are shown below for the on-site ponds. “A” basins drain to Pond A, while “B” basins drain to Pond B, etc. Drainage maps showing the basin locations in the plan view can be seen in the appendix.

TABLE 10: BASIN A SUMMARY TABLE

Basin Summary				
Basin	Area (acres)	% Imp.	Q2	Q100
A-0	3.49	50.30	2.6	15.1
A-1	1.23	53.97	1.1	6.2
A-1a	1.34	54.63	1.0	5.5
A-2	0.48	73.46	0.8	3.4
A-3a	0.84	56.07	0.7	3.6
A-3	1.98	49.55	1.3	7.6
A-4	0.83	81.11	1.4	5.7
A-5	0.75	58.24	0.7	3.6
A-6	2.09	39.43	1.0	7.3
A-7	2.44	41.00	1.3	8.1
A-7a	0.09	67.33	0.1	0.6
A-8	1.73	58.28	1.4	6.6
A-8a	0.56	53.07	0.5	2.4
A-9	1.13	64.32	1.0	4.5
A-10	0.99	57.68	0.8	3.9
A-11	0.13	77.38	0.2	0.9
A-12	0.73	56.99	0.6	2.8
A-13	0.40	60.80	0.5	2.5
A-14	0.71	75.15	0.9	3.8
A-15	2.85	36.06	1.2	9.3
A-16a	0.98	58.88	0.9	4.7
A-16	0.24	46.92	0.2	1.1
A-17	2.03	34.10	0.8	6.7
A-18	0.27	81.85	0.5	2.0
A-19	1.10	54.95	1.0	5.3
A-20	1.75	41.42	1.1	7.3
A-20a	0.43	33.91	0.2	1.8
A-21	2.66	55.73	2.1	11.5
A-23	0.58	56.31	0.5	2.8
A-24	0.60	65.23	0.7	3.1
A-25	0.19	63.89	0.3	1.3
A-27	1.33	61.13	1.2	6.0
A-28	0.66	47.36	0.4	2.7
A-28a	2.23	51.06	1.5	8.6
A-29	1.75	51.22	1.2	6.7
A-29a	0.80	55.10	0.8	4.2
A-30	0.16	63.25	0.2	1.1
A-31	1.44	50.26	1.1	6.3
A-32	12.32	45.02	6.4	40.8

TABLE 11: BASIN B SUMMARY TABLE

Basin Summary				
Basin	Area (acres)	% Imp.	Q2	Q100
B-0	3.10	14.17	0.3	3.1
B-1	0.96	52.04	0.7	3.2
B-2	2.14	53.58	1.7	8.0
B-3	2.80	49.01	1.9	9.4
B-4	1.63	51.68	1.0	4.9
B-5	1.66	53.84	1.5	7.0
B-6	1.15	56.33	0.9	4.2
B-7	1.12	65.41	1.1	4.6
B-8	3.33	55.02	2.0	9.4
B-9	2.90	52.30	2.2	10.5
B-10	1.58	57.61	1.2	5.5
B-11	3.52	54.53	2.4	12.4
B-12	1.10	36.80	0.4	2.3
B-13	3.02	19.76	0.4	3.6
B-14	1.31	59.66	1.2	5.8
B-15	2.07	54.68	1.6	8.5
B-16	1.47	62.69	1.4	6.0
B-17	1.01	61.03	1.0	4.2
B-18	0.81	52.67	0.6	2.8
B-19	1.58	60.61	1.3	5.6
B-20	3.31	54.69	2.1	9.9
B-21	0.74	51.03	0.5	2.5
B-22	1.18	61.63	1.1	5.0
B-23	3.96	41.83	1.7	10.5
B-24	2.13	46.32	1.5	8.7
B-25	1.43	60.63	1.4	6.8
B-26	1.56	56.18	1.1	5.0
B-27	2.80	52.31	1.8	8.4
B-28	1.74	53.62	1.2	5.6
B-29	1.98	51.72	1.1	5.2
B-30	1.73	58.90	1.3	5.6
B-31	2.22	45.36	1.1	6.6

TABLE 12: BASIN C SUMMARY TABLE

Basin Summary				
Basin	Area (acres)	% Imp.	Q2	Q100
C-0	2.76	5.22	0.1	4.0
C-1	0.52	96.23	1.2	4.2
C-2	6.01	26.20	1.7	13.3
C-3	0.21	100.00	0.5	1.7
C-4	4.99	44.13	3.2	20.6
C-5	0.21	76.67	0.4	1.5
C-6	1.60	44.26	0.8	4.7
C-3a	0.61	51.11	0.5	2.7

TABLE 13: BASIN D SUMMARY TABLE

Basin Summary				
Basin	Area (acres)	% Imp.	Q2	Q100
D-0	1.18	97.63	2.3	8.4
D-1	2.40	58.47	2.2	10.6
D-2	3.80	49.34	2.5	14.5
D-3	0.16	35.25	0.1	0.5
D-4	1.36	77.52	1.7	7.2
D-5	0.87	50.92	0.7	3.9
D-6	3.89	18.22	0.7	10.0
D-7	1.19	70.13	1.3	6.0

TABLE 14: BASIN E SUMMARY TABLE

Basin Summary				
Basin	Area (acres)	% Imp.	Q2	Q100
E-1	1.08	100.00	2.0	7.1
E-2	1.48	84.11	2.0	8.0
E-3	1.92	38.20	1.0	7.5
E-4	2.55	66.40	2.1	9.7
E-5	1.34	81.19	1.7	6.9
E-6	1.62	76.23	2.2	9.5
E-7	1.26	68.36	1.5	7.0
E-8	1.18	75.14	1.6	7.0
E-9	1.06	80.11	1.5	6.3
E-0	1.33	52.84	1.3	7.3
OS-E1	5.34	30.39	1.6	13.3
OS-E2	4.02	33.86	1.4	11.0
OS-E3	4.15	19.21	0.7	8.9

Inlet design criteria was based off Town of Erie and UDFCD criteria. MHFD-Inlet v5.01 was used to calculate the peak discharges for major and minor events, and to choose appropriate inlet types and sizes. Local and Collector streets will use CDOT Type R Inlets, inlets in swales will use CDOT Type C Inlets, the on-site school will use a stub-in, and no alleyways within the development will require an inlet.

For most inlets designed on local streets for this site, minor storm events design criteria are regulated by the requested 4” curb height, while most major storm events design criteria are regulated by the maximum water depth of 12”. For the collector street inlet design, a 6” curb height generally leads to design criteria regulation by maximum spread (T_{max}). These design criteria are Tables 800-7 and 800-8 shown in section III. There are no exceptional inlet locations besides basin A-32, which is a stub-in location for a proposed schoolyard plot. The offsite basins do not have inlets, as the runoff from those basins will be carried via swale to culvert underneath the roadway to connect with the outflow channel. Emergency overflow paths

will be designed for applicable sump-inlets during the Phase III drainage report submission. The inlet summary sheets are shown below.

TABLE 15: BASIN A DESIGN POINT SUMMARY

Design Point Summary Table Basin A			
Design Point	Inlet Type	Q2 (CFS)	Q100 (CFS)
31-A	SHEET FLOW	0.0	0.0
30-A	SHEET FLOW	0.0	0.0
29-A	15' CDOT TYPE R ON-GRADE INLET	2.3	11.1
29a-A	10' CDOT TYPE R ON-GRADE INLET	0.8	4.3
28-A	5' CDOT TYPE R ON-GRADE INLET	0.4	2.3
28a-A	SHEET FLOW	0.0	0.0
27-A	10' CDOT TYPE R ON-GRADE INLET	1.2	5.7
25-A	SHEET FLOW	0.0	0.0
24-A	SHEET FLOW	0.0	0.0
23-A	SHEET FLOW	0.0	0.0
21-A	SHEET FLOW	0.0	0.0
20-A	2 - 10' CDOT TYPE R ON-GRADE INLETS	4.4	18.8
20a-A	15' CDOT TYPE R ON-GRADE INLET	1.7	12.1
19-A	10' CDOT TYPE R ON-GRADE INLET	1.0	5.3
18-A	SHEET FLOW	0.0	0.0
17-A	SHEET FLOW	0.0	0.0
16-A	15' CDOT TYPE R ON-GRADE INLET	2.0	12.4
16a-A	SHEET FLOW	0.0	0.0
15-A	10' CDOT TYPE R ON-GRADE INLET	1.2	7.5
14-A	10' CDOT TYPE R ON-GRADE INLET	0.9	3.8
13-A	SHEET FLOW	0.0	0.0
12-A	SHEET FLOW	0.0	0.0
11-A	SHEET FLOW	0.0	0.0
10-A	SHEET FLOW	0.0	0.0
9-A	10' CDOT TYPE R ON-GRADE INLET	1.0	4.5
8a-A	SHEET FLOW	0.0	0.0
8-A	SHEET FLOW	0.0	0.0
7a-A	15' CDOT TYPE R ON-GRADE INLET	2.6	10.9
7-A	10' CDOT TYPE R ON-GRADE INLET	1.9	8.2
6-A	10' CDOT TYPE R ON-GRADE INLET	1.0	7.7
5-A	SHEET FLOW	0.0	0.0
32-A	STUB OUT	6.4	40.8
4-A	15' CDOT TYPE R ON-GRADE INLET	1.4	5.7
3a-A	10' CDOT TYPE R ON-GRADE INLET	1.3	6.8
3-A	10' CDOT TYPE R ON-GRADE INLET	1.6	8.5
2-A	10' CDOT TYPE R ON-GRADE INLET	0.8	3.5
1a-A	10' CDOT TYPE R ON-GRADE INLET	1.0	5.9
1-A	15' CDOT TYPE R ON-GRADE INLET	1.1	6.1
0-A	OVERLAND TO POND	2.6	15.3

TABLE 16: BASIN B DESIGN POINT SUMMARY

Design Point Summary Basin B			
Design Point	Inlet Type	Q2 (CFS)	Q100 (CFS)
31-B	10' CDOT TYPE R INLET ON GRADE	1.1	6.0
30-B	10' CDOT TYPE R INLET ON GRADE	1.3	5.4
29-B	10' CDOT TYPE R INLET ON GRADE	1.1	5.1
28-B	10' CDOT TYPE R INLET ON GRADE	1.2	5.4
27-B	10' CDOT TYPE R INLET ON GRADE	1.8	7.0
26-B	10' CDOT TYPE R INLET ON GRADE	1.1	5.5
25-B	10' CDOT TYPE R INLET ON GRADE	1.4	6.3
24-B	10' CDOT TYPE R INLET ON GRADE	1.5	7.4
23-B	15' CDOT TYPE R INLET ON GRADE	1.7	9.9
22-B	10' CDOT TYPE R INLET ON GRADE	1.1	5.0
21-B	10' CDOT TYPE R INLET ON GRADE	0.5	3.3
20-B	10' CDOT TYPE R INLET ON GRADE	2.1	7.7
19-B	10' CDOT TYPE R INLET ON GRADE	1.3	5.1
18-B	10' CDOT TYPE R INLET ON GRADE	0.6	4.8
17-B	10' CDOT TYPE R INLET ON GRADE	1.0	4.3
16-B	10' CDOT TYPE R INLET ON GRADE	1.4	5.7
15-B	10' CDOT TYPE R INLET ON GRADE	1.6	7.3
14-B	10' CDOT TYPE R INLET ON GRADE	1.2	5.5
13-B	10' CDOT TYPE R INLET ON GRADE	0.4	3.6
12-B	10' CDOT TYPE R INLET ON GRADE	0.4	3.5
11-B	15' CDOT TYPE R INLET ON GRADE	2.4	10.9
10-B	10' CDOT TYPE R INLET ON GRADE	1.2	5.3
9-B	10' CDOT TYPE R INLET ON GRADE	2.2	8.0
8-B	10' CDOT TYPE R INLET ON GRADE	2.0	7.4
7-B	10' CDOT TYPE R INLET ON GRADE	1.1	5.5
6-B	10' CDOT TYPE R INLET IN SUMP	0.9	4.2
5-B	10' CDOT TYPE R INLET ON GRADE	1.5	6.4
4-B	10' CDOT TYPE R INLET IN SUMP	1.0	6.9
3-B	10' CDOT TYPE R INLET ON GRADE	1.9	7.6
2-B	15' CDOT TYPE R INLET IN SUMP	1.7	8.0
1-B	10' CDOT TYPE R INLET IN SUMP	0.7	3.2
0-B	OVERLAND TO POND B	0.3	3.1

TABLE 17: BASIN C DESIGN POINT SUMMARY

Design Point	Inlet Type	Q2 (CFS)	Q100 (CFS)
0-C	OVERLAND TO POND C	0.0	3.8
1-C	5' CDOT TYPE R INLET IN SUMP	1.2	4.2
2-C	2-15' CDOT TYPE R INLET IN SUMP	1.7	13.3
3-C	15' CDOT TYPE R INLET ON GRADE	0.7	3.8
4-C	2-15' CDOT TYPE R INLET ON GRADE	3.2	17.4
5-C	5' CDOT TYPE R INLET IN SUMP	0.4	1.5
6-C	10' CDOT TYPE R INLET IN SUMP	0.9	4.7
3a-C	BYPASS	0.0	0.0

TABLE 18: BASIN D DESIGN POINT SUMMARY

Design Point Summary Table Basin D			
Design Point	Inlet Type	Q2 (CFS)	Q100 (CFS)
0-D	OVERLAND TO POND D	2.3	8.4
1-D	15' CDOT TYPE R IN SUMP	2.2	11.1
2-D	15' CDOT TYPE R IN SUMP	2.5	14.9
3-D	10' CDOT TYPE R ON GRADE	0.1	0.9
4-D	10' CDOT TYPE R ON GRADE	1.7	6.3
5-D	10' CDOT TYPE R ON GRADE	0.7	5.6
6-D	10' CDOT TYPE R IN SUMP	0.7	6.9
7-D	10' CDOT TYPE R ON GRADE	1.3	5.7

TABLE 19: BASIN E DESIGN POINT SUMMARY

Design Point Summary Basin E			
Design Point	Inlet Type	Q2 (CFS)	Q100 (CFS)
9-E	Bypass	0.0	0.0
8-E	15' CDOT Type R On-Grade Inlet	2.7	10.3
7-E	15' CDOT Type R On-Grade Inlet	1.5	6.3
6-E	15' CDOT Type R On-Grade Inlet	2.2	7.6
5-E	15' CDOT Type R On-Grade Inlet	1.7	6.2
4-E	15' CDOT Type R On-Grade Inlet	2.1	7.5
3-E	15' CDOT Type R On-Grade Inlet	1.0	6.5
2-E	CDOT Type C Sump Inlet	2.0	8.0
1-E	CDOT Type C Sump Inlet	2.0	8.0
0-E	Overland to Pond	1.3	7.3
E1-OS	Swale	2.6	13.3
E2-OS	Swale	0.0	0.0
E3-OS	CDOT Type C Inlet in Depression	0.7	8.9

Culverts will be used onsite along the southern basin boundary of Major Basin E and southern boundary of basin D when the channel crosses underneath the road. Th3 culverts are designed to convey all of the channel flows through the site. Culverts were sized using HY-8. The culvert calculations can be found in Appendix B.

Swales are used on the site to carry water from the off-site basins towards the culverts. Swales on-site are grass-lined and comply with Town of Erie and UDFCD criteria. Swale calculations, cross-sections, and plan view locations can be seen in Appendix A.

C. ADAPTATIONS FROM CRITERIA

No adaptations are requested from the criteria.

V. SUMMARY

The purpose of this report is to describe the preliminary drainage design of the Spring Hill subdivision development. The designed detention ponds, inlets, storm sewer system, channel modifications, culverts, swales, overflow paths, and PBMP/BMP's all achieve the purpose of draining the 100-year storm event runoff in a safe, calculated, and environmentally friendly manner. Please refer to the appendix for detailed calculations, design drawings and additional information. Additional features, such as the detailed outlet structure for the detention ponds, will be completed for the final design report as per the Town of Erie requirements.

This Phase II Drainage Report for Spring Hill is prepared in general conformance with the "Engineering Standards & Specifications" [Ref. 5] and the "Urban Storm Drainage Criteria Manual, Volumes 1, 2, and 3" [Ref. 1]. This includes, but is not limited to, compliance with town floodplain regulations and stream preservation standards.

The report addresses drainage concepts related to conceptual drainage design and pond and storm system infrastructure sizing. The site drains to one major channel, which will be modified and detailed separately in *Spring Hill Conceptual Channel Design Memo June 2025*. Surface flow is intercepted by on-grade and sump inlets and are piped to five separate ponds. The on-site ponds will capture and detain developed runoff before exiting the site.

VI.REFERENCES

1. **Urban Storm Drainage Criteria Manual, Volumes 1,2,3**, Urban Drainage and Flood Control District, prepared by Urban Drainage and Flood Control District, Latest Revisions.

2. **Web Soil Survey**, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx, United States Department of Agriculture – Natural Resources Conservation Service.

3. **Town of Erie, Outfall Systems Plan (East of Coal Creek),** Town of Erie, Merrick & Company, 2020.

4. **Spring Hill Phase 1 Master Drainage Report,** Town of Erie and Weld County, CVL Consultants, November 2018

5. **Erie Colorado Engineering Standards and Specifications, Sections 100 & 800,** Town of Erie, Colorado, Engineering Division, 2021

Software used in analysis: Civil3D 2019, UD-Inlet, UD-Sewer, UD-Culvert, UD-Channel, HEC-RAS, MHFD Data Viewer, UDFCD SF-1, SF-2, SF-3

VII.APPENDICES

A. Hydrologic Computations

1. Wetland Proximity and FEMA Maps
2. Web Soil Survey
3. SF Forms 1-3
4. Runoff Reduction

B. Hydraulic Computations

1. UD Detention Pond Sizing and Forebay Calculations
2. Spillway Rip Rap Sizing
3. Inlet and Street Capacity Calculations
4. Swale Calculations
5. Culvert Calculations

C. Drainage Maps

Appendix A – Hydrologic Computations

Wetland Proximity and FEMA Maps
Web Soil Survey
SF Forms 1-3
Runoff Reduction

Westwood

Appendix A – Hydrologic Computations

Wetland Proximity and FEMA Maps

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
DENVER REGULATORY OFFICE, 9307 SOUTH WADSWORTH BOULEVARD
LITTLETON, COLORADO 80128-6901

July 7, 2021

SUBJECT: Approved Jurisdictional Determination – Corps File No. NWO-2021-01101-DEN, 2018 Andulasia Project

Matt Janke
EJE, LLC
7353 S Alton Way

Centennial, CO 80112

Dear Mr. Janke:

This letter is in reference to the Andalusia Project property located at approximate latitude 40.079217, longitude -105.042058, in Weld County, Colorado. The submittal dated June 15, 2021, consists of a request for an Approved Jurisdictional Determination for the above project. The delineated area located on the subject property has been reviewed in accordance with Section 404 of the Clean Water Act under which the U.S. Army Corps of Engineers regulates the discharge of dredged and fill material, and any excavation activity associated with a dredge and fill project in waters of the United States.

At your request, an Approved Jurisdictional Determination (JD), a written indication that wetlands and waterways within your project area are not waters of the United States has been prepared. The review area contains the following aquatic resources that are not considered waters of the United States (WOTUS). Aquatic resources C, D, and F (the Lower Boulder Ditch, Boulder and Weld County Ditch, and Cottonwood Extension Ditch respectively) are irrigation ditches excavated in uplands and do not relocate a tributary, are not constructed in tributaries, and are not constructed in wetlands adjacent to tributaries. Aquatic resources A, B, E, and G are non-adjacent wetlands.

The JD is attached to this letter. If you are not in agreement with the JD decision, you may request an administrative appeal under regulation 33 CFR 331, by using the attached Appeal Form and Administrative Appeal Process form. The request for appeal must be received within 60 days from the date of this letter. It is not necessary to submit a Request for Appeal if you do not object to the JD.

This JD is valid for a period of five years from the date of this letter, unless new information warrants revisions of the JDs before the expiration date, or unless the Corps

has identified, after a possible public notice and comment, that specific geographic areas with rapidly changing environmental conditions merit re-verification on a more frequent basis.

If there are any questions please feel free to contact Cody Wheeler at (720) 922-3846 or by e-mail at Cody.S.Wheeler@usace.army.mil, and reference **Corps File No. NWO-2021-01101-DEN**.

Sincerely,



Kiel Downing
Chief, Denver Regulatory Office

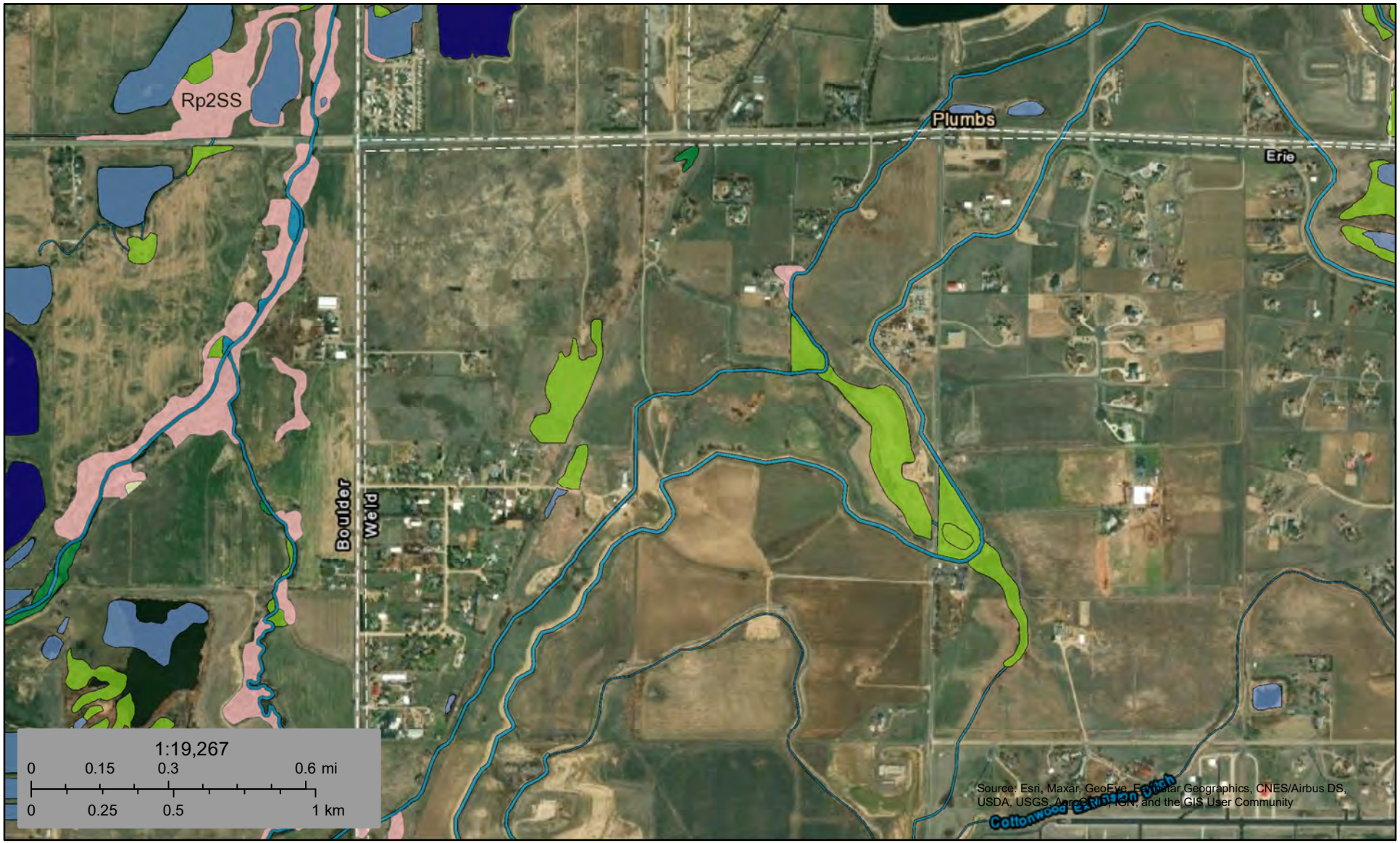
Enclosure(s)

Copies Furnished:

Tyler Worley
2820 Wilderness Place, Suite A
Boulder, CO 80301

U.S. Fish and Wildlife Service
National Wetlands Inventory

Spring Hill Wetlands



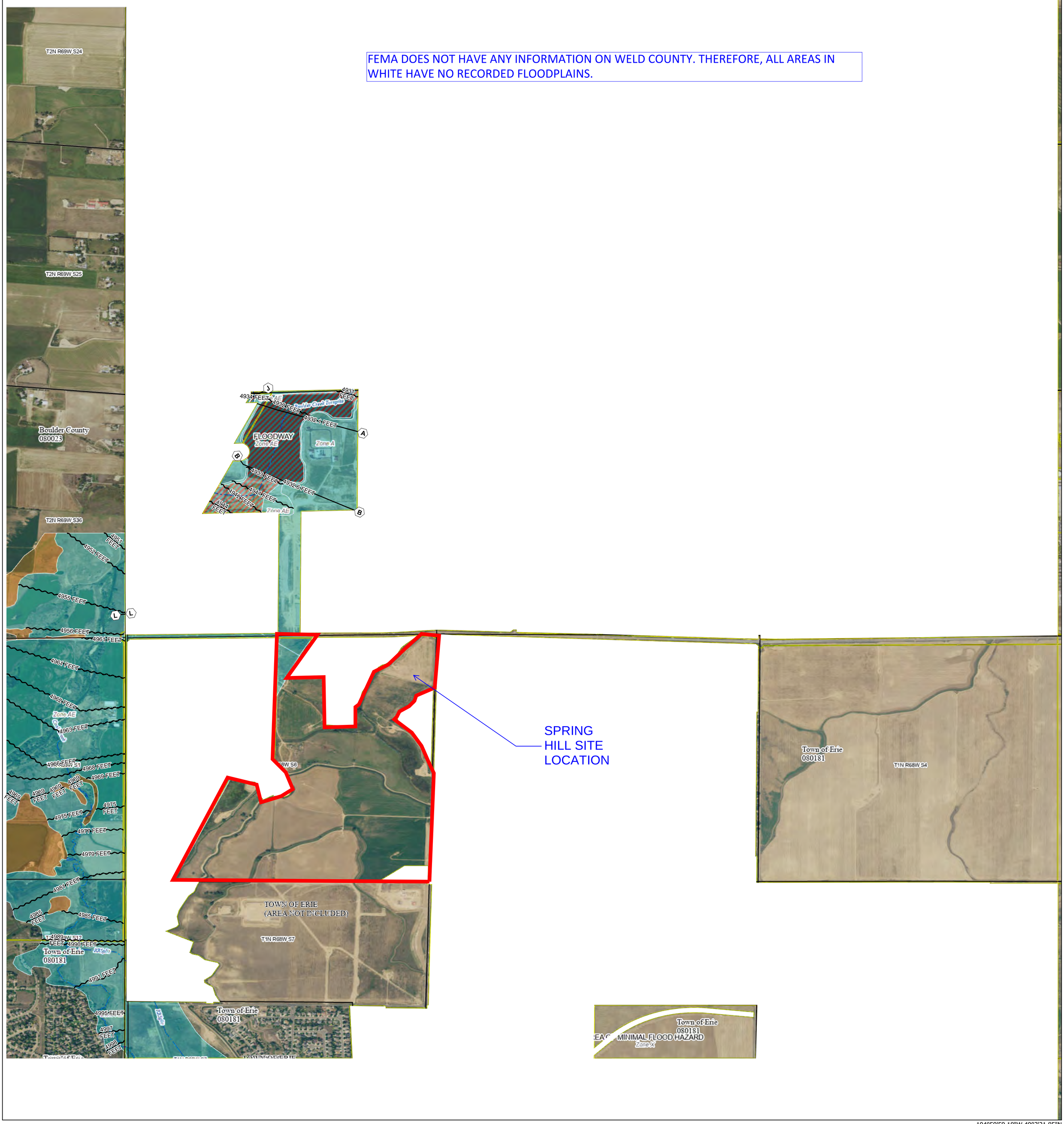
February 15, 2021

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

FEMA DOES NOT HAVE ANY INFORMATION ON WELD COUNTY. THEREFORE, ALL AREAS IN WHITE HAVE NO RECORDED FLOODPLAINS.



104°59'59.18"W 40°3'31.85"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **8/5/2021 12:18 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 1,000 feet 1:12,000

0 500 1,000 2,000 3,000 4,000 Feet

0 105 210 420 630 840 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL **435** OF **610**

Panel Contains:

COMMUNITY	NUMBER	PANEL
WELD COUNTY	080266	0435
WELD COUNTY	080266	0435
TOWN OF ERIE	080181	0435
TOWN OF FREDERICK	080244	0435
TOWN OF ERIE	080181	0435
TOWN OF FREDERICK	080244	0435
BOULDER COUNTY	080023	0435

MAP NUMBER
08013C0435J
EFFECTIVE DATE
December 18, 2012

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from NAIP Orthophotography produced with a one meter ground resolution from photography dated 2013.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

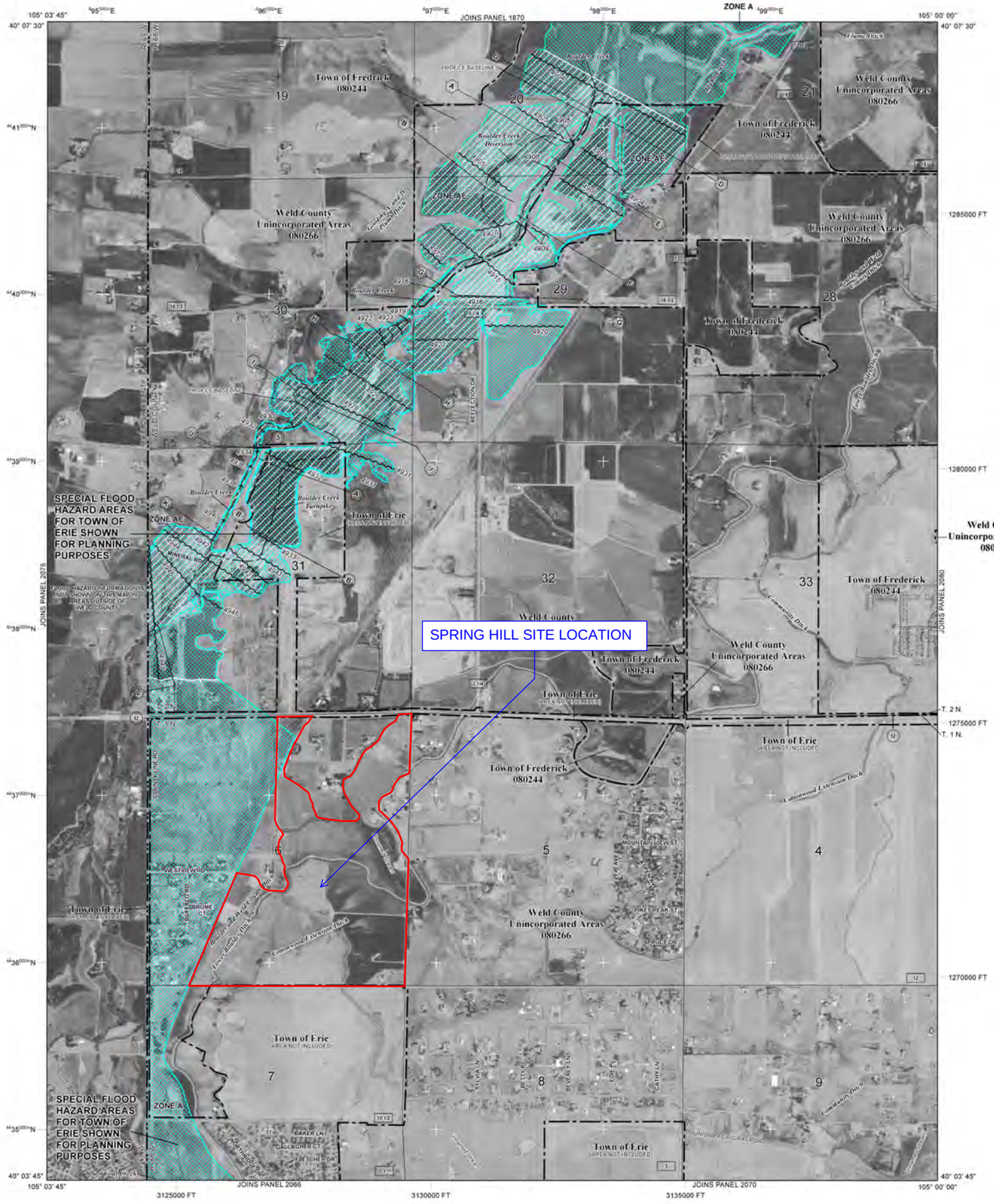
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- (A)—(A) Cross section line
- (23) - - - - (23) Transect line
- 45° 02' 08", 93° 02' 12" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 3100000 FT 5000-foot ticks: Colorado State Plane Central Zone (FIPS Zone 0502), Lambert Conformal Conic projection
- 4439000 N 1000-meter Universal Transverse Mercator grid values, zone 13
- DX5510 × Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
January 20, 2016

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2060E

FIRM
FLOOD INSURANCE RATE MAP
WELD COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 2060 OF 2250
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
FREDERICK, TOWN OF	080244	2060	E
WELD COUNTY	080266	2060	E

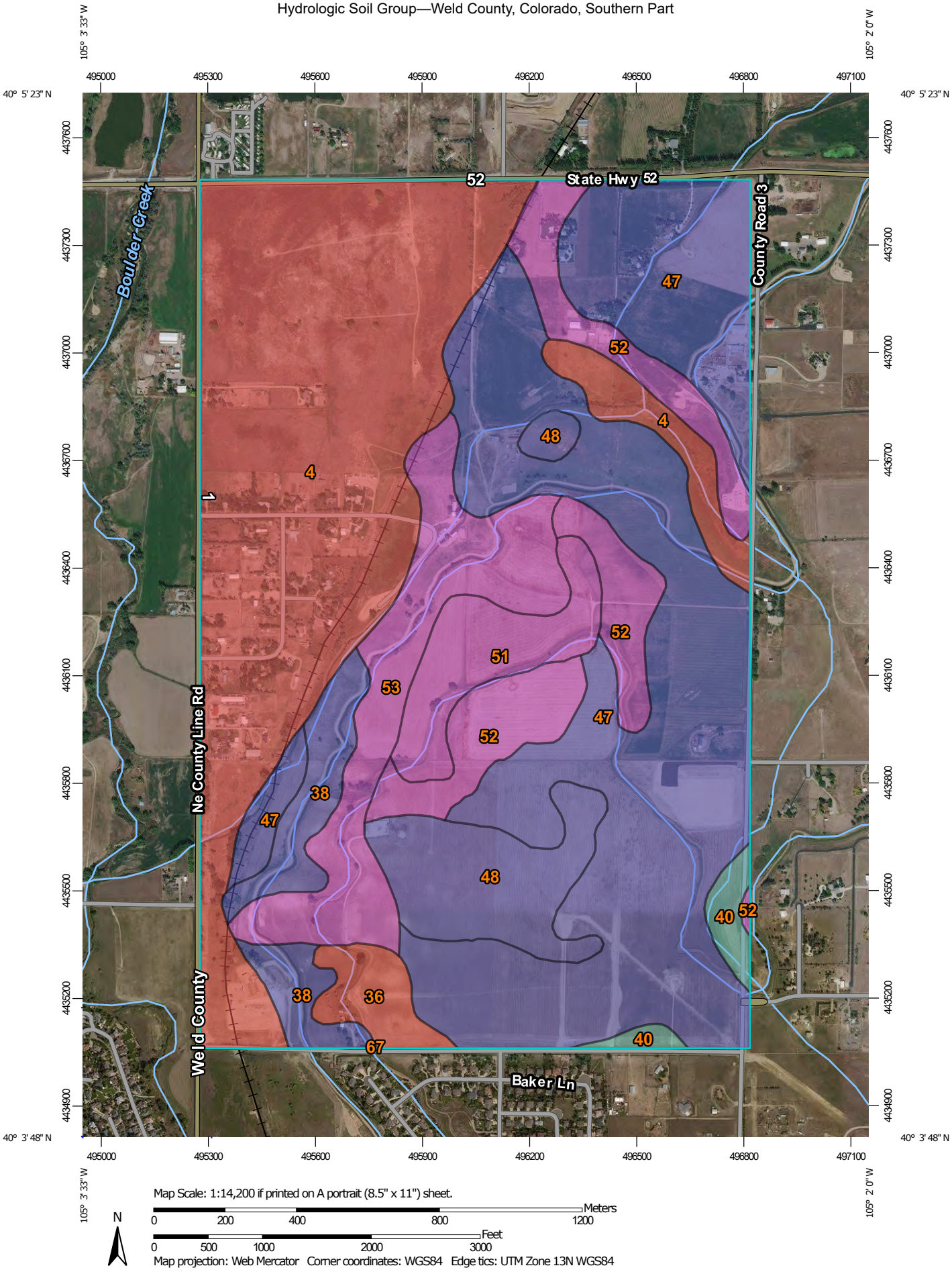
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08123C2060E
EFFECTIVE DATE
JANUARY 20, 2016

Federal Emergency Management Agency

Appendix A – Hydrologic Computations

Web Soil Survey


105° 3' 33" W
105° 2' 0" W
40° 5' 23" N
40° 3' 48" N
495000
495300
495600
495900
496200
496500
496800
497100
4437600
4437300
4437000
4436700
4436400
4436100
4435800
4435500
4435200
4434900
Boulder Creek
State Hwy 52
County Road 3
Ne County Line Rd
Weld County
Baker Ln
52
47
52
4
48
4
1
52
51
53
47
52
38
47
48
40
52
38
36
67
40
Map Scale: 1:14,200 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0
200
400
800
1200
Feet
0
500
1000
2000
3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

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.

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: Weld County, Colorado, Southern Part
Survey Area Data: Version 16, Oct 10, 2017

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

Date(s) aerial images were photographed: Mar 16, 2012—Oct 15, 2016

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
4	Aquolls and Aquepts, flooded	D	295.5	31.9%
36	Midway-Shingle complex, 5 to 20 percent slopes	D	16.8	1.8%
38	Nelson fine sandy loam, 3 to 9 percent slopes	B	35.8	3.9%
40	Nunn loam, 1 to 3 percent slopes	C	10.7	1.2%
47	Olney fine sandy loam, 1 to 3 percent slopes	B	323.6	35.0%
48	Olney fine sandy loam, 3 to 5 percent slopes	B	52.4	5.7%
51	Otero sandy loam, 1 to 3 percent slopes	A	36.4	3.9%
52	Otero sandy loam, 3 to 5 percent slopes	A	75.5	8.2%
53	Otero sandy loam, 5 to 9 percent slopes	A	79.0	8.5%
67	Ulm clay loam, 3 to 5 percent slopes	C	0.0	0.0%
Totals for Area of Interest			**925.8**	**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

Appendix A – Hydrologic Computations

SF Forms 1-3

SF-1 COMPOSITE BASIN LAND USE

Project Name: Springhill E5X
Calculated By: VJH
Checked By:
Date: 6/5/2025

Westwood

Basin	Type	Total Area (acres)	Single Family Res. (acres)	Multi-Family Res. (acres)	School (acres)	Park (acres)	Paved (acres)	Open Space (acres)	Commercial (acres)	Existing Report (acres)	Avg. Imp. (%)	Soil Type A (%)	Soil Type B (%)	Soil Type C/D (%)	C_2	C_5	C_{100}
A-0	Proposed	3.49	0.49	-	-	-	1.48	1.52	-	-	50.3	-	100%	-	0.38	0.41	0.66
A-1	Proposed	1.23	0.76	-	-	-	0.28	0.19	-	-	54.0	-	100%	-	0.41	0.44	0.68
A-1a	Proposed	1.34	1.02	-	-	-	0.22	0.10	-	-	54.6	-	100%	-	0.41	0.45	0.68
A-2	Proposed	0.48	-	-	-	-	0.35	0.13	-	-	73.5	10%	90%	-	0.58	0.61	0.76
A-3a	Proposed	0.84	0.64	-	-	-	0.15	0.05	-	-	56.1	-	100%	-	0.43	0.46	0.69
A-3	Proposed	1.98	1.41	-	-	-	0.27	0.30	-	-	49.5	-	100%	-	0.37	0.40	0.66
A-4	Proposed	0.83	-	-	-	-	0.67	0.16	-	-	81.1	-	100%	-	0.66	0.68	0.81
A-5	Proposed	0.75	0.45	-	-	-	0.21	0.09	-	-	58.2	-	100%	-	0.45	0.48	0.70
A-6	Proposed	2.09	1.16	-	-	-	0.23	0.70	-	-	39.4	-	100%	-	0.28	0.31	0.61
A-7	Proposed	2.44	1.37	-	-	-	0.30	0.77	-	-	41.0	35%	65%	-	0.28	0.31	0.55
A-7a	Proposed	0.09	-	-	-	-	0.06	0.03	-	-	67.3	-	100%	-	0.53	0.56	0.74
A-8	Proposed	1.73	1.13	-	-	-	0.44	0.16	-	-	58.3	50%	50%	-	0.43	0.45	0.63
A-8a	Proposed	0.56	0.31	-	-	-	0.14	0.11	-	-	53.1	50%	50%	-	0.38	0.41	0.60
A-9	Proposed	1.13	0.63	-	-	-	0.41	0.09	-	-	64.3	80%	20%	-	0.48	0.50	0.64
A-10	Proposed	0.99	0.74	-	-	-	0.20	0.05	-	-	57.7	80%	20%	-	0.42	0.44	0.59
A-11	Proposed	0.13	-	-	-	-	0.10	0.03	-	-	77.4	100%	-	-	0.60	0.62	0.71
A-12	Proposed	0.73	0.53	-	-	-	0.15	0.05	-	-	57.0	100%	-	-	0.40	0.42	0.55
A-13	Proposed	0.40	-	-	-	-	0.24	0.16	-	-	60.8	-	100%	-	0.47	0.50	0.71
A-14	Proposed	0.71	-	-	-	-	0.53	0.18	-	-	75.2	15%	85%	-	0.60	0.63	0.77
A-15	Proposed	2.85	0.94	-	-	-	0.53	1.38	-	-	36.1	-	100%	-	0.25	0.28	0.60
A-16a	Proposed	0.98	0.61	-	-	-	0.27	0.10	-	-	58.9	-	100%	-	0.45	0.48	0.70
A-16	Proposed	0.24	-	-	-	-	0.11	0.13	-	-	46.9	-	100%	-	0.35	0.38	0.65
A-17	Proposed	2.03	0.99	-	-	-	0.18	0.86	-	-	34.1	-	100%	-	0.24	0.27	0.59
A-18	Proposed	0.27	-	-	-	-	0.22	0.05	-	-	81.9	-	100%	-	0.66	0.69	0.81
A-19	Proposed	1.10	0.56	-	-	-	0.32	0.22	-	-	54.9	-	100%	-	0.42	0.45	0.68
A-20	Proposed	1.75	1.09	-	-	-	0.17	0.49	-	-	41.4	-	100%	-	0.30	0.33	0.62
A-20a	Proposed	0.43	-	-	-	-	0.14	0.29	-	-	33.9	-	100%	-	0.24	0.27	0.59
A-21	Proposed	2.66	2.12	-	-	-	0.42	0.12	-	-	55.7	-	100%	-	0.42	0.46	0.69
A-23	Proposed	0.58	0.35	-	-	-	0.15	0.08	-	-	56.3	-	100%	-	0.43	0.46	0.69
A-24	Proposed	0.60	0.28	-	-	-	0.25	0.07	-	-	65.2	-	100%	-	0.51	0.54	0.73
A-25	Proposed	0.19	-	-	-	-	0.12	0.07	-	-	63.9	-	100%	-	0.50	0.53	0.73
A-27	Proposed	1.33	0.74	-	-	-	0.44	0.15	-	-	61.1	-	100%	-	0.47	0.50	0.71
A-28	Proposed	0.66	0.44	-	-	-	0.09	0.13	-	-	47.4	-	100%	-	0.35	0.38	0.65
A-28a	Proposed	2.23	1.83	-	-	-	0.22	0.18	-	-	51.1	-	100%	-	0.38	0.41	0.67
A-29	Proposed	1.75	1.08	-	-	-	0.35	0.32	-	-	51.2	-	100%	-	0.38	0.42	0.67
A-29a	Proposed	0.80	0.15	-	-	-	0.36	0.29	-	-	55.1	-	100%	-	0.42	0.45	0.68
A-30	Proposed	0.16	-	-	-	-	0.10	0.06	-	-	63.3	-	100%	-	0.49	0.52	0.72
A-31	Proposed	1.44	1.06	-	-	-	0.19	0.19	-	-	50.3	-	100%	-	0.38	0.41	0.66
A-32	Proposed	12.32	-	-	10.00	-	-	2.32	-	-	45.0	-	85%	15%	0.33	0.37	0.64

Land Use	% Imp.
Single Family Res.	50
Multi-Family Res.	75
School	55
Park	10
Paved	100
Open Space	2
Commercial	95
Existing Report	-

Sum of Areas =	56.31
A*I =	2824.74
Weighted I =	50.2%

SF-2 TIME OF CONCENTRATION FOR EACH SUB-BASIN

Project Name: Springhill E5X

BASIN INFORMATION			INITIAL/OVERLAND FLOW			CHANNELIZED FLOW					TOTAL Tc	MHFD T_c Check				EFFECTIVE Tc
BASIN	AREA	C_5	L_i	S_i	T_i	L_t	S_t	LAND SURFACE	VEL.	T_t	$T_c = T_I + T_T$	% IMP.	LENGTH	SLOPE	T_c	
	(AC)	-	FT	FT/FT	MINUTES	FT	FT/FT		FPS	MINUTES	MINUTES	%	FT	FT/FT	MINUTES	MINUTES
A-0	3.49	0.41	208	0.070	9.5	420	0.010	Paved area	2.00	3.5	13.0	50%	420	0.010	21.8	13.0
A-1	1.23	0.44	65	0.020	7.6	220	0.010	Paved area	2.00	1.8	9.5	54%	220	0.010	19.0	9.5
A-1a	1.34	0.45	202	0.020	13.4	265	0.010	Paved area	2.00	2.2	15.6	55%	265	0.010	19.4	15.6
A-2	0.48	0.61	15	0.020	2.7	250	0.010	Paved area	2.00	2.1	4.8	73%	250	0.010	15.7	5.0
A-3a	0.84	0.46	197	0.020	12.9	205	0.010	Paved area	2.00	1.7	14.6	56%	205	0.010	18.5	14.6
A-3	1.98	0.40	210	0.020	14.6	259	0.010	Paved area	2.00	2.2	16.7	50%	259	0.010	20.3	16.7
A-4	0.83	0.68	17	0.020	2.5	699	0.020	Paved area	2.83	4.1	6.6	81%	699	0.020	16.3	6.6
A-5	0.75	0.48	114	0.020	9.5	297	0.010	Paved area	2.00	2.5	12.0	58%	297	0.010	19.0	12.0
A-6	2.09	0.31	184	0.020	15.3	250	0.010	Paved area	2.00	2.1	17.4	39%	250	0.010	22.2	17.4
A-7	2.44	0.31	180	0.040	12.1	443	0.010	Paved area	2.00	3.7	15.8	41%	443	0.010	24.0	15.8
A-7a	0.09	0.56	15	0.020	3.0	122	0.010	Paved area	2.00	1.0	4.0	67%	122	0.010	15.7	5.0
A-8	1.73	0.45	85	0.020	8.5	850	0.010	Paved area	2.00	7.1	15.6	58%	850	0.010	24.3	15.6
A-8a	0.56	0.41	65	0.020	8.0	275	0.010	Paved area	2.00	2.3	10.3	53%	275	0.010	19.8	10.3
A-9	1.13	0.50	150	0.020	10.6	468	0.010	Paved area	2.00	3.9	14.5	64%	468	0.010	19.4	14.5
A-10	0.99	0.44	120	0.020	10.5	289	0.020	Paved area	2.83	1.7	12.2	58%	289	0.020	18.2	12.2
A-11	0.13	0.62	15	0.020	2.7	158	0.030	Paved area	3.46	0.8	3.4	77%	158	0.030	13.6	5.0
A-12	0.73	0.42	129	0.020	11.1	82	0.010	Paved area	2.00	0.7	11.8	57%	82	0.010	17.1	11.8
A-13	0.40	0.50	17	0.020	3.6	372	0.020	Paved area	2.83	2.2	5.7	61%	372	0.020	18.2	5.7
A-14	0.71	0.63	15	0.020	2.6	1,000	0.010	Paved area	2.00	8.3	11.0	75%	1,000	0.010	21.8	11.0
A-15	2.85	0.28	152	0.030	12.6	764	0.010	Paved area	2.00	6.4	19.0	36%	764	0.010	28.9	19.0
A-16a	0.98	0.48	68	0.020	7.3	515	0.010	Paved area	2.00	4.3	11.6	59%	515	0.010	21.0	11.6
A-16	0.24	0.38	65	0.020	8.4	155	0.010	Paved area	2.00	1.3	9.7	47%	155	0.010	19.7	9.7
A-17	2.03	0.27	188	0.030	14.4	442	0.010	Paved area	2.00	3.7	18.0	34%	442	0.010	25.6	18.0
A-18	0.27	0.69	20	0.020	2.6	273	0.040	Paved area	4.00	1.1	3.8	82%	273	0.040	13.2	5.0
A-19	1.10	0.45	65	0.020	7.5	800	0.040	Paved area	4.00	3.3	10.9	55%	800	0.040	20.7	10.9
A-20	1.75	0.33	196	0.080	9.8	280	0.010	Paved area	2.00	2.3	12.1	41%	280	0.010	22.1	12.1
A-20a	0.43	0.27	62	0.030	8.3	221	0.010	Paved area	2.00	1.8	10.1	34%	221	0.010	22.9	10.1
A-21	2.66	0.46	165	0.040	9.5	571	0.010	Paved area	2.00	4.8	14.2	56%	571	0.010	22.2	14.2
A-23	0.58	0.46	65	0.020	7.4	479	0.010	Paved area	2.00	4.0	11.4	56%	479	0.010	21.2	11.4
A-24	0.60	0.54	69	0.020	6.7	479	0.010	Paved area	2.00	4.0	10.7	65%	479	0.010	19.3	10.7
A-25	0.19	0.53	15	0.020	3.2	224	0.030	Paved area	3.46	1.1	4.3	64%	224	0.030	16.3	5.0
A-27	1.33	0.50	70	0.020	7.2	852	0.010	Paved area	2.00	7.1	14.3	61%	852	0.010	23.7	14.3
A-28	0.66	0.38	131	0.020	11.8	291	0.010	Paved area	2.00	2.4	14.2	47%	291	0.010	21.1	14.2
A-28a	2.23	0.41	186	0.020	13.4	432	0.010	Paved area	2.00	3.6	17.0	51%	432	0.010	21.8	17.0
A-29	1.75	0.42	131	0.020	11.3	700	0.010	Paved area	2.00	5.8	17.1	51%	700	0.010	24.5	17.1
A-29a	0.80	0.45	15	0.020	3.6	650	0.010	Paved area	2.00	5.4	9.0	55%	650	0.010	23.1	9.0
A-30	0.16	0.52	15	0.020	3.2	197	0.010	Paved area	2.00	1.6	4.9	63%	197	0.010	17.1	5.0
A-31	1.44	0.41	137	0.020	11.7	195	0.030	Paved area	3.46	0.9	12.6	50%	195	0.030	18.6	12.6
A-32	12.32	0.37	300	0.020	18.2	500	0.020	Paved area	2.83	2.9	21.2	45%	500	0.020	22.2	21.2

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: Springhill E5X
Design Storm: 2 YEAR
2-Year P1 = 0.81 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C2)	C2*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
A-31	1.44	0.38	0.54	12.6	2.0	1.09
A-30	0.16	0.49	0.08	5.0	2.7	0.22
A-29	1.75	0.38	0.67	17.1	1.7	1.17
A-29a	0.80	0.42	0.33	9.0	2.3	0.77
A-28	0.66	0.35	0.23	14.2	1.9	0.44
A-28a	2.23	0.38	0.85	17.0	1.7	1.49
A-27	1.33	0.47	0.63	14.3	1.9	1.19
A-25	0.19	0.50	0.09	5.0	2.7	0.26
A-24	0.60	0.51	0.31	10.7	2.1	0.66
A-23	0.58	0.43	0.25	11.4	2.1	0.52
A-21	2.66	0.42	1.13	14.2	1.9	2.14
A-20	1.75	0.30	0.52	12.1	2.0	1.07
A-20a	0.43	0.24	0.10	10.1	2.2	0.22
A-19	1.10	0.42	0.46	10.9	2.1	0.98
A-18	0.27	0.66	0.18	5.0	2.7	0.50
A-17	2.03	0.24	0.48	18.0	1.7	0.82
A-16a	0.98	0.45	0.44	11.6	2.1	0.92
A-16	0.24	0.35	0.08	9.7	2.2	0.19

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C2*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
			0.54	12.6	2.0	1.09							1.09 cfs Total Flow at DP 31-A
31-A	A-31	SHEET FLOW	0.00	12.6	2.0			0.00					0 cfs Captured by DP 31-A.
			0.54	12.6	2.0		1.09		1.5	650.0	2.45	4.4	1.09 cfs-Bypass Flow to DP 29-A
			0.08	5.0	2.75	0.22							0.22 cfs Total Flow at DP 30-A
30-A	A-30	SHEET FLOW	0.00	5.0	2.7			0.00					0 cfs Captured by DP 30-A.
			0.08	5.0	2.7		0.22		1.5	650.0	2.45	4.4	0.22 cfs-Bypass Flow to DP 29-A
			1.29	17.1	1.7	2.25							2.25 cfs Total Flow at DP 29-A
29-A	A-29, A-31, A-30	15' CDOT TYPE R ON-GRADE INLET	1.29	17.1	1.7			2.25					2.25 cfs Captured by DP 29-A.
			0.00	17.1	1.7						-	-	No Bypass Flow
			0.33	9.0	2.3	0.77							0.77 cfs Total Flow at DP 29a-A
29a-A	A-29a	10' CDOT TYPE R ON-GRADE INLET	0.33	9.0	2.3			0.77					0.77 cfs Captured by DP 29a-A.
			0.00	9.0	2.3						-	-	No Bypass Flow
			0.23	14.2	1.9	0.44							0.44 cfs Total Flow at DP 28-A
28-A	A-28	5' CDOT TYPE R ON-GRADE INLET	0.23	14.2	1.9			0.44					0.44 cfs Captured by DP 28-A.
			0.00	14.2	1.9						-	-	No Bypass Flow
			0.85	17.0	1.7	1.49							1.49 cfs Total Flow at DP 28a-A
28a-A	A-28a	SHEET FLOW	0.00	17.0	1.7			0.00					0 cfs Captured by DP 28a-A.
			0.85	17.0	1.7		1.49				-	-	1.49 cfs-Bypass Flow to DP 20a-A
			0.63	14.3	1.9	1.19							1.19 cfs Total Flow at DP 27-A
27-A	A-27	10' CDOT TYPE R ON-GRADE INLET	0.63	14.3	1.9			1.19					1.19 cfs Captured by DP 27-A.
			0.00	14.3	1.9						-	-	No Bypass Flow
			0.09	5.0	2.7	0.26							0.26 cfs Total Flow at DP 25-A
25-A	A-25	SHEET FLOW	0.00	5.0	2.7			0.00					0 cfs Captured by DP 25-A.
			0.09	5.0	2.7		0.26				-	-	0.26 cfs-Bypass Flow to DP 20-A
			0.31	10.7	2.1	0.66							0.66 cfs Total Flow at DP 24-A
24-A	A-24	SHEET FLOW	0.00	10.7	2.1			0.00					0 cfs Captured by DP 24-A.
			0.31	10.7	2.1		0.66				-	-	0.66 cfs-Bypass Flow to DP 20-A
			0.25	11.4	2.1	0.52							0.52 cfs Total Flow at DP 23-A
23-A	A-23	SHEET FLOW	0.00	11.4	2.1			0.00					0 cfs Captured by DP 23-A.
			0.25	11.4	2.1		0.52				-	-	0.52 cfs-Bypass Flow to DP 20-A
			1.13	14.2	1.9	2.14							2.14 cfs Total Flow at DP 21-A
21-A	A-21	SHEET FLOW	0.00	14.2	1.9			0.00					0 cfs Captured by DP 21-A.
			1.13	14.2	1.9		2.14				-	-	2.14 cfs-Bypass Flow to DP 20-A
			2.30	14.2	1.9	4.38							4.38 cfs Total Flow at DP 20-A
20-A	A-20, A-25, A-24, A-23, A-21	2 - 10' CDOT TYPE R ON-GRADE INLETS	2.30	14.2	1.9			4.37					4.37 cfs Captured by DP 20-A.
			0.01	14.2	1.9		0.01		1.5	205.0	2.45	1.4	0.01 cfs-Bypass Flow to DP 20a-A
			0.96	17.0	1.7	1.68							1.68 cfs Total Flow at DP 20a-A
20a-A	A-20a, A-28a, A-20	15' CDOT TYPE R ON-GRADE INLET	0.96	17.0	1.7			1.68					1.68 cfs Captured by DP 20a-A.
			0.00	17.0	1.7						-	-	No Bypass Flow
			0.46	10.9	2.1	0.98							0.98 cfs Total Flow at DP 19-A
19-A	A-19	10' CDOT TYPE R ON-GRADE INLET	0.46	10.9	2.1			0.98					0.98 cfs Captured by DP 19-A.
			0.00	10.9	2.1						-	-	No Bypass Flow
			0.18	5.0	2.7	0.50							0.5 cfs Total Flow at DP 18-A
18-A	A-18	SHEET FLOW	0.00	5.0	2.7			0.00					0 cfs Captured by DP 18-A.
			0.18	5.0	2.7		0.50				-	-	0.5 cfs-Bypass Flow to DP 16-A
			0.48	18.0	1.7	0.82							0.82 cfs Total Flow at DP 17-A
17-A	A-17	SHEET FLOW	0.00	18.0	1.7			0.00					0 cfs Captured by DP 17-A.
			0.48	18.0	1.7		0.82				-	-	0.82 cfs-Bypass Flow to DP 16-A
			0.44	11.6	2.1	0.92							0.92 cfs Total Flow at DP 16a-A
16a-A	A-16a	SHEET FLOW	0.00	11.6	2.1			0.00					0 cfs Captured by DP 16a-A.
			0.44	11.6	2.1		0.92				-	-	0.92 cfs-Bypass Flow to DP 16-A
			1.19	18.0	1.7	2.02							2.02 cfs Total Flow at DP 16-A
16-A	A-16, A-18, A-17, A-16a	15' CDOT TYPE R ON-GRADE INLET	1.19	18.0	1.7			2.02					2.02 cfs Captured by DP 16-A.

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: Springhill E5X
Design Storm: 2 YEAR
2-Year P1 = 0.81 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C2)	C2*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
A-15	2.85	0.25	0.73	19.0	1.6	1.20
A-14	0.71	0.60	0.42	11.0	2.1	0.90
A-13	0.40	0.47	0.19	5.7	2.6	0.50
A-12	0.73	0.40	0.29	11.8	2.0	0.61
A-11	0.13	0.60	0.08	5.0	2.7	0.22
A-10	0.99	0.42	0.41	12.2	2.0	0.84
A-9	1.13	0.48	0.54	14.5	1.9	1.02
A-8a	0.56	0.38	0.22	10.3	2.2	0.47
A-8	1.73	0.43	0.75	15.6	1.8	1.36
A-7a	0.09	0.53	0.05	5.0	2.7	0.13
A-7	2.44	0.28	0.69	15.8	1.8	1.26
A-6	2.09	0.28	0.59	17.4	1.7	1.02
A-5	0.75	0.45	0.33	12.0	2.0	0.69
A-32	12.32	0.33	4.09	21.2	1.5	6.37
A-4	0.83	0.66	0.55	6.6	2.5	1.40
A-3a	0.84	0.43	0.36	14.6	1.9	0.67
A-3	1.98	0.37	0.73	16.7	1.7	1.29

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C2*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
	10a	GRADE INLET	0.00	18.0	1.7						-	-	No Bypass Flow
15-A	A-15	10' CDOT TYPE R ON-GRADE INLET	0.73	19.0	1.6	1.20							1.2 cfs Total Flow at DP 15-A
			0.73	19.0	1.6			1.20					1.2 cfs Captured by DP 15-A.
			0.00	19.0	1.6						-	-	No Bypass Flow
14-A	A-14	10' CDOT TYPE R ON-GRADE INLET	0.42	11.0	2.1	0.90							0.9 cfs Total Flow at DP 14-A
			0.42	11.0	2.1			0.90					0.9 cfs Captured by DP 14-A.
			0.00	11.0	2.1						-	-	No Bypass Flow
13-A	A-13	SHEET FLOW	0.19	5.7	2.6	0.50							0.5 cfs Total Flow at DP 13-A
			0.00	5.7	2.6			0.00					0 cfs Captured by DP 13-A.
			0.19	5.7	2.6		0.50				-	-	0.5 cfs-Bypass Flow to DP 3-A
12-A	A-12	SHEET FLOW	0.29	11.8	2.0	0.61							0.61 cfs Total Flow at DP 12-A
			0.00	11.8	2.0			0.00					0 cfs Captured by DP 12-A.
			0.29	11.8	2.0		0.61				-	-	0.61 cfs-Bypass Flow to DP 7-A
11-A	A-11	SHEET FLOW	0.08	5.0	2.7	0.22							0.22 cfs Total Flow at DP 11-A
			0.00	5.0	2.7			0.00					0 cfs Captured by DP 11-A.
			0.08	5.0	2.7		0.22				-	-	0.22 cfs-Bypass Flow to DP 7-A
10-A	A-10	SHEET FLOW	0.41	12.2	2.0	0.84							0.84 cfs Total Flow at DP 10-A
			0.00	12.2	2.0			0.00					0 cfs Captured by DP 10-A.
			0.41	12.2	2.0		0.84				-	-	0.84 cfs-Bypass Flow to DP 7a-A
9-A	A-9	10' CDOT TYPE R ON-GRADE INLET	0.54	14.5	1.9	1.02							1.02 cfs Total Flow at DP 9-A
			0.54	14.5	1.9			1.02					1.02 cfs Captured by DP 9-A.
			0.00	14.5	1.9						-	-	No Bypass Flow
8a-A	A-8a	SHEET FLOW	0.22	10.3	2.2	0.47							0.47 cfs Total Flow at DP 8a-A
			0.00	10.3	2.2			0.00					0 cfs Captured by DP 8a-A.
			0.22	10.3	2.2		0.47				-	-	0.47 cfs-Bypass Flow to DP 7a-A
8-A	A-8	SHEET FLOW	0.75	15.6	1.8	1.36							1.36 cfs Total Flow at DP 8-A
			0.00	15.6	1.8			0.00					0 cfs Captured by DP 8-A.
			0.75	15.6	1.8		1.36				-	-	1.36 cfs-Bypass Flow to DP 7a-A
7a-A	A-7a, A-10, A-8a, A-8	15' CDOT TYPE R ON-GRADE INLET	1.42	15.6	1.8	2.58							2.58 cfs Total Flow at DP 7a-A
			1.42	15.6	1.8			2.58					2.58 cfs Captured by DP 7a-A.
			0.00	15.6	1.8						-	-	No Bypass Flow
7-A	A-7, A-12, A-11	10' CDOT TYPE R ON-GRADE INLET	1.07	15.8	1.8	1.93							1.93 cfs Total Flow at DP 7-A
			1.07	15.8	1.8			1.93					1.93 cfs Captured by DP 7-A.
			0.00	15.8	1.8						-	-	No Bypass Flow
6-A	A-6	10' CDOT TYPE R ON-GRADE INLET	0.59	17.4	1.7	1.02							1.02 cfs Total Flow at DP 6-A
			0.59	17.4	1.7			1.02					1.02 cfs Captured by DP 6-A.
			0.00	17.4	1.7						-	-	No Bypass Flow
5-A	A-5	SHEET FLOW	0.33	12.0	2.0	0.69							0.69 cfs Total Flow at DP 5-A
			0.00	12.0	2.0			0.00					0 cfs Captured by DP 5-A.
			0.33	12.0	2.0		0.69				-	-	0.69 cfs-Bypass Flow to DP 3a-A
32-A	A-32	STUB OUT	4.09	21.2	1.5	6.37							6.37 cfs Total Flow at DP 32-A
			4.09	21.2	1.5			6.37					6.37 cfs Captured by DP 32-A.
			0.00	21.2	1.5						-	-	No Bypass Flow
4-A	A-4	15' CDOT TYPE R ON-GRADE INLET	0.55	6.6	2.5	1.40							1.4 cfs Total Flow at DP 4-A
			0.55	6.6	2.5			1.40					1.4 cfs Captured by DP 4-A.
			0.00	6.6	2.5						-	-	No Bypass Flow
3a-A	A-3a, A-5	10' CDOT TYPE R ON-GRADE INLET	0.69	14.6	1.9	1.30							1.3 cfs Total Flow at DP 3a-A
			0.69	14.6	1.9			1.30					1.3 cfs Captured by DP 3-A.
			0.00	14.6	1.9						-	-	No Bypass Flow
3-A	A-3, A-13	10' CDOT TYPE R ON-GRADE INLET	0.92	16.7	1.7	1.62							1.62 cfs Total Flow at DP 3-A
			0.92	16.7	1.7			1.62					1.62 cfs Captured by DP 3-A.
			0.00	16.7	1.7						-	-	No Bypass Flow
		10' CDOT TYPE R ON-	0.28	5.0	2.7	0.78							0.78 cfs Total Flow at DP 2-A

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: Springhill E5X
Design Storm: 2 YEAR
2-Year P1 = 0.81 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C2)	C2*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
A-2	0.48	0.58	0.28	5.0	2.7	0.78
A-1a	1.34	0.41	0.56	15.6	1.8	1.01
A-1	1.23	0.41	0.50	9.5	2.2	1.13
A-0	3.49	0.38	1.31	13.0	2.0	2.60

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C2*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
2-A	A-2	10' CDOT TYPE R ON-GRADE INLET	0.28	5.0	2.7			0.78					0.78 cfs Captured by DP 2-A.
			0.00	5.0	2.7						-	-	No Bypass Flow
1a-A	A-1a	10' CDOT TYPE R ON-GRADE INLET	0.56	15.6	1.8	1.01							1.01 cfs Total Flow at DP 1a-A
			0.56	15.6	1.8			1.01					1.01 cfs Captured by DP 1a-A.
			0.00	15.6	1.8						-	-	No Bypass Flow
1-A	A-1	15' CDOT TYPE R ON-GRADE INLET	0.50	9.5	2.2	1.13							1.13 cfs Total Flow at DP 1-A
			0.50	9.5	2.2			1.13					1.13 cfs Captured by DP 1-A.
			0.00	9.5	2.2						-	-	No Bypass Flow
0-A	A-0	OVERLAND TO POND	1.31	13.0	2.0	2.60							2.6 cfs Total Flow at DP 0-A
			1.31	13.0	2.0			2.60					2.6 cfs Captured by DP 0-A.
			0.00	13.0	2.0						-	-	No Bypass Flow

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: Springhill E5X
Design Storm: 100 YEAR
100-Year P1 = 2.68 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C100)	C_{100}*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
A-31	1.44	0.66	0.95	12.6	6.6	6.34
A-30	0.16	0.72	0.12	5.0	9.1	1.06
A-29	1.75	0.67	1.17	17.1	5.7	6.72
A-29a	0.80	0.68	0.55	9.0	7.5	4.17
A-28	0.66	0.65	0.43	14.2	6.2	2.69
A-28a	2.23	0.67	1.49	17.0	5.7	8.57
A-27	1.33	0.71	0.95	14.3	6.2	5.96
A-25	0.19	0.73	0.14	5.0	9.1	1.26
A-24	0.60	0.73	0.44	10.7	7.1	3.13
A-23	0.58	0.69	0.40	11.4	6.9	2.78
A-21	2.66	0.69	1.83	14.2	6.2	11.51
A-20	1.75	0.62	1.09	12.1	6.7	7.33
A-20a	0.43	0.59	0.25	10.1	7.2	1.83
A-19	1.10	0.68	0.75	10.9	7.0	5.32
A-18	0.27	0.81	0.22	5.0	9.1	2.01
A-17	2.03	0.59	1.19	18.0	5.6	6.67
A-16a	0.98	0.70	0.69	11.6	6.8	4.74
A-16	0.24	0.65	0.16	9.7	7.3	1.15

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C100*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
			0.95	12.6	6.6	6.34							6.34 cfs Total Flow at DP 31-A
31-A	A-31	SHEET FLOW	0.00	12.6	6.6			0.00					0 cfs Captured by DP 31-A.
			0.95	12.6	6.6		6.34		1.5	650.0	2.45	4.4	6.34 cfs-Bypass Flow to DP 29-A
			0.12	5.0	9.1	1.06							1.06 cfs Total Flow at DP 30-A
30-A	A-30	SHEET FLOW	0.00	5.0	9.1			0.00					0 cfs Captured by DP 30-A.
			0.12	5.0	9.1		1.06		1.5	650.0	2.45	4.4	1.06 cfs-Bypass Flow to DP 29-A
			2.24	17.1	5.7	12.88							12.88 cfs Total Flow at DP 29-A
29-A	A-29, A-31, A-30	15' CDOT TYPE R ON-GRADE INLET	1.92	17.1	5.7			11.07					11.07 cfs Captured by DP 29-A.
			0.31	17.1	5.7		1.81		1.5	765.0	2.45	5.2	1.81 cfs-Bypass Flow to DP 29a-A
			0.86	22.3	5.0	4.33							4.33 cfs Total Flow at DP 29a-A
29a-A	A-29a, A-29	10' CDOT TYPE R ON-GRADE INLET	0.86	22.3	5.0			4.31					4.31 cfs Captured by DP 29a-A.
			0.00	22.3	5.0		0.02		2.0	840.0	2.83	4.9	0.02 cfs-Bypass Flow to DP 4-A
			0.43	14.2	6.2	2.69							2.69 cfs Total Flow at DP 28-A
28-A	A-28	5' CDOT TYPE R ON-GRADE INLET	0.37	14.2	6.2			2.32					2.32 cfs Captured by DP 28-A.
			0.06	14.2	6.2		0.37		1.5	760.0	2.45	5.2	0.37 cfs-Bypass Flow to DP 20a-A
			1.49	17.0	5.7	8.57							8.57 cfs Total Flow at DP 28a-A
28a-A	A-28a	SHEET FLOW	0.00	17.0	5.7			0.00					0 cfs Captured by DP 28a-A.
			1.49	17.0	5.7		8.57		1.5	218.0	2.45	1.5	8.57 cfs-Bypass Flow to DP 20a-A
			0.95	14.3	6.2	5.96							5.96 cfs Total Flow at DP 27-A
27-A	A-27	10' CDOT TYPE R ON-GRADE INLET	0.90	14.3	6.2			5.66					5.66 cfs Captured by DP 27-A.
			0.05	14.3	6.2		0.30		1.5	210.0	2.45	1.4	0.3 cfs-Bypass Flow to DP 20a-A
			0.14	5.0	9.1	1.26							1.26 cfs Total Flow at DP 25-A
25-A	A-25	SHEET FLOW	0.00	5.0	9.1			0.00					0 cfs Captured by DP 25-A.
			0.14	5.0	9.1		1.26				-	-	1.26 cfs-Bypass Flow to DP 20-A
			0.44	10.7	7.1	3.13							3.13 cfs Total Flow at DP 24-A
24-A	A-24	SHEET FLOW	0.00	10.7	7.1			0.00					0 cfs Captured by DP 24-A.
			0.44	10.7	7.1		3.13				-	-	3.13 cfs-Bypass Flow to DP 20-A
			0.40	11.4	6.9	2.78							2.78 cfs Total Flow at DP 23-A
23-A	A-23	SHEET FLOW	0.00	11.4	6.9			0.00					0 cfs Captured by DP 23-A.
			0.40	11.4	6.9		2.78				-	-	2.78 cfs-Bypass Flow to DP 20-A
			1.83	14.2	6.2	11.51							11.51 cfs Total Flow at DP 21-A
21-A	A-21	SHEET FLOW	0.00	14.2	6.2			0.00					0 cfs Captured by DP 21-A.
			1.83	14.2	6.2		11.51				-	-	11.51 cfs-Bypass Flow to DP 20-A
			3.89	14.2	6.2	24.49							24.49 cfs Total Flow at DP 20-A
20-A	A-20, A-25, A-24, A-23, A-21	2 - 10' CDOT TYPE R ON-GRADE INLETS	2.99	14.2	6.2			18.78					18.78 cfs Captured by DP 20-A.
			0.91	14.2	6.2		5.71		1.5	205.0	2.45	1.4	5.71 cfs-Bypass Flow to DP 20a-A
			2.75	19.4	5.4	14.86							14.86 cfs Total Flow at DP 20a-A
20a-A	A-20a, A-28, A-28a, A-27, A-20	15' CDOT TYPE R ON-GRADE INLET	2.24	19.4	5.4			12.08					12.08 cfs Captured by DP 20a-A.
			0.51	19.4	5.4		2.78		2.0	785.0	2.83	4.6	2.78 cfs-Bypass Flow to DP 4-A
			0.75	10.9	7.0	5.32							5.32 cfs Total Flow at DP 19-A
19-A	A-19	10' CDOT TYPE R ON-GRADE INLET	0.74	10.9	7.0			5.26					5.26 cfs Captured by DP 19-A.
			0.01	10.9	7.0		0.06		2.0	775.0	2.83	4.6	0.06 cfs-Bypass Flow to DP 4-A
			0.22	5.0	9.1	2.01							2.01 cfs Total Flow at DP 18-A
18-A	A-18	SHEET FLOW	0.00	5.0	9.1			0.00					0 cfs Captured by DP 18-A.
			0.22	5.0	9.1		2.01				-	-	2.01 cfs-Bypass Flow to DP 16-A
			1.19	18.0	5.6	6.67							6.67 cfs Total Flow at DP 17-A
17-A	A-17	SHEET FLOW	0.00	18.0	5.6			0.00					0 cfs Captured by DP 17-A.
			1.19	18.0	5.6		6.67				-	-	6.67 cfs-Bypass Flow to DP 16-A
			0.69	11.6	6.8	4.74							4.74 cfs Total Flow at DP 16a-A
16a-A	A-16a	SHEET FLOW	0.00	11.6	6.8			0.00					0 cfs Captured by DP 16a-A.
			0.69	11.6	6.8		4.74				-	-	4.74 cfs-Bypass Flow to DP 16-A
			2.25	18.0	5.6	12.63							12.63 cfs Total Flow at DP 16-A
16-A	A-16, A-18, A-17, A-16a	15' CDOT TYPE R ON-GRADE INLET	2.22	18.0	5.6			12.44					12.44 cfs Captured by DP 16-A.

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
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Project Name: Springhill E5X
Design Storm: 100 YEAR
100-Year P1 = 2.68 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C100)	C_{100}*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
A-15	2.85	0.60	1.70	19.0	5.4	9.26
A-14	0.71	0.77	0.54	11.0	7.0	3.83
A-13	0.40	0.71	0.28	5.7	8.8	2.51
A-12	0.73	0.55	0.40	11.8	6.8	2.77
A-11	0.13	0.71	0.09	5.0	9.1	0.85
A-10	0.99	0.59	0.58	12.2	6.7	3.92
A-9	1.13	0.64	0.72	14.5	6.2	4.47
A-8a	0.56	0.60	0.34	10.3	7.2	2.43
A-8	1.73	0.63	1.09	15.6	6.0	6.58
A-7a	0.09	0.74	0.07	5.0	9.1	0.61
A-7	2.44	0.55	1.35	15.8	5.9	8.06
A-6	2.09	0.61	1.28	17.4	5.7	7.29
A-5	0.75	0.70	0.52	12.0	6.7	3.56
A-32	12.32	0.64	7.91	21.2	5.1	40.81
A-4	0.83	0.81	0.67	6.6	8.4	5.68
A-3a	0.84	0.69	0.58	14.6	6.2	3.59
A-3	1.98	0.66	1.30	16.7	5.8	7.60

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C100*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
	10a	GRADE INLET	0.03	18.0	5.6		0.19		2.0	790.0	2.83	4.7	0.19 cfs-Bypass Flow to DP 2-A
15-A	A-15	10' CDOT TYPE R ON-GRADE INLET	1.70	19.0	5.4	9.26							9.26 cfs Total Flow at DP 15-A
			1.37	19.0	5.4			7.49					7.49 cfs Captured by DP 15-A.
			0.32	19.0	5.4		1.77		2.0	800.0	2.83	4.7	1.77 cfs-Bypass Flow to DP 2-A
14-A	A-14	10' CDOT TYPE R ON-GRADE INLET	0.54	11.0	7.0	3.83							3.83 cfs Total Flow at DP 14-A
			0.54	11.0	7.0			3.83					3.83 cfs Captured by DP 14-A.
			0.00	11.0	7.0						-	-	No Bypass Flow
13-A	A-13	SHEET FLOW	0.28	5.7	8.8	2.51							2.51 cfs Total Flow at DP 13-A
			0.00	5.7	8.8			0.00					0 cfs Captured by DP 13-A.
			0.28	5.7	8.8		2.51				-	-	2.51 cfs-Bypass Flow to DP 3-A
12-A	A-12	SHEET FLOW	0.40	11.8	6.8	2.77							2.77 cfs Total Flow at DP 12-A
			0.00	11.8	6.8			0.00					0 cfs Captured by DP 12-A.
			0.40	11.8	6.8		2.77				-	-	2.77 cfs-Bypass Flow to DP 7-A
11-A	A-11	SHEET FLOW	0.09	5.0	9.1	0.85							0.85 cfs Total Flow at DP 11-A
			0.00	5.0	9.1			0.00					0 cfs Captured by DP 11-A.
			0.09	5.0	9.1		0.85				-	-	0.85 cfs-Bypass Flow to DP 7-A
10-A	A-10	SHEET FLOW	0.58	12.2	6.7	3.92							3.92 cfs Total Flow at DP 10-A
			0.00	12.2	6.7			0.00					0 cfs Captured by DP 10-A.
			0.58	12.2	6.7		3.92				-	-	3.92 cfs-Bypass Flow to DP 7a-A
9-A	A-9	10' CDOT TYPE R ON-GRADE INLET	0.72	14.5	6.2	4.47							4.47 cfs Total Flow at DP 9-A
			0.72	14.5	6.2			4.47					4.47 cfs Captured by DP 9-A.
			0.00	14.5	6.2						-	-	No Bypass Flow
8a-A	A-8a	SHEET FLOW	0.34	10.3	7.2	2.43							2.43 cfs Total Flow at DP 8a-A
			0.00	10.3	7.2			0.00					0 cfs Captured by DP 8a-A.
			0.34	10.3	7.2		2.43				-	-	2.43 cfs-Bypass Flow to DP 7a-A
8-A	A-8	SHEET FLOW	1.09	15.6	6.0	6.58							6.58 cfs Total Flow at DP 8-A
			0.00	15.6	6.0			0.00					0 cfs Captured by DP 8-A.
			1.09	15.6	6.0		6.58				-	-	6.58 cfs-Bypass Flow to DP 7a-A
7a-A	A-7a, A-10, A-8a, A-8	15' CDOT TYPE R ON-GRADE INLET	2.08	15.6	6.0	12.50							12.5 cfs Total Flow at DP 7a-A
			1.80	15.6	6.0			10.85					10.85 cfs Captured by DP 7a-A.
			0.27	15.6	6.0		1.65		1.0	460.0	2.00	3.8	1.65 cfs-Bypass Flow to DP 1a-A
7-A	A-7, A-12, A-11	10' CDOT TYPE R ON-GRADE INLET	1.85	15.8	5.9	11.04							11.04 cfs Total Flow at DP 7-A
			1.36	15.8	5.9			8.16					8.16 cfs Captured by DP 7-A.
			0.48	15.8	5.9		2.88		1.0	190.0	2.00	1.6	2.88 cfs-Bypass Flow to DP 6-A
6-A	A-6, A-7	10' CDOT TYPE R ON-GRADE INLET	1.76	17.4	5.7	10.03							10.03 cfs Total Flow at DP 6-A
			1.36	17.4	5.7			7.74					7.74 cfs Captured by DP 6-A.
			0.40	17.4	5.7		2.29		1.0	350.0	2.00	2.9	2.29 cfs-Bypass Flow to DP 3a-A
5-A	A-5	SHEET FLOW	0.52	12.0	6.7	3.56							3.56 cfs Total Flow at DP 5-A
			0.00	12.0	6.7			0.00					0 cfs Captured by DP 5-A.
			0.52	12.0	6.7		3.56				-	-	3.56 cfs-Bypass Flow to DP 3a-A
32-A	A-32	STUB OUT	7.91	21.2	5.1	40.81							40.81 cfs Total Flow at DP 32-A
			7.91	21.2	5.1			40.81					40.81 cfs Captured by DP 32-A.
			0.00	21.2	5.1						-	-	No Bypass Flow
4-A	A-4, A-29a, A-20a, A-19	15' CDOT TYPE R ON-GRADE INLET	0.67	6.6	8.4	5.68							5.68 cfs Total Flow at DP 4-A
			0.67	6.6	8.4			5.68					5.68 cfs Captured by DP 4-A.
			0.00	6.6	8.4						-	-	No Bypass Flow
3a-A	A-3a, A-6, A-5	10' CDOT TYPE R ON-GRADE INLET	1.51	20.3	5.2	7.93							7.93 cfs Total Flow at DP 3a-A
			1.29	20.3	5.2			6.78					6.78 cfs Captured by DP 3-A.
			0.22	20.3	5.2		1.15		1.0	295.0	2.00	2.5	1.15 cfs-Bypass Flow to DP 3-A
3-A	A-3, A-13, A-3a	10' CDOT TYPE R ON-GRADE INLET	1.81	22.8	4.9	8.96							8.96 cfs Total Flow at DP 3-A
			1.71	22.8	4.9			8.46					8.46 cfs Captured by DP 3-A.
			0.10	22.8	4.9		0.50		0.8	30.0	-	-	0.5 cfs-Bypass Flow to DP 1-A
		10' CDOT TYPE R ON-	0.72	23.7	4.8	3.51							3.51 cfs Total Flow at DP 2-A

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RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C100)	C_{100}*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
A-2	0.48	0.76	0.37	5.0	9.1	3.35
A-1a	1.34	0.68	0.91	15.6	6.0	5.51
A-1	1.23	0.68	0.84	9.5	7.4	6.24
A-0	3.49	0.66	2.31	13.0	6.5	15.15

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C100*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
2-A	A-2, A-16, A-15	10' CDOT TYPE R ON-GRADE INLET	0.72	23.7	4.8			3.51					3.51 cfs Captured by DP 2-A.
			0.00	23.7	4.8						-	-	No Bypass Flow
1a-A	A-1a, A-7a	10' CDOT TYPE R ON-GRADE INLET	1.19	19.5	5.3	6.41							6.41 cfs Total Flow at DP 1a-A
			1.10	19.5	5.3			5.93					5.93 cfs Captured by DP 1a-A.
			0.09	19.5	5.3		0.48		1.0	330.0	2.00	2.8	0.48 cfs-Bypass Flow to DP 1-A
1-A	A-1, A-3, A-1a	15' CDOT TYPE R ON-GRADE INLET	0.84	9.5	7.4	6.24							6.24 cfs Total Flow at DP 1-A
			0.81	9.5	7.4			6.07					6.07 cfs Captured by DP 1-A.
			0.02	9.5	7.4		0.17				-	-	0.17 cfs-Bypass Flow to DP 0-A
0-A	A-0, A-1	OVERLAND TO POND	2.33	13.0	6.5	15.30							15.3 cfs Total Flow at DP 0-A
			2.33	13.0	6.5			15.30					15.3 cfs Captured by DP 0-A.
			0.00	13.0	6.5						-	-	No Bypass Flow

SF-1 COMPOSITE BASIN LAND USE

Project Name: SPRING HILL
Calculated By: GR
Checked By: MS
Date: 6/2/2025

Westwood

Basin	Type	Total Area (acres)	Single Family Res (acres)	Multi Family Res (acres)	Playground (acres)	Park (acres)	Paved (acres)	Historic (acres)	Open Space (acres)	Existing Report (acres)	Avg. Imp. (%)	Soil Type A (%)	Soil Type B (%)	Soil Type C/D (%)	C_2	C_5	C_{100}
B-0	Proposed	3.10	0.50	-	-	-	0.14	-	2.46	-	14.2	100%	-	-	0.07	0.07	0.22
B-1	Proposed	0.96	0.47	-	-	-	0.26	-	0.23	-	52.0	100%	-	-	0.36	0.37	0.52
B-2	Proposed	2.14	1.34	-	-	-	0.47	-	0.33	-	53.6	100%	-	-	0.37	0.39	0.53
B-3	Proposed	2.80	1.64	-	-	-	0.54	-	0.62	-	49.0	100%	-	-	0.33	0.35	0.49
B-4	Proposed	1.63	1.34	-	-	-	0.17	-	0.12	-	51.7	100%	-	-	0.36	0.37	0.51
B-5	Proposed	1.66	1.16	-	-	-	0.31	-	0.19	-	53.8	100%	-	-	0.38	0.39	0.53
B-6	Proposed	1.15	0.73	-	-	-	0.28	-	0.14	-	56.3	100%	-	-	0.40	0.41	0.55
B-7	Proposed	1.12	0.52	-	-	-	0.47	-	0.13	-	65.4	100%	-	-	0.48	0.50	0.62
B-8	Proposed	3.33	2.80	-	-	-	0.43	-	0.10	-	55.0	100%	-	-	0.39	0.40	0.54
B-9	Proposed	2.90	2.12	-	-	-	0.45	-	0.33	-	52.3	100%	-	-	0.36	0.38	0.52
B-10	Proposed	1.58	0.83	-	-	-	0.49	-	0.26	-	57.6	100%	-	-	0.41	0.43	0.56
B-11	Proposed	3.52	2.75	-	-	-	0.54	-	0.23	-	54.5	42%	58%	-	0.40	0.42	0.62
B-12	Proposed	1.10	-	-	-	0.62	0.34	-	0.14	-	36.8	100%	-	-	0.23	0.24	0.40
B-13	Proposed	3.02	-	-	-	2.54	0.34	-	0.14	-	19.8	100%	-	-	0.10	0.11	0.26
B-14	Proposed	1.31	0.90	-	-	-	0.33	-	0.08	-	59.7	55%	45%	-	0.44	0.47	0.63
B-15	Proposed	2.07	1.70	-	-	-	0.28	-	0.09	-	54.7	-	100%	-	0.41	0.45	0.68
B-16	Proposed	1.47	0.94	-	-	-	0.45	-	0.08	-	62.7	100%	-	-	0.46	0.47	0.60
B-17	Proposed	1.01	0.65	-	-	-	0.29	-	0.07	-	61.0	100%	-	-	0.44	0.46	0.59
B-18	Proposed	0.81	0.61	-	-	-	0.12	-	0.08	-	52.7	100%	-	-	0.36	0.38	0.52
B-19	Proposed	1.58	0.99	-	-	-	0.46	-	0.13	-	60.6	100%	-	-	0.44	0.45	0.58
B-20	Proposed	3.31	2.49	-	-	-	0.56	-	0.26	-	54.7	100%	-	-	0.38	0.40	0.54
B-21	Proposed	0.74	0.47	-	-	-	0.14	-	0.13	-	51.0	100%	-	-	0.35	0.36	0.51
B-22	Proposed	1.18	0.69	-	-	-	0.38	-	0.11	-	61.6	95%	5%	-	0.45	0.47	0.60
B-23	Proposed	3.96	2.25	-	0.33	-	0.43	-	0.95	-	41.8	37%	63%	-	0.29	0.31	0.55
B-24	Proposed	2.13	1.04	-	0.23	-	0.40	-	0.46	-	46.3	24%	76%	-	0.33	0.36	0.60
B-25	Proposed	1.43	0.93	-	-	-	0.40	-	0.10	-	60.6	49%	51%	-	0.45	0.48	0.65
B-26	Proposed	1.56	1.23	-	-	-	0.26	-	0.07	-	56.2	100%	-	-	0.40	0.41	0.55
B-27	Proposed	2.80	2.20	-	-	-	0.36	-	0.24	-	52.3	100%	-	-	0.36	0.38	0.52
B-28	Proposed	1.74	1.32	-	-	-	0.27	-	0.15	-	53.6	100%	-	-	0.37	0.39	0.53
B-29	Proposed	1.98	1.03	-	-	-	0.50	-	0.45	-	51.7	100%	-	-	0.36	0.37	0.51
B-30	Proposed	1.73	1.03	-	-	-	0.50	-	0.20	-	58.9	100%	-	-	0.42	0.44	0.57
B-31	Proposed	2.22	1.25	-	-	-	0.37	-	0.60	-	45.4	47%	53%	-	0.32	0.34	0.56

Land Use	% Imp.
Single Family Res	50
Multi Family Res	75
Playground	25
Park	10
Paved	100
Historic	2
Open Space	2
Existing Report	-

Basin B-0 to B-31 are tributary to Pond B

Sum of Areas =	63.04
A*I =	3133.94
Weighted I =	49.7%

SF-2 TIME OF CONCENTRATION FOR EACH SUB-BASIN

Project Name: SPRING HILL

BASIN INFORMATION			INITIAL/OVERLAND FLOW			CHANNELIZED FLOW					TOTAL Tc	MHFD T_c Check				EFFECTIVE Tc
BASIN	AREA	C_5	L_i	S_i	T_i	L_t	S_t	LAND SURFACE	VEL.	T_t	$T_c = T_I + T_T$	% IMP.	LENGTH	SLOPE	T_c	
	(AC)	-	FT	FT/FT	MINUTES	FT	FT/FT		FPS	MINUTES	MINUTES	%	FT	FT/FT	MINUTES	MINUTES
B-0	3.10	0.07	400	0.020	29.6	120	0.005	Short pasture and lawns	0.49	4.0	33.6	14%	120	0.005	26.2	26.2
B-1	0.96	0.37	100	0.020	10.4	320	0.010	Paved area	2.00	2.7	13.1	52%	320	0.010	20.4	13.1
B-2	2.14	0.39	70	0.020	8.6	445	0.026	Paved area	3.22	2.3	10.9	54%	445	0.026	19.7	10.9
B-3	2.80	0.35	70	0.020	9.1	570	0.030	Paved area	3.46	2.7	11.8	49%	570	0.030	21.1	11.8
B-4	1.63	0.37	190	0.020	14.4	400	0.020	Paved area	2.83	2.4	16.8	52%	400	0.020	20.1	16.8
B-5	1.66	0.39	20	0.020	4.6	550	0.020	Paved area	2.83	3.2	7.8	54%	550	0.020	20.8	7.8
B-6	1.15	0.41	75	0.020	8.5	505	0.010	Paved area	2.00	4.2	12.7	56%	505	0.010	21.4	12.7
B-7	1.12	0.50	60	0.020	6.7	710	0.010	Paved area	2.00	5.9	12.6	65%	710	0.010	21.4	12.6
B-8	3.33	0.40	200	0.020	14.2	755	0.010	Paved area	2.00	6.3	20.5	55%	755	0.010	24.2	20.5
B-9	2.90	0.38	35	0.020	6.2	820	0.018	Paved area	2.68	5.1	11.2	52%	820	0.018	23.4	11.2
B-10	1.58	0.43	70	0.020	8.1	835	0.012	Paved area	2.19	6.4	14.5	58%	835	0.012	23.7	14.5
B-11	3.52	0.42	180	0.020	13.0	815	0.023	Paved area	3.03	4.5	17.5	55%	815	0.023	22.1	17.5
B-12	1.10	0.24	300	0.016	23.0	190	0.024	Paved area	3.10	1.0	24.0	37%	190	0.024	21.2	21.2
B-13	3.02	0.11	300	0.020	24.7	345	0.010	Paved area	2.00	2.9	27.5	20%	345	0.010	27.5	27.5
B-14	1.31	0.47	70	0.020	7.6	580	0.020	Paved area	2.83	3.4	11.0	60%	580	0.020	19.8	11.0
B-15	2.07	0.45	185	0.020	12.8	485	0.020	Paved area	2.83	2.9	15.6	55%	485	0.020	20.1	15.6
B-16	1.47	0.47	55	0.020	6.7	640	0.010	Paved area	2.00	5.3	12.0	63%	640	0.010	21.3	12.0
B-17	1.01	0.46	65	0.020	7.4	525	0.020	Paved area	2.83	3.1	10.5	61%	525	0.020	19.2	10.5
B-18	0.81	0.38	120	0.020	11.3	225	0.020	Paved area	2.83	1.3	12.7	53%	225	0.020	18.7	12.7
B-19	1.58	0.45	70	0.020	7.8	880	0.010	Paved area	2.00	7.3	15.1	61%	880	0.010	24.1	15.1
B-20	3.31	0.40	185	0.020	13.7	790	0.020	Paved area	2.83	4.7	18.4	55%	790	0.020	22.3	18.4
B-21	0.74	0.36	120	0.020	11.6	210	0.020	Paved area	2.83	1.2	12.8	51%	210	0.020	18.9	12.8
B-22	1.18	0.47	65	0.020	7.3	605	0.020	Paved area	2.83	3.6	10.9	62%	605	0.020	19.6	10.9
B-23	3.96	0.31	400	0.020	22.6	565	0.015	Paved area	2.45	3.8	26.4	42%	565	0.015	24.1	24.1
B-24	2.13	0.36	65	0.020	8.6	625	0.022	Paved area	2.97	3.5	12.1	46%	625	0.022	22.7	12.1
B-25	1.43	0.48	50	0.020	6.3	630	0.022	Paved area	2.97	3.5	9.9	61%	630	0.022	19.7	9.9
B-26	1.56	0.41	175	0.020	13.1	450	0.010	Paved area	2.00	3.8	16.8	56%	450	0.010	20.9	16.8
B-27	2.80	0.38	180	0.020	13.9	500	0.020	Paved area	2.83	2.9	16.9	52%	500	0.020	20.7	16.9
B-28	1.74	0.39	180	0.020	13.7	260	0.020	Paved area	2.83	1.5	15.2	54%	260	0.020	18.7	15.2
B-29	1.98	0.37	165	0.010	16.9	750	0.016	Paved area	2.53	4.9	21.9	52%	750	0.016	23.3	21.9
B-30	1.73	0.44	180	0.020	12.8	565	0.010	Paved area	2.00	4.7	17.5	59%	565	0.010	21.4	17.5
B-31	2.22	0.34	210	0.010	19.9	455	0.080	Paved area	5.66	1.3	21.2	45%	455	0.080	20.0	20.0

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: SPRING HILL
Design Storm: 2 YEAR
2-Year P1 = 0.81 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C2)	C2*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
B-31	2.22	0.32	0.71	20.0	1.6	1.13
B-30	1.73	0.42	0.73	17.5	1.7	1.26
B-29	1.98	0.36	0.70	21.9	1.5	1.08
B-28	1.74	0.37	0.65	15.2	1.8	1.19
B-27	2.80	0.36	1.01	16.9	1.7	1.77
B-26	1.56	0.40	0.62	16.8	1.7	1.09
B-25	1.43	0.45	0.65	9.9	2.2	1.44
B-24	2.13	0.33	0.71	12.1	2.0	1.45
B-23	3.96	0.29	1.15	24.1	1.4	1.68
B-22	1.18	0.45	0.53	10.9	2.1	1.13
B-21	0.74	0.35	0.26	12.8	2.0	0.52
B-20	3.31	0.38	1.27	18.4	1.7	2.13
B-19	1.58	0.44	0.69	15.1	1.8	1.28
B-18	0.81	0.36	0.30	12.7	2.0	0.59
B-17	1.01	0.44	0.45	10.5	2.1	0.97
B-16	1.47	0.46	0.67	12.0	2.0	1.38
B-15	2.07	0.41	0.86	15.6	1.8	1.56
B-14	1.31	0.44	0.58	11.0	2.1	1.23

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C2*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
31-B	B-31	10' CDOT TYPE R INLET ON GRADE	0.71	20.0	1.6	1.13							1.13 cfs Total Flow at DP 31-B
			0.71	20.0	1.6			1.13					1.13 cfs Captured by DP 31-B.
			0.00	20.0	1.6						-	-	No Bypass Flow
30-B	B-30	10' CDOT TYPE R INLET ON GRADE	0.73	17.5	1.71	1.26							1.26 cfs Total Flow at DP 30-B
			0.73	17.5	1.7			1.26					1.26 cfs Captured by DP 30-B.
			0.00	17.5	1.7						-	-	No Bypass Flow
29-B	B-29	10' CDOT TYPE R INLET ON GRADE	0.70	21.9	1.5	1.08							1.08 cfs Total Flow at DP 29-B
			0.70	21.9	1.5			1.08					1.08 cfs Captured by DP 29-B.
			0.00	21.9	1.5						-	-	No Bypass Flow
28-B	B-28	10' CDOT TYPE R INLET ON GRADE	0.65	15.2	1.8	1.19							1.19 cfs Total Flow at DP 28-B
			0.65	15.2	1.8			1.19					1.19 cfs Captured by DP 28-B.
			0.00	15.2	1.8						-	-	No Bypass Flow
27-B	B-27	10' CDOT TYPE R INLET ON GRADE	1.01	16.9	1.7	1.77							1.77 cfs Total Flow at DP 27-B
			1.01	16.9	1.7			1.77					1.77 cfs Captured by DP 27-B.
			0.00	16.9	1.7						-	-	No Bypass Flow
26-B	B-26	10' CDOT TYPE R INLET ON GRADE	0.62	16.8	1.7	1.09							1.09 cfs Total Flow at DP 26-B
			0.62	16.8	1.7			1.09					1.09 cfs Captured by DP 26-B.
			0.00	16.8	1.7						-	-	No Bypass Flow
25-B	B-25	10' CDOT TYPE R INLET ON GRADE	0.65	9.9	2.2	1.44							1.44 cfs Total Flow at DP 25-B
			0.65	9.9	2.2			1.44					1.44 cfs Captured by DP 25-B.
			0.00	9.9	2.2						-	-	No Bypass Flow
24-B	B-24	10' CDOT TYPE R INLET ON GRADE	0.71	12.1	2.0	1.45							1.45 cfs Total Flow at DP 24-B
			0.71	12.1	2.0			1.45					1.45 cfs Captured by DP 24-B.
			0.00	12.1	2.0						-	-	No Bypass Flow
23-B	B-23	15' CDOT TYPE R INLET ON GRADE	1.15	24.1	1.4	1.68							1.68 cfs Total Flow at DP 23-B
			1.15	24.1	1.4			1.68					1.68 cfs Captured by DP 23-B.
			0.00	24.1	1.4						-	-	No Bypass Flow
22-B	B-22	10' CDOT TYPE R INLET ON GRADE	0.53	10.9	2.1	1.13							1.13 cfs Total Flow at DP 22-B
			0.53	10.9	2.1			1.13					1.13 cfs Captured by DP 22-B.
			0.00	10.9	2.1						-	-	No Bypass Flow
21-B	B-21	10' CDOT TYPE R INLET ON GRADE	0.26	12.8	2.0	0.52							0.52 cfs Total Flow at DP 21-B
			0.26	12.8	2.0			0.52					0.52 cfs Captured by DP 21-B.
			0.00	12.8	2.0						-	-	No Bypass Flow
20-B	B-20	10' CDOT TYPE R INLET ON GRADE	1.27	18.4	1.7	2.13							2.13 cfs Total Flow at DP 20-B
			1.27	18.4	1.7			2.13					2.13 cfs Captured by DP 20-B.
			0.00	18.4	1.7						-	-	No Bypass Flow
19-B	B-19	10' CDOT TYPE R INLET ON GRADE	0.69	15.1	1.8	1.28							1.28 cfs Total Flow at DP 19-B
			0.69	15.1	1.8			1.28					1.28 cfs Captured by DP 19-B.
			0.00	15.1	1.8						-	-	No Bypass Flow
18-B	B-18	10' CDOT TYPE R INLET ON GRADE	0.30	12.7	2.0	0.59							0.59 cfs Total Flow at DP 18-B
			0.30	12.7	2.0			0.59					0.59 cfs Captured by DP 18-B.
			0.00	12.7	2.0						-	-	No Bypass Flow
17-B	B-17	10' CDOT TYPE R INLET ON GRADE	0.45	10.5	2.1	0.97							0.97 cfs Total Flow at DP 17-B
			0.45	10.5	2.1			0.97					0.97 cfs Captured by DP 17-B.
			0.00	10.5	2.1						-	-	No Bypass Flow
16-B	B-16	10' CDOT TYPE R INLET ON GRADE	0.67	12.0	2.0	1.38							1.38 cfs Total Flow at DP 16-B
			0.67	12.0	2.0			1.38					1.38 cfs Captured by DP 16-B.
			0.00	12.0	2.0						-	-	No Bypass Flow
15-B	B-15	10' CDOT TYPE R INLET ON GRADE	0.86	15.6	1.8	1.56							1.56 cfs Total Flow at DP 15-B
			0.86	15.6	1.8			1.56					1.56 cfs Captured by DP 15-B.
			0.00	15.6	1.8						-	-	No Bypass Flow
14-B	B-14	10' CDOT TYPE R INLET ON GRADE	0.58	11.0	2.1	1.23							1.23 cfs Total Flow at DP 14-B
			0.58	11.0	2.1			1.23					1.23 cfs Captured by DP 14-B.
			0.00	11.0	2.1						-	-	No Bypass Flow

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: SPRING HILL
Design Storm: 2 YEAR
2-Year P1 = 0.81 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C2)	C2*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
B-13	3.02	0.10	0.31	27.5	1.3	0.41
B-12	1.10	0.23	0.25	21.2	1.5	0.39
B-11	3.52	0.40	1.41	17.5	1.7	2.42
B-10	1.58	0.41	0.65	14.5	1.9	1.22
B-9	2.90	0.36	1.05	11.2	2.1	2.21
B-8	3.33	0.39	1.28	20.5	1.6	2.04
B-7	1.12	0.48	0.54	12.6	2.0	1.09
B-6	1.15	0.40	0.46	12.7	2.0	0.91
B-5	1.66	0.38	0.62	7.8	2.4	1.51
B-4	1.63	0.36	0.58	16.8	1.7	1.02
B-3	2.80	0.33	0.93	11.8	2.0	1.92
B-2	2.14	0.37	0.80	10.9	2.1	1.71
B-1	0.96	0.36	0.34	13.1	2.0	0.68
B-0	3.10	0.07	0.20	26.2	1.4	0.28

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C2*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
13-B	B-13	10' CDOT TYPE R INLET ON GRADE	0.31	27.5	1.3	0.41							0.41 cfs Total Flow at DP 13-B
			0.31	27.5	1.3			0.41					0.41 cfs Captured by DP 13-B.
			0.00	27.5	1.3						-	-	No Bypass Flow
12-B	B-12	10' CDOT TYPE R INLET ON GRADE	0.25	21.2	1.5	0.39							0.39 cfs Total Flow at DP 12-B
			0.25	21.2	1.5			0.39					0.39 cfs Captured by DP 12-B.
			0.00	21.2	1.5						-	-	No Bypass Flow
11-B	B-11	15' CDOT TYPE R INLET ON GRADE	1.41	17.5	1.7	2.42							2.42 cfs Total Flow at DP 11-B
			1.41	17.5	1.7			2.42					2.42 cfs Captured by DP 11-B.
			0.00	17.5	1.7						-	-	No Bypass Flow
10-B	B-10	10' CDOT TYPE R INLET ON GRADE	0.65	14.5	1.9	1.22							1.22 cfs Total Flow at DP 10-B
			0.65	14.5	1.9			1.22					1.22 cfs Captured by DP 10-B.
			0.00	14.5	1.9						-	-	No Bypass Flow
9-B	B-9	10' CDOT TYPE R INLET ON GRADE	1.05	11.2	2.1	2.21							2.21 cfs Total Flow at DP 9-B
			1.05	11.2	2.1			2.21					2.21 cfs Captured by DP 9-B.
			0.00	11.2	2.1						-	-	No Bypass Flow
8-B	B-8	10' CDOT TYPE R INLET ON GRADE	1.28	20.5	1.6	2.04							2.04 cfs Total Flow at DP 8-B
			1.28	20.5	1.6			2.04					2.04 cfs Captured by DP 8-B.
			0.00	20.5	1.6						-	-	No Bypass Flow
7-B	B-7	10' CDOT TYPE R INLET ON GRADE	0.54	12.6	2.0	1.09							1.09 cfs Total Flow at DP 7-B
			0.54	12.6	2.0			1.09					1.09 cfs Captured by DP 7-B.
			0.00	12.6	2.0						-	-	No Bypass Flow
6-B	B-6	10' CDOT TYPE R INLET IN SUMP	0.46	12.7	2.0	0.91							0.91 cfs Total Flow at DP 6-B
			0.46	12.7	2.0			0.91					0.91 cfs Captured by DP 6-B.
			0.00	12.7	2.0						-	-	No Bypass Flow
5-B	B-5	10' CDOT TYPE R INLET ON GRADE	0.62	7.8	2.4	1.51							1.51 cfs Total Flow at DP 5-B
			0.62	7.8	2.4			1.51					1.51 cfs Captured by DP 5-B.
			0.00	7.8	2.4						-	-	No Bypass Flow
4-B	B-4	10' CDOT TYPE R INLET IN SUMP	0.58	16.8	1.7	1.02							1.02 cfs Total Flow at DP 4-B
			0.58	16.8	1.7			1.02					1.02 cfs Captured by DP 4-B.
			0.00	16.8	1.7						-	-	No Bypass Flow
3-B	B-3	10' CDOT TYPE R INLET ON GRADE	0.93	11.8	2.0	1.92							1.92 cfs Total Flow at DP 3-B
			0.93	11.8	2.0			1.92					1.92 cfs Captured by DP 3-B.
			0.00	11.8	2.0						-	-	No Bypass Flow
2-B	B-2	15' CDOT TYPE R INLET IN SUMP	0.80	10.9	2.1	1.71							1.71 cfs Total Flow at DP 2-B
			0.80	10.9	2.1			1.71					1.71 cfs Captured by DP 2-B.
			0.00	10.9	2.1						-	-	No Bypass Flow
1-B	B-1	10' CDOT TYPE R INLET IN SUMP	0.34	13.1	2.0	0.68							0.68 cfs Total Flow at DP 1-B
			0.34	13.1	2.0			0.68					0.68 cfs Captured by DP 1-B.
			0.00	13.1	2.0						-	-	No Bypass Flow
0-B	B-0	OVERLAND TO POND B	0.20	26.2	1.4	0.28							0.28 cfs Total Flow at DP 0-B
			0.20	26.2	1.4			0.28					0.28 cfs Captured by DP 0-B.
			0.00	26.2	1.4						-	-	No Bypass Flow

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: SPRING HILL
Design Storm: 100 YEAR
100-Year P1 = 2.68 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C100)	C_{100}*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
B-31	2.22	0.56	1.24	20.0	5.3	6.56
B-30	1.73	0.57	0.99	17.5	5.6	5.61
B-29	1.98	0.51	1.02	21.9	5.0	5.15
B-28	1.74	0.53	0.92	15.2	6.0	5.60
B-27	2.80	0.52	1.45	16.9	5.7	8.40
B-26	1.56	0.55	0.86	16.8	5.8	4.96
B-25	1.43	0.65	0.93	9.9	7.3	6.81
B-24	2.13	0.60	1.28	12.1	6.7	8.68
B-23	3.96	0.55	2.19	24.1	4.8	10.55
B-22	1.18	0.60	0.70	10.9	7.0	4.97
B-21	0.74	0.51	0.38	12.8	6.5	2.48
B-20	3.31	0.54	1.78	18.4	5.5	9.87
B-19	1.58	0.58	0.92	15.1	6.1	5.63
B-18	0.81	0.52	0.42	12.7	6.6	2.80
B-17	1.01	0.59	0.59	10.5	7.1	4.24
B-16	1.47	0.60	0.88	12.0	6.7	5.97
B-15	2.07	0.68	1.41	15.6	6.0	8.50
B-14	1.31	0.63	0.83	11.0	7.0	5.84

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C100*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
31-B	B-31	10' CDOT TYPE R INLET ON GRADE	1.24	20.0	5.3	6.56							6.56 cfs Total Flow at DP 31-B
			1.12	20.0	5.3			5.96					5.96 cfs Captured by DP 31-B.
			0.11	20.0	5.3		0.60		1.7	615.0	2.61	3.9	0.6 cfs-Bypass Flow to DP 27-B
30-B	B-30	10' CDOT TYPE R INLET ON GRADE	0.99	17.5	5.6	5.61							5.61 cfs Total Flow at DP 30-B
			0.95	17.5	5.6			5.41					5.41 cfs Captured by DP 30-B.
			0.04	17.5	5.6		0.20		1.2	70.0	2.19	0.5	0.2 cfs-Bypass Flow to DP 28-B
29-B	B-29	10' CDOT TYPE R INLET ON GRADE	1.02	21.9	5.0	5.15							5.15 cfs Total Flow at DP 29-B
			1.00	21.9	5.0			5.05					5.05 cfs Captured by DP 29-B.
			0.02	21.9	5.0		0.10		1.2	45.0	2.19	0.3	0.1 cfs-Bypass Flow to DP 28-B
28-B	B-28, B-30, B-29	10' CDOT TYPE R INLET ON GRADE	0.92	15.2	6.0	5.60							5.6 cfs Total Flow at DP 28-B
			0.89	15.2	6.0			5.40					5.4 cfs Captured by DP 28-B.
			0.03	15.2	6.0		0.20		1.0	775.0	2.00	6.5	0.2 cfs-Bypass Flow to DP 16-B
27-B	B-27, B-31	10' CDOT TYPE R INLET ON GRADE	1.45	16.9	5.7	8.40							8.4 cfs Total Flow at DP 27-B
			1.21	16.9	5.7			7.00					7 cfs Captured by DP 27-B.
			0.24	16.9	5.7		1.40		1.0	550.0	2.00	4.6	1.4 cfs-Bypass Flow to DP 26-B
26-B	B-26, B-27	10' CDOT TYPE R INLET ON GRADE	1.10	21.5	5.1	5.61							5.61 cfs Total Flow at DP 26-B
			1.08	21.5	5.1			5.51					5.51 cfs Captured by DP 26-B.
			0.02	21.5	5.1		0.10		1.0	610.0	2.00	5.1	0.1 cfs-Bypass Flow to DP 5-B
25-B	B-25	10' CDOT TYPE R INLET ON GRADE	0.93	9.9	7.3	6.81							6.81 cfs Total Flow at DP 25-B
			0.86	9.9	7.3			6.31					6.31 cfs Captured by DP 25-B.
			0.07	9.9	7.3		0.50		1.8	585.0	2.68	3.6	0.5 cfs-Bypass Flow to DP 17-B
24-B	B-24	10' CDOT TYPE R INLET ON GRADE	1.28	12.1	6.7	8.68							8.68 cfs Total Flow at DP 24-B
			1.09	12.1	6.7			7.38					7.38 cfs Captured by DP 24-B.
			0.19	12.1	6.7		1.30		1.8	280.0	2.68	1.7	1.3 cfs-Bypass Flow to DP 21-B
23-B	B-23	15' CDOT TYPE R INLET ON GRADE	2.19	24.1	4.8	10.55							10.55 cfs Total Flow at DP 23-B
			2.05	24.1	4.8			9.85					9.85 cfs Captured by DP 23-B.
			0.15	24.1	4.8		0.70		1.8	255.0	2.68	1.6	0.7 cfs-Bypass Flow to DP 21-B
22-B	B-22	10' CDOT TYPE R INLET ON GRADE	0.70	10.9	7.0	4.97							4.97 cfs Total Flow at DP 22-B
			0.70	10.9	7.0			4.97					4.97 cfs Captured by DP 22-B.
			0.00	10.9	7.0						-	-	No Bypass Flow
21-B	B-21, B-24, B-23	10' CDOT TYPE R INLET ON GRADE	0.71	25.6	4.6	3.31							3.31 cfs Total Flow at DP 21-B
			0.71	25.6	4.6			3.31					3.31 cfs Captured by DP 21-B.
			0.00	25.6	4.6						-	-	No Bypass Flow
20-B	B-20	10' CDOT TYPE R INLET ON GRADE	1.78	18.4	5.5	9.87							9.87 cfs Total Flow at DP 20-B
			1.38	18.4	5.5			7.67					7.67 cfs Captured by DP 20-B.
			0.40	18.4	5.5		2.20		1.8	280.0	2.68	1.7	2.2 cfs-Bypass Flow to DP 18-B
19-B	B-19	10' CDOT TYPE R INLET ON GRADE	0.92	15.1	6.1	5.63							5.63 cfs Total Flow at DP 19-B
			0.84	15.1	6.1			5.13					5.13 cfs Captured by DP 19-B.
			0.08	15.1	6.1		0.50		1.8	250.0	2.68	1.6	0.5 cfs-Bypass Flow to DP 18-B
18-B	B-18, B-20, B-19	10' CDOT TYPE R INLET ON GRADE	0.90	20.1	5.3	4.77							4.77 cfs Total Flow at DP 18-B
			0.90	20.1	5.3			4.77					4.77 cfs Captured by DP 18-B.
			0.00	20.1	5.3						-	-	No Bypass Flow
17-B	B-17, B-25	10' CDOT TYPE R INLET ON GRADE	0.66	13.5	6.4	4.25							4.25 cfs Total Flow at DP 17-B
			0.66	13.5	6.4			4.25					4.25 cfs Captured by DP 17-B.
			0.00	13.5	6.4						-	-	No Bypass Flow
16-B	B-16, B-28	10' CDOT TYPE R INLET ON GRADE	0.88	12.0	6.7	5.97							5.97 cfs Total Flow at DP 16-B
			0.84	12.0	6.7			5.67					5.67 cfs Captured by DP 16-B.
			0.04	12.0	6.7		0.30		1.0	550.0	2.00	4.6	0.3 cfs-Bypass Flow to DP 6-B
15-B	B-15	10' CDOT TYPE R INLET ON GRADE	1.41	15.6	6.0	8.50							8.5 cfs Total Flow at DP 15-B
			1.21	15.6	6.0			7.30					7.3 cfs Captured by DP 15-B.
			0.20	15.6	6.0		1.20		2.2	345.0	-	-	1.2 cfs-Bypass Flow to DP 12-B
14-B	B-14	10' CDOT TYPE R INLET ON GRADE	0.83	11.0	7.0	5.84							5.84 cfs Total Flow at DP 14-B
			0.79	11.0	7.0			5.54					5.54 cfs Captured by DP 14-B.
			0.04	11.0	7.0		0.30		2.2	330.0	-	-	0.3 cfs-Bypass Flow to DP 12-B

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: SPRING HILL
Design Storm: 100 YEAR
100-Year P1 = 2.68 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C100)	C_{100}*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
B-13	3.02	0.26	0.80	27.5	4.4	3.56
B-12	1.10	0.40	0.44	21.2	5.1	2.25
B-11	3.52	0.62	2.18	17.5	5.6	12.44
B-10	1.58	0.56	0.88	14.5	6.2	5.52
B-9	2.90	0.52	1.50	11.2	6.9	10.47
B-8	3.33	0.54	1.80	20.5	5.2	9.42
B-7	1.12	0.62	0.69	12.6	6.6	4.62
B-6	1.15	0.55	0.63	12.7	6.6	4.17
B-5	1.66	0.53	0.88	7.8	7.9	7.05
B-4	1.63	0.51	0.84	16.8	5.8	4.86
B-3	2.80	0.49	1.38	11.8	6.8	9.42
B-2	2.14	0.53	1.13	10.9	7.0	7.99
B-1	0.96	0.52	0.50	13.1	6.5	3.23
B-0	3.10	0.22	0.68	26.2	4.6	3.14

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C100*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
13-B	B-13	10' CDOT TYPE R INLET ON GRADE	0.80	27.5	4.4	3.56							3.56 cfs Total Flow at DP 13-B
			0.80	27.5	4.4			3.56					3.56 cfs Captured by DP 13-B.
			0.00	27.5	4.4						-	-	No Bypass Flow
12-B	B-12, B-15, B-14	10' CDOT TYPE R INLET ON GRADE	0.68	21.2	5.1	3.50							3.5 cfs Total Flow at DP 12-B
			0.68	21.2	5.1			3.50					3.5 cfs Captured by DP 12-B.
			0.00	21.2	5.1						-	-	No Bypass Flow
11-B	B-11	15' CDOT TYPE R INLET ON GRADE	2.18	17.5	5.6	12.44							12.44 cfs Total Flow at DP 11-B
			1.92	17.5	5.6			10.94					10.94 cfs Captured by DP 11-B.
			0.26	17.5	5.6		1.50		1.1	625.0	-	-	1.5 cfs-Bypass Flow to DP 9-B
10-B	B-10	10' CDOT TYPE R INLET ON GRADE	0.88	14.5	6.2	5.52							5.52 cfs Total Flow at DP 10-B
			0.85	14.5	6.2			5.32					5.32 cfs Captured by DP 10-B.
			0.03	14.5	6.2		0.20		1.1	340.0	-	-	0.2 cfs-Bypass Flow to DP 7-B
9-B	B-9, B-11	10' CDOT TYPE R INLET ON GRADE	1.50	11.2	6.9	10.47							10.47 cfs Total Flow at DP 9-B
			1.14	11.2	6.9			7.97					7.97 cfs Captured by DP 9-B.
			0.36	11.2	6.9		2.50		1.0	315.0	2.00	2.6	2.5 cfs-Bypass Flow to DP 5-B
8-B	B-8	10' CDOT TYPE R INLET ON GRADE	1.80	20.5	5.2	9.42							9.42 cfs Total Flow at DP 8-B
			1.41	20.5	5.2			7.42					7.42 cfs Captured by DP 8-B.
			0.38	20.5	5.2		2.00		1.1	315.0	-	-	2 cfs-Bypass Flow to DP 7-B
7-B	B-7, B-10, B-8	10' CDOT TYPE R INLET ON GRADE	1.11	20.5	5.2	5.81							5.81 cfs Total Flow at DP 7-B
			1.05	20.5	5.2			5.51					5.51 cfs Captured by DP 7-B.
			0.06	20.5	5.2		0.30		1.0	275.0	2.00	2.3	0.3 cfs-Bypass Flow to DP 5-B
6-B	B-6, B-16	10' CDOT TYPE R INLET IN SUMP	0.63	12.7	6.6	4.17							4.17 cfs Total Flow at DP 6-B
			0.63	12.7	6.6			4.17					4.17 cfs Captured by DP 6-B.
			0.00	12.7	6.6						-	-	No Bypass Flow
5-B	B-5, B-26, B-9, B-7	10' CDOT TYPE R INLET ON GRADE	0.88	7.8	7.9	7.05							7.05 cfs Total Flow at DP 5-B
			0.79	7.8	7.9			6.35					6.35 cfs Captured by DP 5-B.
			0.09	7.8	7.9		0.70		1.0	215.0	2.00	1.8	0.7 cfs-Bypass Flow to DP 4-B
4-B	B-4, B-5, B-3	10' CDOT TYPE R INLET IN SUMP	1.19	16.8	5.8	6.90							6.9 cfs Total Flow at DP 4-B
			1.19	16.8	5.8			6.90					6.9 cfs Captured by DP 4-B.
			0.00	16.8	5.8						-	-	No Bypass Flow
3-B	B-3	10' CDOT TYPE R INLET ON GRADE	1.38	11.8	6.8	9.42							9.42 cfs Total Flow at DP 3-B
			1.12	11.8	6.8			7.62					7.62 cfs Captured by DP 3-B.
			0.26	11.8	6.8		1.80		1.1	150.0	-	-	1.8 cfs-Bypass Flow to DP 4-B
2-B	B-2	15' CDOT TYPE R INLET IN SUMP	1.13	10.9	7.0	7.99							7.99 cfs Total Flow at DP 2-B
			1.13	10.9	7.0			7.99					7.99 cfs Captured by DP 2-B.
			0.00	10.9	7.0						-	-	No Bypass Flow
1-B	B-1	10' CDOT TYPE R INLET IN SUMP	0.50	13.1	6.5	3.23							3.23 cfs Total Flow at DP 1-B
			0.50	13.1	6.5			3.23					3.23 cfs Captured by DP 1-B.
			0.00	13.1	6.5						-	-	No Bypass Flow
0-B	B-0	OVERLAND TO POND B	0.68	26.2	4.6	3.14							3.14 cfs Total Flow at DP 0-B
			0.68	26.2	4.6			3.14					3.14 cfs Captured by DP 0-B.
			0.00	26.2	4.6						-	-	No Bypass Flow

SF-1 COMPOSITE BASIN LAND USE

Westwood

Project Name: SPRING HILL
Calculated By: BK
Checked By: MS
Date: 6/5/2025

Basin	Type	Total Area (acres)	Single Family Res *(acres)*	Town Homes *(acres)*	School *(acres)*	Park *(acres)*	Paved *(acres)*	Historic *(acres)*	Open Space *(acres)*	Existing Report *(acres)*	Avg. Imp. *(%)*	Soil Type A *(%)*	Soil Type B *(%)*	Soil Type C/D *(%)*	C_2	C_5	C_{100}
C-0	Proposed	2.76	-	0.11	-	-	0.02	-	2.63	-	5.2	47%	53%	-	0.02	0.03	0.31
C-1	Proposed	0.52	-	-	-	-	0.50	-	0.02	-	96.2	13%	87%	-	0.80	0.82	0.88
C-2	Proposed	6.01	-	2.06	-	-	0.16	-	3.79	-	26.2	75%	25%	-	0.15	0.17	0.37
C-3	Proposed	0.21	-	-	-	-	0.21	-	-	-	100.0	-	100%	-	0.84	0.86	0.90
C-4	Proposed	4.99	-	1.75	-	-	1.02	-	2.22	-	44.1	1%	99%	-	0.32	0.35	0.63
C-5	Proposed	0.21	-	-	-	-	0.16	-	0.05	-	76.7	-	100%	-	0.62	0.64	0.79
C-6	Proposed	1.60	-	-	-	-	0.69	-	0.91	-	44.3	75%	25%	-	0.30	0.32	0.50
C-3a	Proposed	0.61	-	0.32	-	-	0.10	-	0.19	-	51.1	-	100%	-	0.38	0.41	0.67

Land Use	% Imp.
Single Family Res	50
Town Homes	65
School	55
Park	10
Paved	100

SF-2 TIME OF CONCENTRATION FOR EACH SUB-BASIN

Project Name: SPRING HILL

BASIN INFORMATION			INITIAL/OVERLAND FLOW			CHANNELIZED FLOW					TOTAL Tc	MHFD T_c Check				EFFECTIVE Tc
BASIN	AREA	C_5	L_i	S_i	T_i	L_t	S_t	LAND SURFACE	VEL.	T_t	$T_c = T_I + T_T$	% IMP.	LENGTH	SLOPE	T_c	
	(AC)	-	FT	FT/FT	MINUTES	FT	FT/FT		FPS	MINUTES	MINUTES	%	FT	FT/FT	MINUTES	MINUTES
C-0	2.76	0.03	305	0.045	20.6	140	0.005	Short pasture and lawns	0.49	4.7	25.3	5%	140	0.005	28.5	25.3
C-1	0.52	0.82	15	0.020	1.5	230	0.010	Paved area	2.00	1.9	3.5	96%	230	0.010	11.3	5.0
C-2	6.01	0.17	45	0.020	9.0	1,395	0.027	Paved area	3.29	7.1	16.1	26%	1,395	0.027	32.7	16.1
C-3	0.21	0.86	15	0.020	1.3	225	0.010	Paved area	2.00	1.9	3.2	100%	225	0.010	10.6	5.0
C-4	4.99	0.35	10	0.020	3.4	1,165	0.010	Paved area	2.00	9.7	13.1	44%	1,165	0.010	31.3	13.1
C-5	0.21	0.64	15	0.020	2.5	225	0.010	Paved area	2.00	1.9	4.4	77%	225	0.010	14.9	5.0
C-6	1.60	0.32	95	0.020	11.0	945	0.020	Paved area	2.83	5.6	16.5	44%	945	0.020	25.8	16.5
C-3a	0.61	0.41	160	0.020	12.5	70	0.010	Paved area	2.00	0.6	13.0	51%	70	0.010	18.0	13.0

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: SPRING HILL
Design Storm: 2 YEAR
2-Year P1 = 0.81 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C2)	C2*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
C-6	1.60	0.30	0.48	16.5	1.8	0.85
C-5	0.21	0.62	0.13	5.0	2.7	0.36
C-4	4.99	0.32	1.61	13.1	2.0	3.17
C-3	0.21	0.84	0.18	5.0	2.7	0.49
C-2	6.01	0.15	0.93	16.1	1.8	1.66
C-1	0.52	0.80	0.42	5.0	2.7	1.16
C-0	2.76	0.02	0.06	25.3	1.4	0.09
C-3a	0.61	0.38	0.23	13.0	2.0	0.46

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C2*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
6-C	C-6	10' CDOT TYPE R INLET IN SUMP	0.48	16.5	1.8	0.85							0.85 cfs Total Flow at DP 6-C
			0.48	16.5	1.8			0.85					0.85 cfs Captured by DP 6-C.
			0.00	16.5	1.8						-	-	No Bypass Flow
5-C	C-5	5' CDOT TYPE R INLET IN SUMP	0.13	5.0	2.75	0.36							0.36 cfs Total Flow at DP 5-C
			0.13	5.0	2.7			0.36					0.36 cfs Captured by DP 5-C.
			0.00	5.0	2.7						-	-	No Bypass Flow
4-C	C-4	2-15' CDOT TYPE R INLET ON GRADE	1.61	13.1	2.0	3.17							3.17 cfs Total Flow at DP 4-C
			1.61	13.1	2.0			3.17					3.17 cfs Captured by DP 4-C.
			0.00	13.1	2.0						-	-	No Bypass Flow
3-C	C-3	15' CDOT TYPE R INLET ON GRADE	0.18	5.0	2.7	0.49							0.49 cfs Total Flow at DP 3-C
			0.18	5.0	2.7			0.49					0.49 cfs Captured by DP 3-C.
			0.00	5.0	2.7						-	-	No Bypass Flow
2-C	C-2	2-15' CDOT TYPE R INLET IN SUMP	0.93	16.1	1.8	1.66							1.66 cfs Total Flow at DP 2-C
			0.93	16.1	1.8			1.66					1.66 cfs Captured by DP 2-C.
			0.00	16.1	1.8						-	-	No Bypass Flow
1-C	C-1	5' CDOT TYPE R INLET IN SUMP	0.42	5.0	2.7	1.16							1.16 cfs Total Flow at DP 1-C
			0.42	5.0	2.7			1.16					1.16 cfs Captured by DP 1-C.
			0.00	5.0	2.7						-	-	No Bypass Flow
0-C	C-0, C-3a	OVERLAND TO POND C	0.30	25.3	1.4	0.42							0.42 cfs Total Flow at DP 0-C
			0.30	25.3	1.4			0.42					0.42 cfs Captured by DP 0-C.
			0.00	25.3	1.4						-	-	No Bypass Flow
3A-C	C-3a	BYPASS	0.23	13.0	2.0	0.46							0.46 cfs Total Flow at DP 3A-C
			0.00	13.0	2.0			0.00					0 cfs Captured by DP 3a-C.
			0.23	13.0	2.0		0.46		4.8	275.0	4.38	1.0	0.46 cfs-Bypass Flow to DP 0-C

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: SPRING HILL
Design Storm: 100 YEAR
100-Year P1 = 2.68 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C100)	C_{100}*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
C-6	1.60	0.50	0.80	16.5	5.8	4.68
C-5	0.21	0.79	0.17	5.0	9.1	1.51
C-4	4.99	0.63	3.15	13.1	6.5	20.57
C-3	0.21	0.90	0.19	5.0	9.1	1.72
C-2	6.01	0.37	2.24	16.1	5.9	13.27
C-1	0.52	0.88	0.46	5.0	9.1	4.17
C-0	2.76	0.31	0.85	25.3	4.6	3.99
C-3a	0.61	0.67	0.41	13.0	6.5	2.66

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C100*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
6-C	C-6	10' CDOT TYPE R INLET IN SUMP	0.80	16.5	5.8	4.68							4.68 cfs Total Flow at DP 6-C
			0.80	16.5	5.8			4.68					4.68 cfs Captured by DP 6-C.
			0.00	16.5	5.8						-	-	No Bypass Flow
5-C	C-5	5' CDOT TYPE R INLET IN SUMP	0.17	5.0	9.1	1.51							1.51 cfs Total Flow at DP 5-C
			0.17	5.0	9.1			1.51					1.51 cfs Captured by DP 5-C.
			0.00	5.0	9.1						-	-	No Bypass Flow
4-C	C-4	2-15' CDOT TYPE R INLET ON GRADE	3.15	13.1	6.5	20.57							20.57 cfs Total Flow at DP 4-C
			2.66	13.1	6.5			17.37					17.37 cfs Captured by DP 4-C.
			0.49	13.1	6.5		3.20		0.5	30.0	1.41	0.4	3.2 cfs-Bypass Flow to DP 3-C
3-C	C-3, C-4	15' CDOT TYPE R INLET ON GRADE	0.68	13.5	6.4	4.38							4.38 cfs Total Flow at DP 3-C
			0.68	13.5	6.4			4.38					4.38 cfs Captured by DP 3-C.
			0.00	13.5	6.4						-	-	No Bypass Flow
2-C	C-2	2-15' CDOT TYPE R INLET IN SUMP	2.24	16.1	5.9	13.27							13.27 cfs Total Flow at DP 2-C
			2.24	16.1	5.9			13.27					13.27 cfs Captured by DP 2-C.
			0.00	16.1	5.9						-	-	No Bypass Flow
1-C	C-1	5' CDOT TYPE R INLET IN SUMP	0.46	5.0	9.1	4.17							4.17 cfs Total Flow at DP 1-C
			0.46	5.0	9.1			4.17					4.17 cfs Captured by DP 1-C.
			0.00	5.0	9.1						-	-	No Bypass Flow
0-C	C-0, C-3a	OVERLAND TO POND C	1.26	25.3	4.6	5.89							5.89 cfs Total Flow at DP 0-C
			1.26	25.3	4.6			5.89					5.89 cfs Captured by DP 0-C.
			0.00	25.3	4.6						-	-	No Bypass Flow
3A-C	C-3a	BYPASS	0.41	13.0	6.5	2.66							2.66 cfs Total Flow at DP 3A-C
			0.00	13.0	6.5			0.00					0 cfs Captured by DP 3a-C.
			0.41	13.0	6.5		2.66		4.8	275.0	4.38	1.0	2.66 cfs-Bypass Flow to DP 0-C

SF-1 COMPOSITE BASIN LAND USE

Westwood

Project Name: Spring Hill
Calculated By: VJH
Checked By: MS
Date: 6/2/2025

Basin	Type	Total Area (acres)	Pond (acres)	Townhomes (acres)	Multi-Family Res. (acres)	Roadway w/ Landscaping (acres)	Park (acres)	Concrete (acres)	Historic/Open Space (acres)	Existing Report (acres)	Avg. Imp. (%)	Soil Type A (%)	Soil Type B (%)	Soil Type C/D (%)	C_2	C_5	C_{100}
D-0	Proposed	1.18	0.95	0.08	-	-	-	0.15	-	-	97.6	39%	3%	58%	0.81	0.84	0.88
D-1	Proposed	2.40	-	0.25	-	1.46	-	0.09	0.60	-	58.5	45%	55%	-	0.43	0.46	0.64
D-2	Proposed	3.80	-	1.51	-	0.31	0.79	0.56	0.63	-	49.3	21%	79%	-	0.36	0.39	0.62
D-3	Proposed	0.16	-	-	-	0.07	-	-	0.09	-	35.3	100%	-	-	0.22	0.23	0.38
D-4	Proposed	1.36	-	0.33	-	0.82	-	0.20	0.01	-	77.5	-	100%	-	0.62	0.65	0.79
D-5	Proposed	0.87	-	-	-	0.56	-	-	0.31	-	50.9	6%	94%	-	0.38	0.41	0.66
D-6	Proposed	3.89	-	-	-	0.83	-	-	3.06	-	18.2	4%	96%	-	0.11	0.13	0.50
D-7	Proposed	1.19	-	0.72	-	0.47	-	-	-	-	70.1	-	100%	-	0.55	0.58	0.76

Land Use	% Imp.
Pond	100
Townhomes	65
Multi-Family Res.	75
Roadway w/ Landscaping	78
Park	10
Concrete	100
Historic/Open Space	2
Existing Report	-

Basins D-0 to D-7 are tributary to Pond D.

Sum of Areas =	14.85
A*I =	752.71
Weighted I =	50.7%

SF-2 TIME OF CONCENTRATION FOR EACH SUB-BASIN

Project Name: Spring Hill

BASIN INFORMATION			INITIAL/OVERLAND FLOW			CHANNELIZED FLOW					TOTAL Tc	MHFD T_c Check				EFFECTIVE Tc
BASIN	AREA	C_5	L_i	S_i	T_i	L_t	S_t	LAND SURFACE	VEL.	T_t	$T_c = T_I + T_T$	% IMP.	LENGTH	SLOPE	T_c	
	(AC)	-	FT	FT/FT	MINUTES	FT	FT/FT		FPS	MINUTES	MINUTES	%	FT	FT/FT	MINUTES	MINUTES
D-0	1.18	0.84	300	0.020	6.6	170	0.020	Paved area	2.83	1.0	7.6	98%	170	0.020	10.3	7.6
D-1	2.40	0.46	16	0.020	3.7	1,112	0.014	Paved area	2.37	7.8	11.5	58%	1,112	0.014	25.2	11.5
D-2	3.80	0.39	95	0.020	10.0	757	0.015	Paved area	2.45	5.2	15.1	49%	757	0.015	24.1	15.1
D-3	0.16	0.23	17	0.020	5.2	130	0.013	Paved area	2.28	1.0	6.1	35%	130	0.013	21.4	6.1
D-4	1.36	0.65	31	0.020	3.6	1,128	0.011	Paved area	2.10	9.0	12.5	78%	1,128	0.011	21.9	12.5
D-5	0.87	0.41	38	0.020	6.1	717	0.010	Paved area	2.00	6.0	12.1	51%	717	0.010	24.8	12.1
D-6	3.89	0.13	80	0.020	12.4	1,178	0.012	Paved area	2.19	9.0	21.4	18%	1,178	0.012	38.4	21.4
D-7	1.19	0.58	115	0.020	7.9	590	0.013	Paved area	2.28	4.3	12.3	70%	590	0.013	18.7	12.3

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: Spring Hill
Design Storm: 2 YEAR
2-Year P1 = 0.81 in. UDFCD Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C2)	C2*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
D-0	1.18	0.81	0.96	7.6	2.4	2.34
D-1	2.40	0.43	1.04	11.5	2.1	2.18
D-2	3.80	0.36	1.37	15.1	1.8	2.53
D-3	0.16	0.22	0.03	6.1	2.6	0.09
D-4	1.36	0.62	0.85	12.5	2.0	1.71
D-5	0.87	0.38	0.33	12.1	2.0	0.68
D-6	3.89	0.11	0.44	21.4	1.5	0.69
D-7	1.19	0.55	0.66	12.3	2.0	1.34

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C2*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
0-D	D-0	OVERLAND TO POND D	0.96	7.6	2.4	2.34							2.34 cfs Total Flow at DP 0D
			0.96	7.6	2.4			2.34					2.34 cfs Captured by DP 0D.
			0.00	7.6	2.4						-	-	No Bypass Flow
1-D	D-1	15' CDOT TYPE R IN SUMP	1.04	11.5	2.07	2.18							2.18 cfs Total Flow at DP 1D
			1.04	11.5	2.1			2.18					2.18 cfs Captured by DP 1D.
			0.00	11.5	2.1						-	-	No Bypass Flow
2-D	D-2	15' CDOT TYPE R IN SUMP	1.37	15.1	1.8	2.53							2.53 cfs Total Flow at DP 2D
			1.37	15.1	1.8			2.53					2.53 cfs Captured by DP 2D.
			0.00	15.1	1.8						-	-	No Bypass Flow
3-D	D-3	10' CDOT TYPE R ON GRADE	0.03	6.1	2.6	0.09							0.09 cfs Total Flow at DP 3D
			0.03	6.1	2.6			0.09					0.09 cfs Captured by DP 3D.
			0.00	6.1	2.6						-	-	No Bypass Flow
4-D	D-4	10' CDOT TYPE R ON GRADE	0.85	12.5	2.0	1.71							1.71 cfs Total Flow at DP 4D
			0.85	12.5	2.0			1.71					1.71 cfs Captured by DP 4D.
			0.00	12.5	2.0						-	-	No Bypass Flow
5-D	D-5	10' CDOT TYPE R ON GRADE	0.33	12.1	2.0	0.68							0.68 cfs Total Flow at DP 5D
			0.33	12.1	2.0			0.68					0.68 cfs Captured by DP 5D.
			0.00	12.1	2.0						-	-	No Bypass Flow
6-D	D-6	10' CDOT TYPE R IN SUMP	0.44	21.4	1.5	0.69							0.69 cfs Total Flow at DP 6D
			0.44	21.4	1.5			0.69					0.69 cfs Captured by DP 6D.
			0.00	21.4	1.5						-	-	No Bypass Flow
7-D	D-7	10' CDOT TYPE R ON GRADE	0.66	12.3	2.0	1.34							1.34 cfs Total Flow at DP 7D
			0.66	12.3	2.0			1.34					1.34 cfs Captured by DP 7D.
			0.00	12.3	2.0						-	-	No Bypass Flow

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: Spring Hill
Design Storm: 100 YEAR
100-Year P1 = 2.68 in. UDFCD Figure RA-6

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C100)	C_{100}*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
D-0	1.18	0.88	1.04	7.6	8.0	8.39
D-1	2.40	0.64	1.54	11.5	6.8	10.61
D-2	3.80	0.62	2.37	15.1	6.1	14.49
D-3	0.16	0.38	0.06	6.1	8.6	0.53
D-4	1.36	0.79	1.07	12.5	6.6	7.15
D-5	0.87	0.66	0.57	12.1	6.7	3.86
D-6	3.89	0.50	1.95	21.4	5.1	10.00
D-7	1.19	0.76	0.90	12.3	6.7	6.05

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C100*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
0-D	D-0	OVERLAND TO POND D	1.04	7.6	8.0	8.39							8.39 cfs Total Flow at DP 0D
			1.04	7.6	8.0			8.39					8.39 cfs Captured by DP 0D.
			0.00	7.6	8.0						-	-	No Bypass Flow
1-D	D-1, D-4	15' CDOT TYPE R IN SUMP	1.67	12.5	6.6	11.12							11.12 cfs Total Flow at DP 1D
			1.67	12.5	6.6			11.12					11.12 cfs Captured by DP 1D.
			0.00	12.5	6.6						-	-	No Bypass Flow
2-D	D-2, D-7	15' CDOT TYPE R IN SUMP	2.43	15.1	6.1	14.85							14.85 cfs Total Flow at DP 2D
			2.43	15.1	6.1			14.85					14.85 cfs Captured by DP 2D.
			0.00	15.1	6.1						-	-	No Bypass Flow
3-D	D-3, D-5	10' CDOT TYPE R ON GRADE	0.14	12.1	6.7	0.94							0.94 cfs Total Flow at DP 3D
			0.14	12.1	6.7			0.94					0.94 cfs Captured by DP 3D.
			0.00	12.1	6.7						-	-	No Bypass Flow
4-D	D-4	10' CDOT TYPE R ON GRADE	1.07	12.5	6.6	7.15							7.15 cfs Total Flow at DP 4D
			0.94	12.5	6.6			6.25					6.25 cfs Captured by DP 4D.
			0.14	12.5	6.6		0.90		1.1	330.0	-	-	0.9 cfs-Bypass Flow to DP 1-D
5-D	D-5, D-6	10' CDOT TYPE R ON GRADE	1.17	21.4	5.1	6.03							6.03 cfs Total Flow at DP 5D
			1.10	21.4	5.1			5.63					5.63 cfs Captured by DP 5D.
			0.08	21.4	5.1		0.40		1.1	163.0	-	-	0.4 cfs-Bypass Flow to DP 3-D
6-D	D-6	10' CDOT TYPE R IN SUMP	1.95	21.4	5.1	10.00							10 cfs Total Flow at DP 6D
			1.35	21.4	5.1			6.90					6.9 cfs Captured by DP 6D.
			0.60	21.4	5.1		3.10		1.0	1.0	2.00	0.0	3.1 cfs-Bypass Flow to DP 5-D
7-D	D-7	10' CDOT TYPE R ON GRADE	0.90	12.3	6.7	6.05							6.05 cfs Total Flow at DP 7D
			0.84	12.3	6.7			5.65					5.65 cfs Captured by DP 7D.
			0.06	12.3	6.7		0.40		1.0	300.0	2.00	2.5	0.4 cfs-Bypass Flow to DP 2-D

SF-1 COMPOSITE BASIN LAND USE

Project Name: Spring Hill
Calculated By: EJB
Checked By: MS
Date: 6/5/2025

Westwood

Basin	Type	Total Area (acres)	Townhome (acres)	Multi-Family Res. (acres)	School (acres)	Park (acres)	Paved (acres)	Open Space (acres)	Gravel (Packed) (acres)	Existing Report (acres)	Avg. Imp. (%)	Soil Type A (%)	Soil Type B (%)	Soil Type C/D (%)	C_2	C_5	C_{100}
E-1	Proposed	1.08	-	-	-	-	1.08	-	-	-	100.0	-	-	100%	0.83	0.86	0.89
E-2	Proposed	1.48	-	-	-	-	1.24	0.24	-	-	84.1	-	-	100%	0.68	0.72	0.83
E-3	Proposed	1.92	0.45	-	-	-	0.42	1.05	-	-	38.2	-	100%	-	0.27	0.30	0.61
E-4	Proposed	2.55	1.16	-	-	-	0.93	0.46	-	-	66.4	-	100%	-	0.52	0.55	0.74
E-5	Proposed	1.34	0.44	-	-	-	0.80	0.10	-	-	81.2	-	100%	-	0.66	0.69	0.81
E-6	Proposed	1.62	1.10	-	-	-	0.52	-	-	-	76.2	-	100%	-	0.61	0.64	0.78
E-7	Proposed	1.26	0.45	-	-	-	0.56	0.24	0.01	-	68.4	-	100%	-	0.54	0.57	0.75
E-8	Proposed	1.18	0.53	-	-	-	0.54	0.11	-	-	75.1	-	100%	-	0.60	0.63	0.78
E-9	Proposed	1.06	0.40	-	-	-	0.58	0.06	0.02	-	80.1	-	95%	5%	0.65	0.68	0.80
E-0	Proposed	1.33	-	-	-	-	0.69	0.64	-	-	52.8	-	-	100%	0.41	0.47	0.70
OS-E1	Proposed	5.34	-	-	-	-	-	1.35	3.99	-	30.4	40%	-	60%	0.20	0.25	0.50
OS-E2	Proposed	4.02	-	-	-	-	-	0.65	3.37	-	33.9	10%	30%	60%	0.24	0.29	0.59
OS-E3	Proposed	4.15	-	-	-	-	-	2.27	1.88	-	19.2	20%	70%	10%	0.12	0.14	0.47

Land Use	% Imp.
Townhome	65
Multi-Family Res.	75
School	55
Park	10
Paved	100
Open Space	2
Gravel (Packed)	40
Existing Report	-

Basins E-1 to E-0 are tributary to Pond E.

Sum of Areas =	28.33
A*I =	1415.59
Weighted I =	50.0%

SF-2 TIME OF CONCENTRATION FOR EACH SUB-BASIN

Project Name: Spring Hill

BASIN INFORMATION			INITIAL/OVERLAND FLOW			CHANNELIZED FLOW					TOTAL Tc	MHFD T_c Check				EFFECTIVE Tc
BASIN	AREA	C_5	L_i	S_i	T_i	L_t	S_t	LAND SURFACE	VEL.	T_t	$T_c = T_I + T_T$	% IMP.	LENGTH	SLOPE	T_c	
	(AC)	-	FT	FT/FT	MINUTES	FT	FT/FT		FPS	MINUTES	MINUTES	%	FT	FT/FT	MINUTES	MINUTES
E-1	1.08	0.86	30	0.020	1.9	960	0.010	Paved area	2.00	8.0	9.9	100%	960	0.010	16.0	9.9
E-2	1.48	0.72	80	0.020	4.8	985	0.010	Paved area	2.00	8.2	13.0	84%	985	0.010	19.6	13.0
E-3	1.92	0.30	70	0.020	9.6	470	0.010	Paved area	2.00	3.9	13.5	38%	470	0.010	25.0	13.5
E-4	2.55	0.55	236	0.020	12.1	1,107	0.010	Paved area	2.00	9.2	21.3	66%	1,107	0.010	24.8	21.3
E-5	1.34	0.69	80	0.020	5.3	1,034	0.010	Paved area	2.00	8.6	13.9	81%	1,034	0.010	20.7	13.9
E-6	1.62	0.64	50	0.020	4.7	696	0.015	Paved area	2.45	4.7	9.4	76%	696	0.015	17.9	9.4
E-7	1.26	0.57	50	0.020	5.4	708	0.020	Paved area	2.83	4.2	9.6	68%	708	0.020	18.9	9.6
E-8	1.18	0.63	80	0.020	6.0	500	0.020	Paved area	2.83	2.9	9.0	75%	500	0.020	16.2	9.0
E-9	1.06	0.68	80	0.020	5.4	703	0.020	Paved area	2.83	4.1	9.6	80%	703	0.020	16.5	9.6
E-0	1.33	0.47	85	0.020	8.4	10	0.010	Paved area	2.00	0.1	8.4	53%	10	0.010	17.1	8.4
OS-E1	5.34	0.25	300	0.030	18.6	401	0.010	Grassed waterway	1.50	4.5	23.0	30%	401	0.010	25.9	23.0
OS-E2	4.02	0.29	300	0.020	20.2	486	0.010	Grassed waterway	1.50	5.4	25.6	34%	486	0.010	26.1	25.6
OS-E3	4.15	0.14	300	0.030	20.9	700	0.020	Grassed waterway	2.12	5.5	26.4	19%	700	0.020	29.8	26.4

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: Spring Hill
Design Storm: 2 YEAR
2-Year P1 = 0.81 in. UDFCF Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C2)	C2*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
E-9	1.06	0.65	0.69	9.6	2.2	1.54
E-8	1.18	0.60	0.71	9.0	2.3	1.63
E-7	1.26	0.54	0.68	9.6	2.2	1.52
E-6	1.62	0.61	0.99	9.4	2.2	2.24
E-5	1.34	0.66	0.88	13.9	1.9	1.69
E-4	2.55	0.52	1.33	21.3	1.5	2.06
E-3	1.92	0.27	0.52	13.5	1.9	1.02
OS-E3	4.15	0.12	0.49	26.4	1.4	0.68
E-2	1.48	0.68	1.01	13.0	2.0	2.00
E-1	1.08	0.83	0.90	9.9	2.2	1.99
OS-E2	4.02	0.24	0.96	25.6	1.4	1.35
OS-E1	5.34	0.20	1.08	23.0	1.5	1.61
E-0	1.33	0.41	0.54	8.4	2.3	1.27

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C2*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
			0.69	9.6	2.2	1.54							1.54 cfs Total Flow at DP 9-E
9-E	E-9	Bypass	0.06	9.6	2.2			0.14					No Flow Captured
			0.62	9.6	2.2		1.54		2.0	517.0	2.83	3.0	1.54 cfs-Bypass Flow to DP 8-E
			1.33	12.6	1.99	2.67							2.67 cfs Total Flow at DP 8-E
8-E	E-8, E-9	15' CDOT Type R On-Grade Inlet	1.33	12.6	2.0			2.67					2.67 cfs Captured by DP 8-E.
			0.00	12.6	2.0						-	-	No Bypass Flow
			0.68	9.6	2.2	1.52							1.52 cfs Total Flow at DP 7-E
7-E	E-7	15' CDOT Type R On-Grade Inlet	0.68	9.6	2.2			1.52					1.52 cfs Captured by DP 7-E.
			0.00	9.6	2.2						-	-	No Bypass Flow
			0.99	9.4	2.2	2.24							2.24 cfs Total Flow at DP 6-E
6-E	E-6	15' CDOT Type R On-Grade Inlet	0.99	9.4	2.2			2.24					2.24 cfs Captured by DP 6-E.
			0.00	9.4	2.2						-	-	No Bypass Flow
			0.88	13.9	1.9	1.69							1.69 cfs Total Flow at DP 5-E
5-E	E-5	15' CDOT Type R On-Grade Inlet	0.88	13.9	1.9			1.69					1.69 cfs Captured by DP 5-E.
			0.00	13.9	1.9						-	-	No Bypass Flow
			1.33	21.3	1.5	2.06							2.06 cfs Total Flow at DP 4-E
4-E	E-4	15' CDOT Type R On-Grade Inlet	1.33	21.3	1.5			2.06					2.06 cfs Captured by DP 4-E.
			0.00	21.3	1.5						-	-	No Bypass Flow
			0.52	13.5	1.9	1.02							1.02 cfs Total Flow at DP 3-E
3-E	E-3	15' CDOT Type R On-Grade Inlet	0.52	13.5	1.9			1.02					1.02 cfs Captured by DP 3-E.
			0.00	13.5	1.9						-	-	No Bypass Flow
			0.49	26.4	1.4	0.68							0.68 cfs Total Flow at DP E3-OS
E3-OS	OS-E3	CDOT Type C Inlet in Depression	0.49	26.4	1.4			0.68					0.68 cfs Captured by DP E3-OS.
			0.00	26.4	1.4						-	-	No Bypass Flow
			1.01	13.0	2.0	2.00							2 cfs Total Flow at DP 2-E
2-E	E-2	CDOT Type C Sump Inlet	1.01	13.0	2.0			2.00					2 cfs Captured by DP 2-E.
			0.00	13.0	2.0						-	-	No Bypass Flow
			0.90	9.9	2.2	1.99							1.99 cfs Total Flow at DP 1-E
1-E	E-1	CDOT Type C Sump Inlet	0.90	9.9	2.2			1.99					1.99 cfs Captured by DP 1-E.
			0.00	9.9	2.2						-	-	No Bypass Flow
			0.96	25.6	1.4	1.35							1.35 cfs Total Flow at DP E2-OS
E2-OS	OS-E2	Swale	0.00	25.6	1.4			0.00					No Flow Captured
			0.96	25.6	1.4		1.35		0.5	380.0	1.41	4.5	1.35 cfs-Bypass Flow to DP E1-OS
			2.04	30.1	1.3	2.61							2.61 cfs Total Flow at DP E1-OS
E1-OS	OS-E1, OS-E2	Swale	2.04	30.1	1.3			2.61					2.61 cfs Captured by DP E1-OS.
			0.00	30.1	1.3						-	-	No Bypass Flow
			0.54	8.4	2.3	1.27							1.27 cfs Total Flow at DP 0-E
0-E	E-0	Overland to Pond	0.54	8.4	2.3			1.27					1.27 cfs Captured by DP E-0.
			0.00	8.4	2.3						-	-	No Bypass Flow

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE FOR INLET DESIGN)

Project Name: Spring Hill
Design Storm: 100 YEAR
100-Year P1 = 2.68 in. UDFCF Figure RA-1

RUNOFF GENERATED BY INDIVIDUAL BASIN						
BASIN	AREA	Runoff Coeff. (C100)	C_{100}*A	T_c	I	Q_{BASIN}
	ACRES		acres	minutes	in/hr	cfs
E-9	1.06	0.80	0.85	9.6	7.4	6.33
E-8	1.18	0.78	0.92	9.0	7.6	7.00
E-7	1.26	0.75	0.94	9.6	7.4	7.00
E-6	1.62	0.78	1.27	9.4	7.4	9.51
E-5	1.34	0.81	1.08	13.9	6.3	6.87
E-4	2.55	0.74	1.88	21.3	5.1	9.67
E-3	1.92	0.61	1.16	13.5	6.4	7.49
OS-E3	4.15	0.47	1.95	26.4	4.5	8.90
E-2	1.48	0.83	1.23	13.0	6.5	8.03
E-1	1.08	0.89	0.97	9.9	7.3	7.08
OS-E2	4.02	0.59	2.36	25.6	4.6	10.96
OS-E1	5.34	0.50	2.69	23.0	4.9	13.26
E-0	1.33	0.70	0.93	8.4	7.7	7.26

RUNOFF INCLUDING TRIBUTARY BASINS									BYPASS TC				
DESIGN POINT	TRIBUTARY BASINS	Flow Description (Inlet, Bypass, etc.)	Effective C100*A	Effective Tc	Effective I	Total Q at DP (MHFD-Inlet Input)	Q (Bypass)	Q (Captured)	Slope	Length	Velocity	Tt	Notes
			acres	minutes	in/hr	cfs	cfs	cfs	%	ft	ft/s	minutes	
			0.85	9.6	7.4	6.33							6.33 cfs Total Flow at DP 9-E
9-E	E-9	Bypass	0.03	9.6	7.4			0.21					No Flow Captured
			0.82	9.6	7.4		6.33		2.0	517.0	2.83	3.0	6.33 cfs-Bypass Flow to DP 8-E
			1.74	12.6	6.6	11.56							11.56 cfs Total Flow at DP 8-E
8-E	E-8, E-9	15' CDOT Type R On-Grade Inlet	1.55	12.6	6.6			10.29					10.29 cfs Captured by DP 8-E.
			0.19	12.6	6.6		1.27		1.0	993.0	2.00	8.3	1.27 cfs-Bypass Flow to DP 1-E
			0.94	9.6	7.4	7.00							7 cfs Total Flow at DP 7-E
7-E	E-7	15' CDOT Type R On-Grade Inlet	0.84	9.6	7.4			6.26					6.26 cfs Captured by DP 7-E.
			0.10	9.6	7.4		0.74		2.0	140.0	2.83	0.8	0.74 cfs-Bypass Flow to DP 6-E
			1.37	10.4	7.1	9.86							9.86 cfs Total Flow at DP 6-E
6-E	E-6, E-7	15' CDOT Type R On-Grade Inlet	1.06	10.4	7.1			7.61					7.61 cfs Captured by DP 6-E.
			0.31	10.4	7.1		2.25		1.0	1025.0	2.00	8.5	2.25 cfs-Bypass Flow to DP 1-E
			1.08	13.9	6.3	6.87							6.87 cfs Total Flow at DP 5-E
5-E	E-5	15' CDOT Type R On-Grade Inlet	0.97	13.9	6.3			6.18					6.18 cfs Captured by DP 5-E.
			0.11	13.9	6.3		0.69		2.0	490.0	2.83	2.9	0.69 cfs-Bypass Flow to DP 3-E
			1.88	21.3	5.1	9.67							9.67 cfs Total Flow at DP 4-E
4-E	E-4	15' CDOT Type R On-Grade Inlet	1.47	21.3	5.1			7.53					7.53 cfs Captured by DP 4-E.
			0.42	21.3	5.1		2.14		1.0	1015.0	2.00	8.5	2.14 cfs-Bypass Flow to DP 1-E
			1.16	13.5	6.4	7.49							7.49 cfs Total Flow at DP 3-E
3-E	E-3, E-5	15' CDOT Type R On-Grade Inlet	1.01	13.5	6.4			6.53					6.53 cfs Captured by DP 3-E.
			0.15	13.5	6.4		0.96		1.0	990.0	2.00	8.3	0.96 cfs-Bypass Flow to DP 2-E
			1.95	26.4	4.5	8.90							8.9 cfs Total Flow at DP E3-OS
E3-OS	OS-E3	CDOT Type C Inlet in Depression	1.95	26.4	4.5			8.90					8.9 cfs Captured by DP E3-OS.
			0.00	26.4	4.5						-	-	No Bypass Flow
			1.23	13.0	6.5	8.03							8.03 cfs Total Flow at DP 2-E
2-E	E-2, E-3	CDOT Type C Sump Inlet	1.23	13.0	6.5			8.03					8.03 cfs Captured by DP 2-E.
			0.00	13.0	6.5						-	-	No Bypass Flow
			1.89	29.8	4.2	8.03							8.03 cfs Total Flow at DP 1-E
1-E	E-1, E-8, E-6, E-4	CDOT Type C Sump Inlet	1.89	29.8	4.2			8.03					8.03 cfs Captured by DP 1-E.
			0.00	29.8	4.2						-	-	No Bypass Flow
			2.36	25.6	4.6	10.96							10.96 cfs Total Flow at DP E2-OS
E2-OS	OS-E2	Swale	0.00	25.6	4.6			0.00					No Flow Captured
			2.36	25.6	4.6		10.96		0.5	380.0	1.41	4.5	10.96 cfs-Bypass Flow to DP OS-E1
			2.69	23.0	4.9	13.26							13.26 cfs Total Flow at DP E1-OS
E1-OS	OS-E1	Swale	2.69	23.0	4.9			13.26					13.26 cfs Captured by DP E1-OS.
			0.00	23.0	4.9						-	-	No Bypass Flow
			0.93	8.4	7.7	7.26							7.26 cfs Total Flow at DP 0-E
0-E	E-0	Overland to Pond	0.93	8.4	7.7			7.26					7.26 cfs Captured by DP E-0.
			0.00	8.4	7.7						-	-	No Bypass Flow

Appendix A – Hydrologic Computations

Runoff Reduction

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 1

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	1	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	22,123	--								
RPA (ft^2)	--	--	23,889								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	80.0%								
HSG B (%)	--	--	20.0%								
HSG C/D (%)	--	--	0.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	46,012								
UIA:RPA Ratio	--	--	0.9								
UIA:RPA Interface Width (ft)	--	--	427								
L / W Ratio of UIA:RPA	--	--	0.25								

2. Buffer Length

Average Buffer Length (ft)	--	--	56								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.013								
Effective Distance (ft)	--	--	50								
Number of Level Spreaders	--	--	2								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	48.1%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	922								
Runoff Reduction (ft^3)	--	--	922								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	1	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	22,123	46,012								
Imperviousness (%)		100.0%	48.1%								
Tributary Runoff (ft^3)	0	922	922								
Runoff Reduction (ft^3)	0	0	922								
Runoff Remaining (ft^3)	0	922	0								

Total Tributary Area entered on Site Layout Worksheet is: 46,012 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 2

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	2	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	22,605	--								
RPA (ft^2)	--	--	20,114								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	100.0%								
HSG C/D (%)	--	--	0.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	42,719								
UIA:RPA Ratio	--	--	1.1								
UIA:RPA Interface Width (ft)	--	--	372								
L / W Ratio of UIA:RPA	--	--	0.31								

2. Buffer Length

Average Buffer Length (ft)	--	--	54								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.025								
Effective Distance (ft)	--	--	50								
Number of Level Spreaders	--	--	2								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	52.9%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	942								
Runoff Reduction (ft^3)	--	--	942								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	2	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	22,605	42,719								
Imperviousness (%)		100.0%	52.9%								
Tributary Runoff (ft^3)	0	942	942								
Runoff Reduction (ft^3)	0	0	942								
Runoff Remaining (ft^3)	0	942	0								

Total Tributary Area entered on Site Layout Worksheet is: 42,719 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 3

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	3	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	18,977	--								
RPA (ft^2)	--	--	19,318								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	100.0%								
HSG C/D (%)	--	--	0.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	38,295								
UIA:RPA Ratio	--	--	1.0								
UIA:RPA Interface Width (ft)	--	--	324								
L / W Ratio of UIA:RPA	--	--	0.36								

2. Buffer Length

Average Buffer Length (ft)	--	--	60								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.055								
Effective Distance (ft)	--	--	50								
Number of Level Spreaders	--	--	2								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	49.6%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	791								
Runoff Reduction (ft^3)	--	--	791								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	3	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	18,977	38,295								
Imperviousness (%)		100.0%	49.6%								
Tributary Runoff (ft^3)	0	791	791								
Runoff Reduction (ft^3)	0	0	791								
Runoff Remaining (ft^3)	0	791	0								

Total Tributary Area entered on Site Layout Worksheet is: 38,295 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 4

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	4	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	13,969	--								
RPA (ft^2)	--	--	10,630								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	55.0%								
HSG B (%)	--	--	45.0%								
HSG C/D (%)	--	--	0.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	24,599								
UIA:RPA Ratio	--	--	1.3								
UIA:RPA Interface Width (ft)	--	--	225								
L / W Ratio of UIA:RPA	--	--	0.49								

2. Buffer Length

Average Buffer Length (ft)	--	--	47								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.080								
Effective Distance (ft)	--	--	25								
Number of Level Spreaders	--	--	2								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	56.8%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	582								
Runoff Reduction (ft^3)	--	--	582								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	4	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	13,969	24,599								
Imperviousness (%)		100.0%	56.8%								
Tributary Runoff (ft^3)	0	582	582								
Runoff Reduction (ft^3)	0	0	582								
Runoff Remaining (ft^3)	0	582	0								

Total Tributary Area entered on Site Layout Worksheet is: 24,599 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 5

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	5	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	16,778	--								
RPA (ft^2)	--	--	14,697								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	0.0%								
HSG C/D (%)	--	--	100.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	31,475								
UIA:RPA Ratio	--	--	1.1								
UIA:RPA Interface Width (ft)	--	--	295								
L / W Ratio of UIA:RPA	--	--	0.36								

2. Buffer Length

Average Buffer Length (ft)	--	--	50								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.050								
Effective Distance (ft)	--	--	50								
Number of Level Spreaders	--	--	1								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	53.3%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	699								
Runoff Reduction (ft^3)	--	--	699								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	5	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	16,778	31,475								
Imperviousness (%)		100.0%	53.3%								
Tributary Runoff (ft^3)	0	699	699								
Runoff Reduction (ft^3)	0	0	699								
Runoff Remaining (ft^3)	0	699	0								

Total Tributary Area entered on Site Layout Worksheet is: 31,475 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 6

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	6	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	16,991	--								
RPA (ft^2)	--	--	15,667								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	0.0%								
HSG C/D (%)	--	--	100.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	32,658								
UIA:RPA Ratio	--	--	1.1								
UIA:RPA Interface Width (ft)	--	--	292								
L / W Ratio of UIA:RPA	--	--	0.38								

2. Buffer Length

Average Buffer Length (ft)	--	--	54								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.080								
Effective Distance (ft)	--	--	25								
Number of Level Spreaders	--	--	3								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	52.0%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	708								
Runoff Reduction (ft^3)	--	--	708								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	6	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	16,991	32,658								
Imperviousness (%)		100.0%	52.0%								
Tributary Runoff (ft^3)	0	708	708								
Runoff Reduction (ft^3)	0	0	708								
Runoff Remaining (ft^3)	0	708	0								

Total Tributary Area entered on Site Layout Worksheet is: 32,658 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 7

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	7	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	21,735	--								
RPA (ft^2)	--	--	26,615								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	95.0%								
HSG C/D (%)	--	--	5.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	48,350								
UIA:RPA Ratio	--	--	0.8								
UIA:RPA Interface Width (ft)	--	--	443								
L / W Ratio of UIA:RPA	--	--	0.25								

2. Buffer Length

Average Buffer Length (ft)	--	--	60								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.025								
Effective Distance (ft)	--	--	50								
Number of Level Spreaders	--	--	2								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	45.0%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	906								
Runoff Reduction (ft^3)	--	--	906								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	7	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	21,735	48,350								
Imperviousness (%)		100.0%	45.0%								
Tributary Runoff (ft^3)	0	906	906								
Runoff Reduction (ft^3)	0	0	906								
Runoff Remaining (ft^3)	0	906	0								

Total Tributary Area entered on Site Layout Worksheet is: 48,350 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 8

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	8	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	20,426	--								
RPA (ft^2)	--	--	25,282								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	100.0%								
HSG C/D (%)	--	--	0.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	45,708								
UIA:RPA Ratio	--	--	0.8								
UIA:RPA Interface Width (ft)	--	--	443								
L / W Ratio of UIA:RPA	--	--	0.23								

2. Buffer Length

Average Buffer Length (ft)	--	--	57								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.055								
Effective Distance (ft)	--	--	50								
Number of Level Spreaders	--	--	2								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	44.7%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	851								
Runoff Reduction (ft^3)	--	--	851								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	8	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	20,426	45,708								
Imperviousness (%)		100.0%	44.7%								
Tributary Runoff (ft^3)	0	851	851								
Runoff Reduction (ft^3)	0	0	851								
Runoff Remaining (ft^3)	0	851	0								

Total Tributary Area entered on Site Layout Worksheet is: 45,708 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 9

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	9	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	15,466	--								
RPA (ft^2)	--	--	16,986								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	100.0%								
HSG C/D (%)	--	--	0.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	32,452								
UIA:RPA Ratio	--	--	0.9								
UIA:RPA Interface Width (ft)	--	--	292								
L / W Ratio of UIA:RPA	--	--	0.38								

2. Buffer Length

Average Buffer Length (ft)	--	--	58								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.020								
Effective Distance (ft)	--	--	50								
Number of Level Spreaders	--	--	2								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	47.7%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	644								
Runoff Reduction (ft^3)	--	--	644								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	9	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	15,466	32,452								
Imperviousness (%)		100.0%	47.7%								
Tributary Runoff (ft^3)	0	644	644								
Runoff Reduction (ft^3)	0	0	644								
Runoff Remaining (ft^3)	0	644	0								

Total Tributary Area entered on Site Layout Worksheet is: 32,452 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 10

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	10	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	12,552	--								
RPA (ft^2)	--	--	12,873								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	100.0%								
HSG C/D (%)	--	--	0.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	25,425								
UIA:RPA Ratio	--	--	1.0								
UIA:RPA Interface Width (ft)	--	--	266								
L / W Ratio of UIA:RPA	--	--	0.36								

2. Buffer Length

Average Buffer Length (ft)	--	--	48								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.020								
Effective Distance (ft)	--	--	50								
Number of Level Spreaders	--	--	1								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	49.4%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	523								
Runoff Reduction (ft^3)	--	--	523								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	10	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	12,552	25,425								
Imperviousness (%)		100.0%	49.4%								
Tributary Runoff (ft^3)	0	523	523								
Runoff Reduction (ft^3)	0	0	523								
Runoff Remaining (ft^3)	0	523	0								

Total Tributary Area entered on Site Layout Worksheet is: 25,425 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 11

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	11	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	18,873	--								
RPA (ft^2)	--	--	16,716								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	100.0%								
HSG C/D (%)	--	--	0.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	35,589								
UIA:RPA Ratio	--	--	1.1								
UIA:RPA Interface Width (ft)	--	--	341								
L / W Ratio of UIA:RPA	--	--	0.31								

2. Buffer Length

Average Buffer Length (ft)	--	--	49								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.120								
Effective Distance (ft)	--	--	25								
Number of Level Spreaders	--	--	2								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	53.0%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	786								
Runoff Reduction (ft^3)	--	--	786								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	11	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	18,873	35,589								
Imperviousness (%)		100.0%	53.0%								
Tributary Runoff (ft^3)	0	786	786								
Runoff Reduction (ft^3)	0	0	786								
Runoff Remaining (ft^3)	0	786	0								

Total Tributary Area entered on Site Layout Worksheet is: 35,589 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 12

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	12	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	30,617	--								
RPA (ft^2)	--	--	36,561								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	80.0%								
HSG B (%)	--	--	20.0%								
HSG C/D (%)	--	--	0.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	67,178								
UIA:RPA Ratio	--	--	0.8								
UIA:RPA Interface Width (ft)	--	--	512								
L / W Ratio of UIA:RPA	--	--	0.26								

2. Buffer Length

Average Buffer Length (ft)	--	--	71								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.220								
Effective Distance (ft)	--	--	25								
Number of Level Spreaders	--	--	3								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	45.6%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	1,276								
Runoff Reduction (ft^3)	--	--	1,276								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	12	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	30,617	67,178								
Imperviousness (%)		100.0%	45.6%								
Tributary Runoff (ft^3)	0	1,276	1,276								
Runoff Reduction (ft^3)	0	0	1,276								
Runoff Remaining (ft^3)	0	1,276	0								

Total Tributary Area entered on Site Layout Worksheet is: 67,178 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 13

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	13	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	45,591	--								
RPA (ft^2)	--	--	27,679								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	100.0%								
HSG B (%)	--	--	0.0%								
HSG C/D (%)	--	--	0.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	73,270								
UIA:RPA Ratio	--	--	1.6								
UIA:RPA Interface Width (ft)	--	--	358								
L / W Ratio of UIA:RPA	--	--	0.57								

2. Buffer Length

Average Buffer Length (ft)	--	--	77								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.023								
Effective Distance (ft)	--	--	50								
Number of Level Spreaders	--	--	2								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	62.2%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	1,900								
Runoff Reduction (ft^3)	--	--	1,900								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	13	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	45,591	73,270								
Imperviousness (%)		100.0%	62.2%								
Tributary Runoff (ft^3)	0	1,900	1,900								
Runoff Reduction (ft^3)	0	0	1,900								
Runoff Remaining (ft^3)	0	1,900	0								

Total Tributary Area entered on Site Layout Worksheet is: 73,270 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 14

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	14	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	22,964	--								
RPA (ft^2)	--	--	19,317								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	0.0%								
HSG C/D (%)	--	--	100.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	42,281								
UIA:RPA Ratio	--	--	1.2								
UIA:RPA Interface Width (ft)	--	--	200								
L / W Ratio of UIA:RPA	--	--	1.06								

2. Buffer Length

Average Buffer Length (ft)	--	--	97								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.020								
Effective Distance (ft)	--	--	50								
Number of Level Spreaders	--	--	2								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	54.3%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	957								
Runoff Reduction (ft^3)	--	--	957								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	14	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	22,964	42,281								
Imperviousness (%)		100.0%	54.3%								
Tributary Runoff (ft^3)	0	957	957								
Runoff Reduction (ft^3)	0	0	957								
Runoff Remaining (ft^3)	0	957	0								

Total Tributary Area entered on Site Layout Worksheet is: 42,281 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer:
Company: WESTWOOD PROFESSIONAL SERVICES
Date: June 3, 2025
Project: SPRING HILL
Location: ERIE COUNTY
Outfall ID: 15

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	15	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	BUFFER									
DCIA (ft^2)	--	--	--								
UIA (ft^2)	--	4,879	--								
RPA (ft^2)	--	--	4,598								
SPA (ft^2)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None								

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	0.0%								
HSG C/D (%)	--	--	100.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Other								
Irrigation Type	--	--	None								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other								
Is Concrete Edger used?	--	--	--								
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft^2)	--	--	9,477								
UIA:RPA Ratio	--	--	1.1								
UIA:RPA Interface Width (ft)	--	--	115								
L / W Ratio of UIA:RPA	--	--	0.72								

2. Buffer Length

Average Buffer Length (ft)	--	--	40								

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.025								
Effective Distance (ft)	--	--	50								
Number of Level Spreaders	--	--	1								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	0.00								
Mowing Strip Provided?	--	--	NO								

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	51.5%								
UIA:RPA Runoff (in)	--	--	0.00								
UIA:RPA Runoff (ft^3)	--	--	0								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	203								
Runoff Reduction (ft^3)	--	--	203								
Runoff Reduction (%)	--	--	100.0%								

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--								
Imperviousness (%)	--	--	--								
2. Swale Inflows											
Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft^3)	--	--	--								
Design Forebay Volume (ft^3)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								
3. Swale Cross Section											
Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft^2)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--								
Reduced Trib. Runoff (ft^3)	--	--	--								
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--								
Swale Discharge (ft^3)	--	--	--								
Runoff Reduction (%)	--	--	--								
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--								
8. Design Velocity											
Vegetal Retardance Curve	--	--	--								
Velocity, V2 (fps)	--	--	--								
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--								
Flow Area, A (ft^2)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, Rh (ft)	--	--	--								
VR Product (ft^2/sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, Dh (ft)	--	--	--								
Froude Number	--	--	--								
10. Swale Outflows											
Outflows Considered?	--	--	--								

Notes: _____

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	15	UIA	BUFFER								
Area Type	RPA	UIA	RPA_Buffer								
Total Area (ft^2)	0	4,879	9,477								
Imperviousness (%)		100.0%	51.5%								
Tributary Runoff (ft^3)	0	203	203								
Runoff Reduction (ft^3)	0	0	203								
Runoff Remaining (ft^3)	0	203	0								

Total Tributary Area entered on Site Layout Worksheet is: 9,477 square feet

Appendix B – Hydraulic Computations

UD Detention Pond Sizing and Forebay Calculations
Spillway Riprap Sizing
Inlet and Street Capacity Calculations
Swale Calculations
Culvert Calculations

Appendix B – Hydraulic Computations

UD Detention Pond Sizing and Forebay Calculations

Pond Tributray Area and Forebay Calculations					
Pond A					
Pond A East Forebay					
Tributray Basins	Area (acres)	Imperviousness (%)	Type A Soil (%)	Type B Soil (%)	Types C/D Soil (%)
A-1	1.23	53.97	0%	100%	0%
A-1a	1.34	54.63	0%	100%	0%
A-3	1.98	49.55	0%	100%	0%
A-3a	0.84	56.07	0%	100%	0%
A-5	0.75	58.24	0%	100%	0%
A-6	2.09	39.43	0%	100%	0%
A-7	2.44	41.00	35%	65%	0%
A-7a	0.09	67.33	0%	100%	0%
A-8	1.73	58.28	50%	50%	0%
A-8a	0.56	53.07	50%	50%	0%
A-9	1.13	64.32	80%	20%	0%
A-10	0.99	57.68	80%	20%	0%
A-11	0.13	77.38	100%	0%	0%
A-12	0.73	56.99	100%	0%	0%
A-13	0.4	60.80	0%	100%	0%
Sum of Area =			16.43		
Sum of A*I =			853.26		
Weight I =			51.93		
Pond A South Forebay					
Tributray Basins	Area (acres)	Imperviousness (%)	Type A Soil (%)	Type B Soil (%)	Types C/D Soil (%)
A-2	0.48	73.46	10%	90%	0%
A-4	0.83	81.11	0%	100%	0%
A-14	0.71	75.15	15%	85%	0%
A-15	2.85	36.06	0%	100%	0%
A-16	0.24	46.92	0%	100%	0%
A-16a	0.98	58.88	0%	100%	0%
A-17	2.03	34.10	0%	100%	0%
A-18	0.27	81.85	0%	100%	0%
A-19	1.1	54.95	0%	100%	0%
A-20	1.75	41.42	0%	100%	0%
A-20a	0.43	33.91	0%	100%	0%
A-21	2.66	55.73	0%	100%	0%
A-23	0.58	56.31	0%	100%	0%
A-24	0.6	65.23	0%	100%	0%
A-25	0.19	63.89	0%	100%	0%
A-27	1.33	61.13	0%	100%	0%
A-28	0.66	47.36	0%	100%	0%
A-28a	2.23	51.06	0%	100%	0%
A-29	1.75	51.22	0%	100%	0%
A-29a	0.8	55.10	0%	100%	0%
A-30	0.16	63.25	0%	100%	0%
A-31	1.44	50.26	0%	100%	0%
A-32	12.32	45.02	0%	85%	15%
Sum of Area =			36.39		
Sum of A*I =			1795.94		
Weight I =			49.35		
Sum of Area =			52.82		
Sum of A*I =			2649.20		
Weight I =			50.16		
% Soil Type =	-	-	8.92%	87.59%	3.50%

Pond Tributray Area and Forebay Calculations					
Pond B					
Pond B Forebay					
Tributray Basins	Area (acres)	Imperviousness (%)	Type A Soil (%)	Type B Soil (%)	Types C/D Soil (%)
B-0	3.1	14.2%	100%	0%	0%
B-1	0.96	52.0%	100%	0%	0%
B-2	2.14	53.6%	100%	0%	0%
B-3	2.8	49.0%	100%	0%	0%
B-4	1.63	51.7%	100%	0%	0%
B-5	1.66	53.8%	100%	0%	0%
B-6	1.15	56.3%	100%	0%	0%
B-7	1.12	65.4%	100%	0%	0%
B-8	3.33	55.0%	100%	0%	0%
B-9	2.9	52.3%	100%	0%	0%
B-10	1.58	57.6%	100%	0%	0%
B-11	3.52	54.5%	42%	58%	0%
B-12	1.1	36.8%	100%	0%	0%
B-13	3.02	19.8%	100%	0%	0%
B-14	1.31	59.7%	55%	45%	0%
B-15	2.07	54.7%	0%	100%	0%
B-16	1.47	62.7%	100%	0%	0%
B-17	1.01	61.0%	100%	0%	0%
B-18	0.81	52.7%	100%	0%	0%
B-19	1.58	60.6%	100%	0%	0%
B-20	3.31	54.7%	100%	0%	0%
B-21	0.74	51.0%	100%	0%	0%
B-22	1.18	61.6%	95%	5%	0%
B-23	3.96	41.8%	37%	63%	0%
B-24	2.13	46.3%	24%	76%	0%
B-25	1.43	60.6%	49%	51%	0%
B-26	1.56	56.2%	100%	0%	0%
B-27	2.8	52.3%	100%	0%	0%
B-28	1.74	53.6%	100%	0%	0%
B-29	1.98	51.7%	100%	0%	0%
B-30	1.73	58.9%	100%	0%	0%
B-31	2.22	45.4%	47%	53%	0%
Sum of Area =	63.04				
Sum of A*I =	31.34				
Weight I =	49.71%				
% Soil Type =	-	-	82.90%	17.10%	0.00%

Pond Tributray Area and Forebay Calculations					
Pond C Forebay					
Pond C Forebay					
Tributray Basins	Area (acres)	Imperviousness (%)	Type A Soil (%)	Type B Soil (%)	Types C/D Soil (%)
C-1	0.52	96.23	0.13	0.87	0.00
C-2	6.01	26.20	0.75	0.25	0.00
C-3	0.21	100.00	0.00	1.00	0.00
C-4	4.99	44.13	0.01	0.99	0.00
C-5	0.21	76.67	0.00	1.00	0.00
C-6	1.60	44.26	0.75	0.25	0.00
Sum of Area =	13.54				
Sum of A*I =	535.63				
Weight I =	39.56				
% Soil Type =	-	-	43.24%	56.76%	0.00%

Pond Tributray Area and Forebay Calculations					
Pond D					
Pond D Forebay					
Tributray Basins	Area (acres)	Imperviousness (%)	Type A Soil (%)	Type B Soil (%)	Types C/D Soil (%)
D-0	1.18	97.63	0.39	0.03	0.58
D-1	2.40	58.47	0.45	0.55	0.00
D-2	3.80	49.34	0.21	0.79	0.00
D-3	0.16	35.25	1.00	0.00	0.00
D-4	1.36	77.52	0.00	1.00	0.00
D-5	0.87	50.92	0.06	0.94	0.00
D-6	3.89	18.22	0.04	0.96	0.00
D-7	1.19	70.13	0.00	1.00	0.00
Sum of Area =	14.85				
Sum of A*I =	752.71				
Weight I =	50.69				
% Soil Type =	-	-	18.22%	77.17%	4.61%

Pond Tributray Area and Forebay Calculations					
Pond E					
Pond E Forebay West					
Tributray Basins	Area (acres)	Imperviousness (%)	Type A Soil (%)	Type B Soil (%)	Types C/D Soil (%)
E-1	1.08	100	0	0	100
E-2	1.48	84.1	0	0	100
Sum of Area =	2.56				
Sum of A*I =	232.47				
Weighted I =	90.81				
Pond E Forebay South					
Tributray Basins	Area (acres)	Imperviousness (%)	Type A Soil (%)	Type B Soil (%)	Types C/D Soil (%)
E-9	1.06	80.1	0	95	5
E-8	1.18	75.1	0	100	0
E-7	1.26	68.4	0	100	0
E-6	1.62	76.2	0	100	0
E-5	1.34	81.2	0	100	0
E-4	2.55	66.4	0	100	0
E-3	1.92	38.2	0	100	0
OS-E3	4.15	19.2	20	70	10
Sum of Area =	15.08				
Sum of A*I =	814.30				
Weighted I =	54.00				
Overall					
Sum of Area =	17.64				
Sum of A*I =	1046.77				
Weighted I =	59.34				
% Soil Type =	-	-	4.71	78.13	17.17

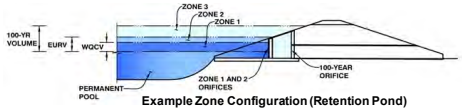
POND A - NO CLOGGING

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	56.40	acres
Watershed Length =	2,138	ft
Watershed Length to Centroid =	1,067	ft
Watershed Slope =	0.026	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	8.9%	percent
Percentage Hydrologic Soil Group B =	87.6%	percent
Percentage Hydrologic Soil Groups C/D =	3.5%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.036	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	3.358	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.81 in.) =	1.852	acre-feet	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	2.735	acre-feet	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	3.817	acre-feet	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	6.101	acre-feet	inches
50-yr Runoff Volume (P1 = 2.24 in.) =	7.981	acre-feet	inches
100-yr Runoff Volume (P1 = 2.68 in.) =	10.291	acre-feet	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	16.286	acre-feet	inches
Approximate 2-yr Detention Volume =	1.729	acre-feet	
Approximate 5-yr Detention Volume =	2.549	acre-feet	
Approximate 10-yr Detention Volume =	3.534	acre-feet	
Approximate 25-yr Detention Volume =	4.488	acre-feet	
Approximate 50-yr Detention Volume =	5.095	acre-feet	
Approximate 100-yr Detention Volume =	6.014	acre-feet	

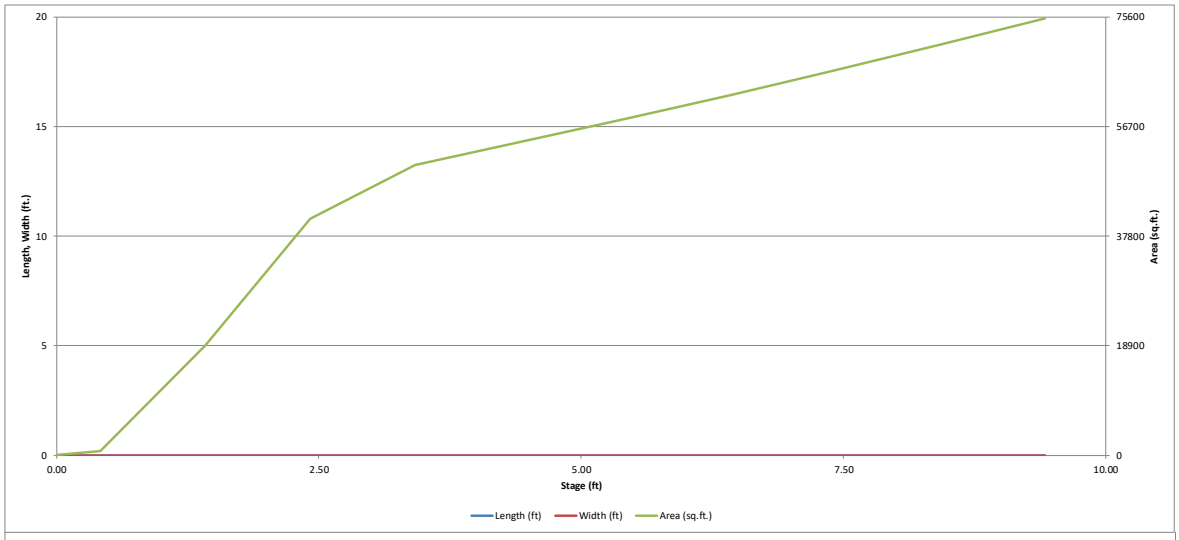
Define Zones and Basin Geometry

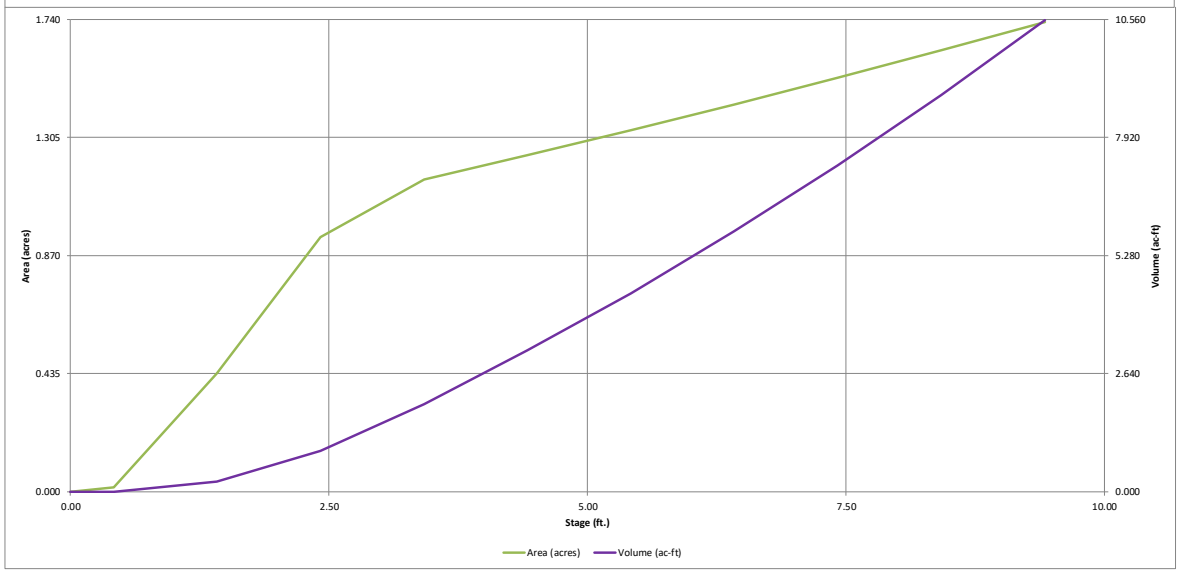
Zone 1 Volume (WQCV) =	1.036	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.322	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	7.190	acre-feet
Total Detention Basin Volume =	10.548	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	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

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
4997	--	0.42	--	--	--	675	0.015	152	0.003
4998	--	1.42	--	--	--	18,943	0.435	9,961	0.229
4999	--	2.42	--	--	--	40,807	0.937	39,836	0.915
5000	--	3.42	--	--	--	50,102	1.150	85,290	1.958
5001	--	4.42	--	--	--	54,032	1.240	137,357	3.153
5002	--	5.42	--	--	--	58,053	1.333	193,400	4.440
5003	--	6.42	--	--	--	62,147	1.427	253,500	5.820
5004	--	7.42	--	--	--	66,386	1.524	317,766	7.295
5005	--	8.42	--	--	--	70,804	1.625	386,361	8.870
5006	--	9.42	--	--	--	75,422	1.731	459,474	10.548


20
15
10
5
0
Length, Width (ft.)
75600
56700
37800
18900
0
Area (sq.ft.)
0.00
2.50
5.00
7.50
10.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

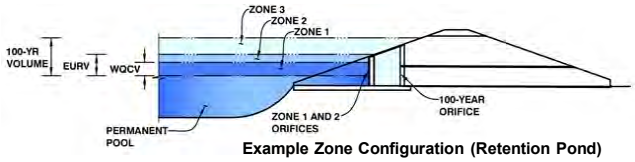

1.740
1.305
0.870
0.435
0.000
Area (acres)
10.560
7.920
5.280
2.640
0.000
Volume (ac-ft)
0.00
2.50
5.00
7.50
10.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND A



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.55	1.036	Orifice Plate
Zone 2 (EURV)	4.59	2.322	Orifice Plate
Zone 3 (User)	9.42	7.190	Weir&Pipe (Restrict)
Total (all zones)		10.548	

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 Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	5.10	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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	1.60	3.60					
Orifice Area (sq. inches)	4.00	18.00	25.00					

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.10	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.10	N/A	feet
Overflow Weir Front Edge Length =	10.00	N/A	feet	Overflow Weir Slope Length =	10.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	13.60	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	100.00	N/A	ft^2
Overflow Grate Type =	No Grate	N/A		Overflow Grate Open Area w/ Debris =	100.00	N/A	ft^2
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	7.35	N/A	ft^2
Outlet Pipe Diameter =	42.00	N/A	inches	Outlet Orifice Centroid =	1.39	N/A	feet
Restrictor Plate Height Above Pipe Invert =	30.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.01	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.60	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.58	feet
Spillway Crest Length =	100.00	feet	Stage at Top of Freeboard =	8.18	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	1.60	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	8.48	acre-ft

Calculated Parameters for Spillway

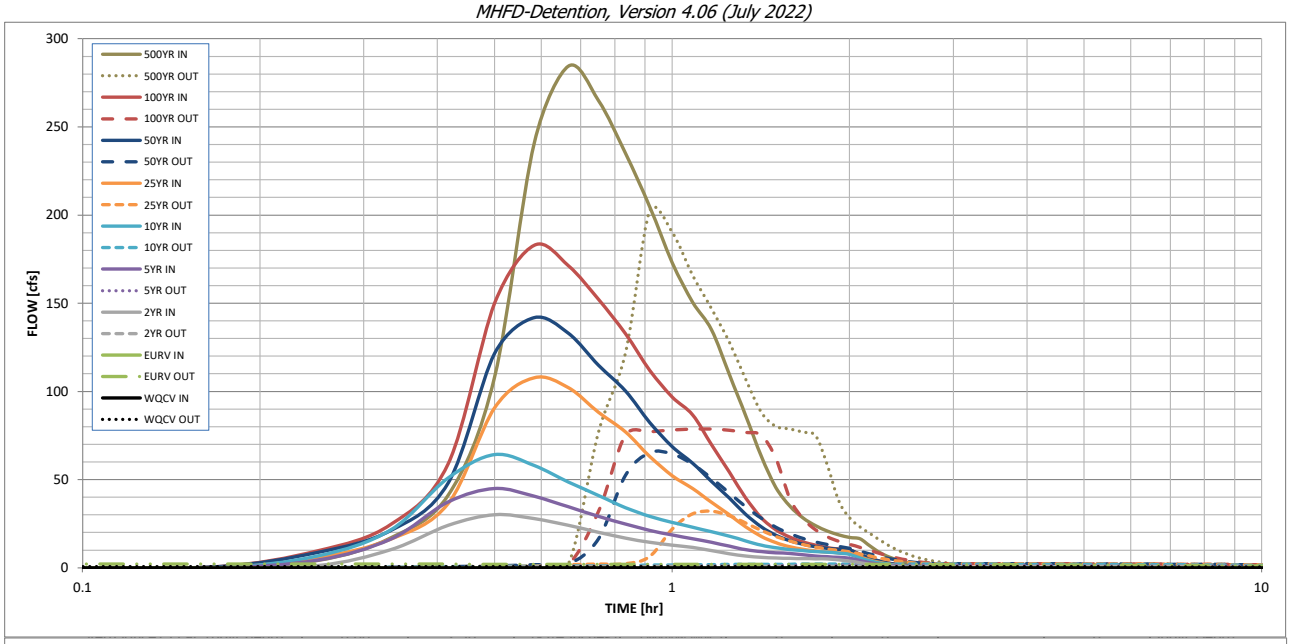
Routed Hydrograph Results

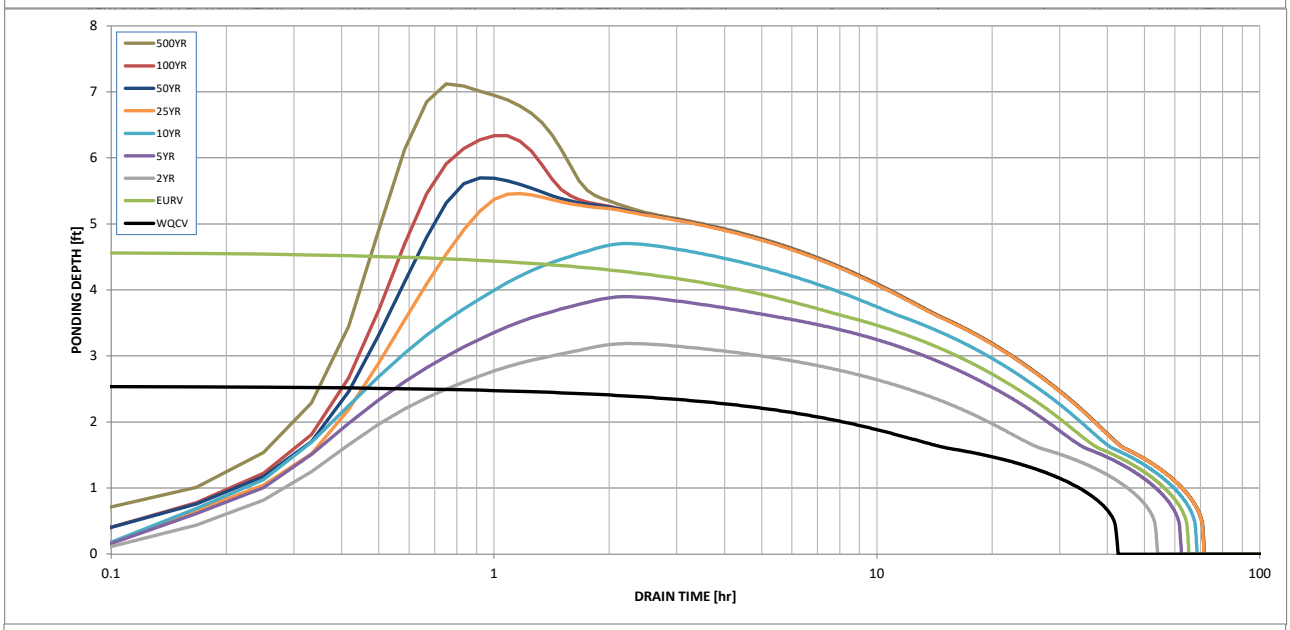
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

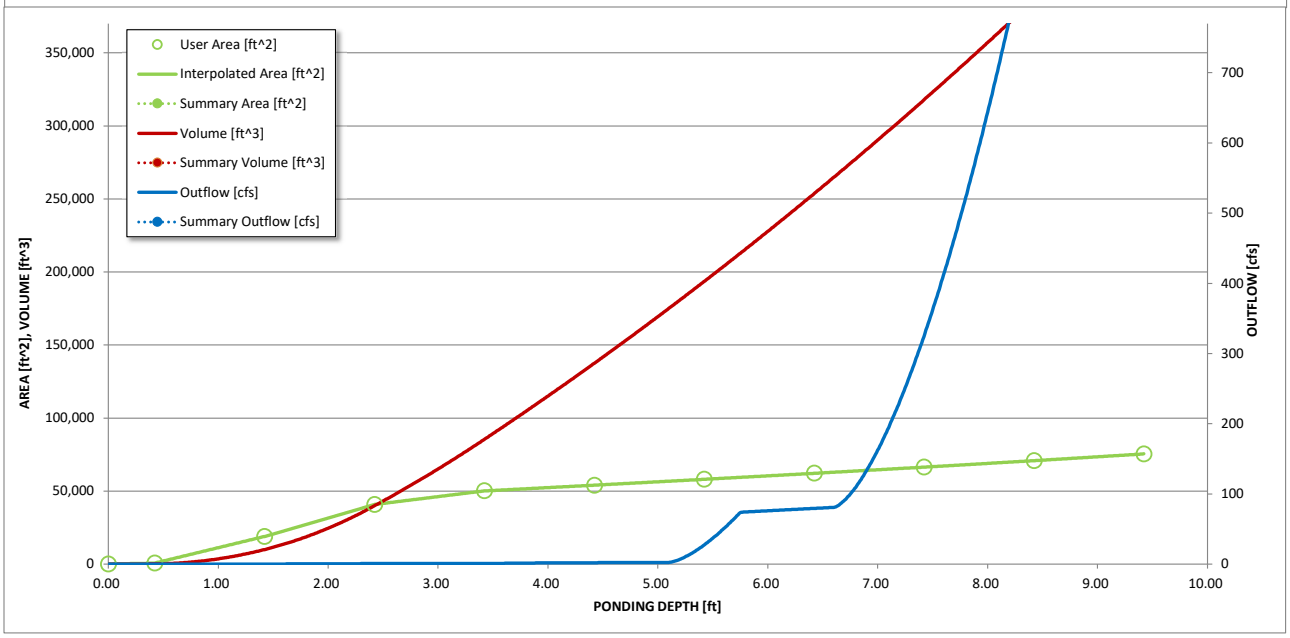
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.11	1.39	1.84	2.24	2.68	3.89
CUHP Runoff Volume (acre-ft) =	1.036	3.358	1.852	2.735	3.817	6.101	7.981	10.291	16.286
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.852	2.735	3.817	6.101	7.981	10.291	16.286
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	0.9	10.0	39.0	59.0	84.4	145.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.18	0.69	1.05	1.50	2.58
Peak Inflow Q (cfs) =	N/A	N/A	30.2	45.1	64.3	107.9	141.9	183.0	284.6
Peak Outflow Q (cfs) =	0.8	2.2	1.0	1.6	2.2	32.1	65.3	78.7	202.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.8	0.2	0.8	1.1	0.9	1.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.3	0.6	0.8	0.8
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) =	39	55	48	54	57	54	50	45	39
Time to Drain 99% of Inflow Volume (hours) =	**41**	61	52	59	64	65	63	61	56
Maximum Ponding Depth (ft) =	2.55	4.59	3.19	3.90	4.70	5.46	5.70	6.34	7.12
Area at Maximum Ponding Depth (acres) =	0.96	1.26	1.10	1.19	1.27	1.34	1.36	1.42	1.49
Maximum Volume Stored (acre-ft) =	1.038	3.365	1.699	2.509	3.504	4.493	4.803	5.692	6.842

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.53	4.12
	0:15:00	0.00	0.00	1.21	4.33	6.79	5.89	8.75	9.58	17.08
	0:20:00	0.00	0.00	10.43	16.36	21.55	16.28	21.22	24.62	41.16
	0:25:00	0.00	0.00	24.10	37.41	51.06	36.41	48.11	58.97	108.23
	0:30:00	0.00	0.00	30.23	45.10	64.27	90.84	121.69	150.15	240.91
	0:35:00	0.00	0.00	27.89	40.64	58.03	107.86	141.92	183.00	284.56
	0:40:00	0.00	0.00	24.25	34.60	48.68	102.12	133.00	171.40	264.99
	0:45:00	0.00	0.00	20.24	29.23	41.09	88.29	114.92	152.24	235.13
	0:50:00	0.00	0.00	16.88	24.89	34.23	77.14	100.37	132.78	204.73
	0:55:00	0.00	0.00	14.49	21.24	29.19	63.10	82.35	111.93	173.20
	1:00:00	0.00	0.00	12.89	18.64	25.86	52.36	68.80	96.94	150.72
	1:05:00	0.00	0.00	11.60	16.52	23.12	44.95	59.42	86.72	135.08
	1:10:00	0.00	0.00	9.79	14.52	20.47	37.18	49.00	69.80	109.67
	1:15:00	0.00	0.00	8.04	12.28	18.06	30.19	39.60	54.27	86.30
	1:20:00	0.00	0.00	6.71	10.28	15.25	23.28	30.41	39.65	63.19
	1:25:00	0.00	0.00	5.96	9.19	12.89	17.85	23.32	28.37	45.66
	1:30:00	0.00	0.00	5.59	8.63	11.43	14.28	18.53	21.57	34.97
	1:35:00	0.00	0.00	5.38	8.27	10.45	11.99	15.41	17.47	28.41
	1:40:00	0.00	0.00	5.27	7.46	9.75	10.55	13.40	14.71	23.93
	1:45:00	0.00	0.00	5.18	6.77	9.26	9.60	12.05	12.84	20.90
	1:50:00	0.00	0.00	5.11	6.30	8.91	9.00	11.18	11.55	18.78
	1:55:00	0.00	0.00	4.49	5.94	8.44	8.58	10.57	10.66	17.32
	2:00:00	0.00	0.00	3.91	5.51	7.64	8.30	10.18	10.19	16.52
	2:05:00	0.00	0.00	2.94	4.14	5.67	6.26	7.65	7.68	12.38
	2:10:00	0.00	0.00	2.11	2.93	4.00	4.40	5.36	5.41	8.69
	2:15:00	0.00	0.00	1.50	2.08	2.83	3.12	3.80	3.86	6.19
	2:20:00	0.00	0.00	1.05	1.44	1.99	2.19	2.66	2.71	4.35
	2:25:00	0.00	0.00	0.72	0.97	1.36	1.50	1.81	1.85	2.96
	2:30:00	0.00	0.00	0.48	0.65	0.92	1.02	1.24	1.26	2.02
	2:35:00	0.00	0.00	0.30	0.42	0.59	0.67	0.81	0.82	1.31
	2:40:00	0.00	0.00	0.16	0.25	0.33	0.39	0.47	0.48	0.76
	2:45:00	0.00	0.00	0.07	0.12	0.15	0.19	0.22	0.23	0.35
	2:50:00	0.00	0.00	0.02	0.04	0.04	0.06	0.07	0.07	0.10
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

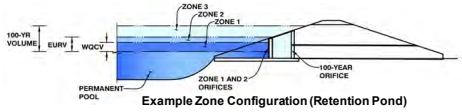
POND A - 50% CLOGGING

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	56.40	acres
Watershed Length =	2,138	ft
Watershed Length to Centroid =	1,067	ft
Watershed Slope =	0.026	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	8.9%	percent
Percentage Hydrologic Soil Group B =	87.6%	percent
Percentage Hydrologic Soil Groups C/D =	3.5%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

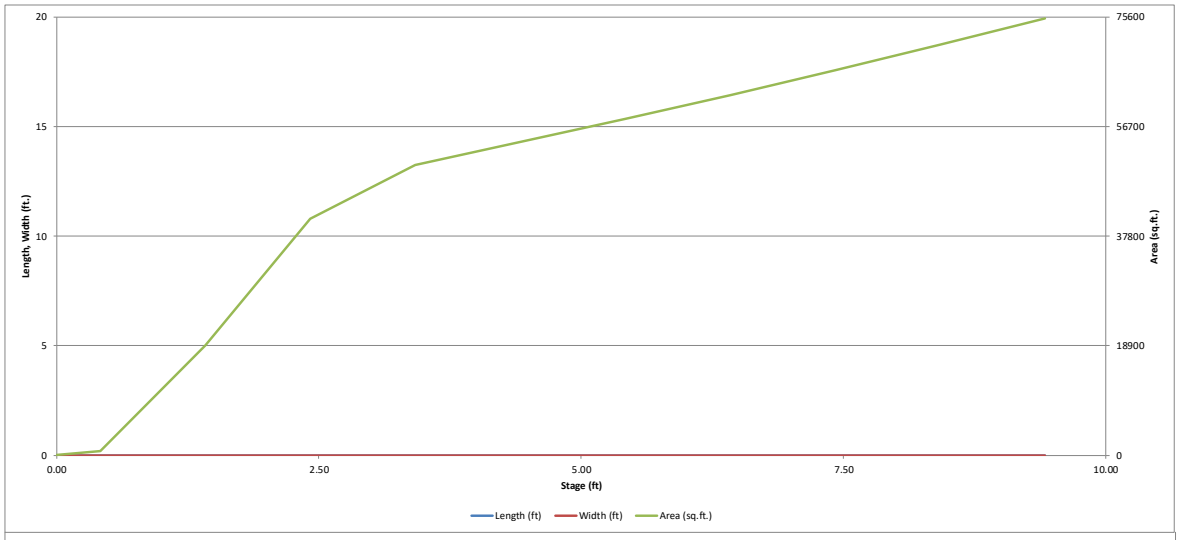
			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.036	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	3.358	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.81 in.) =	1.852	acre-feet	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	2.735	acre-feet	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	3.817	acre-feet	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	6.101	acre-feet	inches
50-yr Runoff Volume (P1 = 2.24 in.) =	7.981	acre-feet	inches
100-yr Runoff Volume (P1 = 2.68 in.) =	10.291	acre-feet	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	16.286	acre-feet	inches
Approximate 2-yr Detention Volume =	1.729	acre-feet	
Approximate 5-yr Detention Volume =	2.549	acre-feet	
Approximate 10-yr Detention Volume =	3.534	acre-feet	
Approximate 25-yr Detention Volume =	4.488	acre-feet	
Approximate 50-yr Detention Volume =	5.095	acre-feet	
Approximate 100-yr Detention Volume =	6.014	acre-feet	

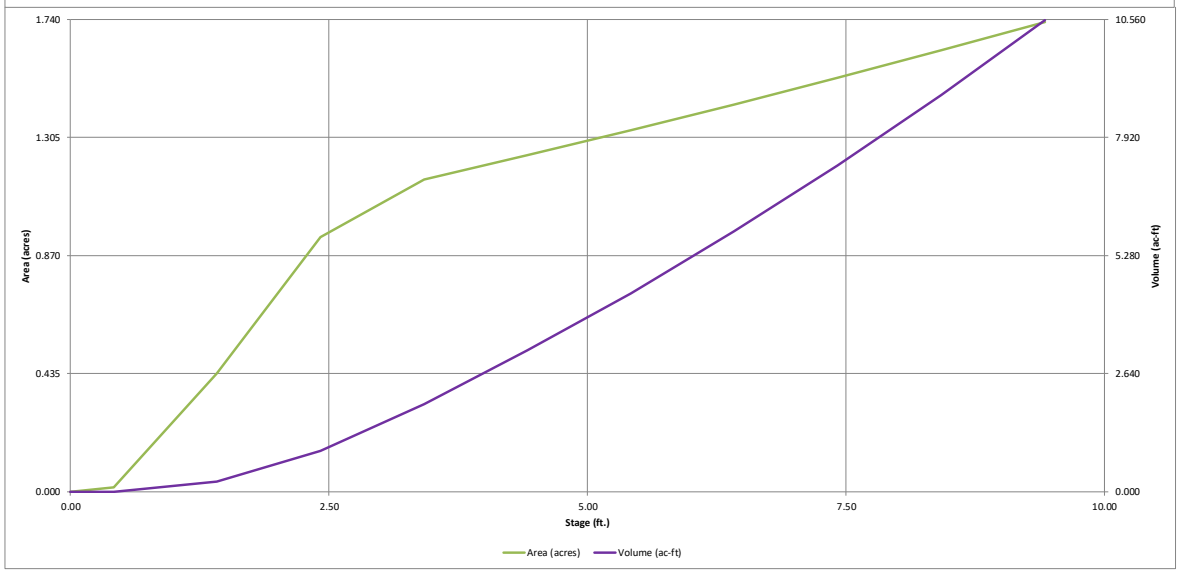
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.036	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.322	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	7.190	acre-feet
Total Detention Basin Volume =	10.548	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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	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

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
4997	--	0.42	--	--	--	675	0.015	152	0.003
4998	--	1.42	--	--	--	18,943	0.435	9,961	0.229
4999	--	2.42	--	--	--	40,807	0.937	39,836	0.915
5000	--	3.42	--	--	--	50,102	1.150	85,290	1.958
5001	--	4.42	--	--	--	54,032	1.240	137,357	3.153
5002	--	5.42	--	--	--	58,053	1.333	193,400	4.440
5003	--	6.42	--	--	--	62,147	1.427	253,500	5.820
5004	--	7.42	--	--	--	66,386	1.524	317,766	7.295
5005	--	8.42	--	--	--	70,804	1.625	386,361	8.870
5006	--	9.42	--	--	--	75,422	1.731	459,474	10.548


20
15
10
5
0
Length, Width (ft.)
75600
56700
37800
18900
0
Area (sq.ft.)
0.00
2.50
5.00
7.50
10.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

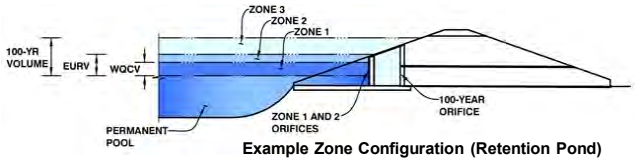

1.740
1.305
0.870
0.435
0.000
Area (acres)
10.560
7.920
5.280
2.640
0.000
Volume (ac-ft)
0.00
2.50
5.00
7.50
10.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND A



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.55	1.036	Orifice Plate
Zone 2 (EURV)	4.59	2.322	Orifice Plate
Zone 3 (User)	9.42	7.190	Weir&Pipe (Restrict)
Total (all zones)		10.548	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	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)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	5.10	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

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	1.60	3.60					
Orifice Area (sq. inches)	4.00	18.00	25.00					

	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)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.10	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.10	N/A	feet
Overflow Weir Front Edge Length =	10.00	N/A	feet	Overflow Weir Slope Length =	10.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	13.60	N/A	
Horiz. Length of Weir Sides =	10.00	N/A	feet	Overflow Grate Open Area w/o Debris =	100.00	N/A	ft^2
Overflow Grate Type =	No Grate	N/A		Overflow Grate Open Area w/ Debris =	75.00	N/A	ft^2
Debris Clogging % =	25%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	7.35	N/A	ft^2
Outlet Pipe Diameter =	42.00	N/A	inches	Outlet Orifice Centroid =	1.39	N/A	feet
Restrictor Plate Height Above Pipe Invert =	30.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.01	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.60	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.58	feet
Spillway Crest Length =	100.00	feet	Stage at Top of Freeboard =	8.18	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	1.60	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	8.48	acre-ft

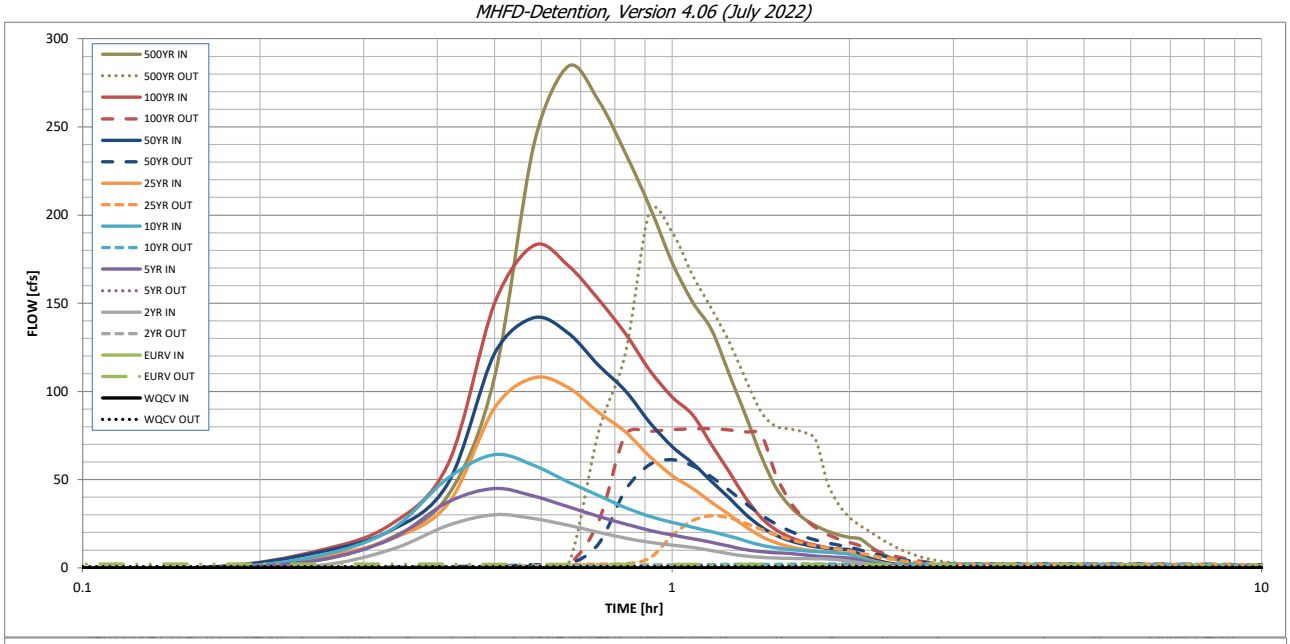
Routed Hydrograph Results

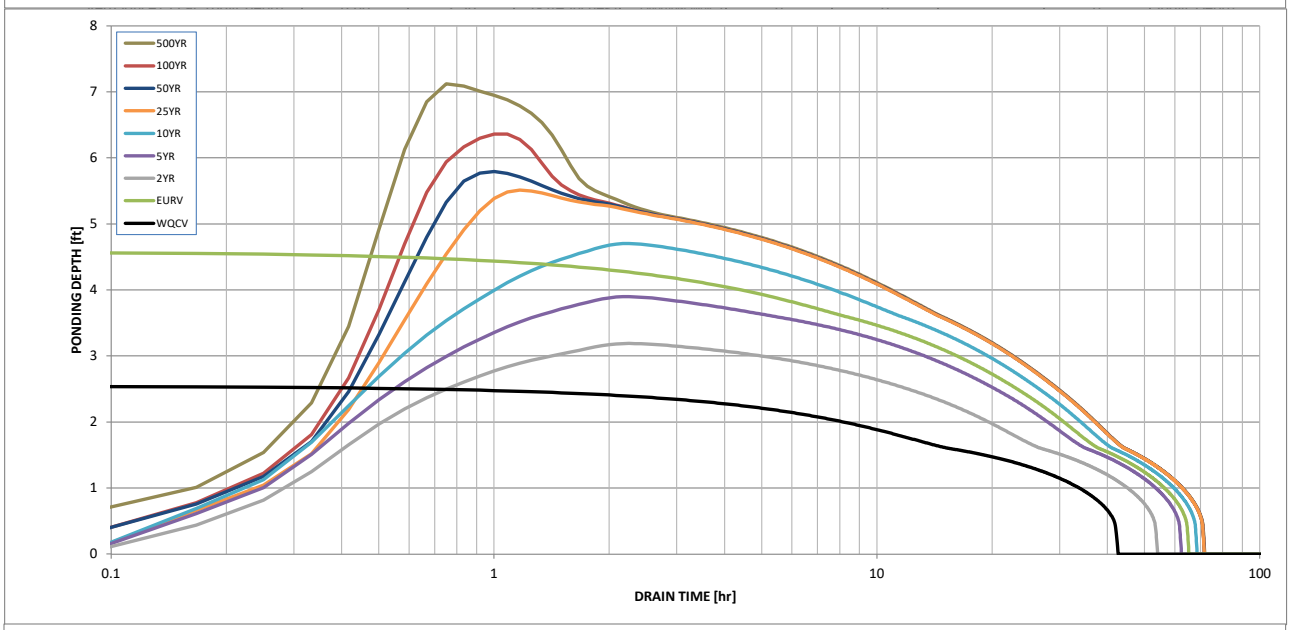
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

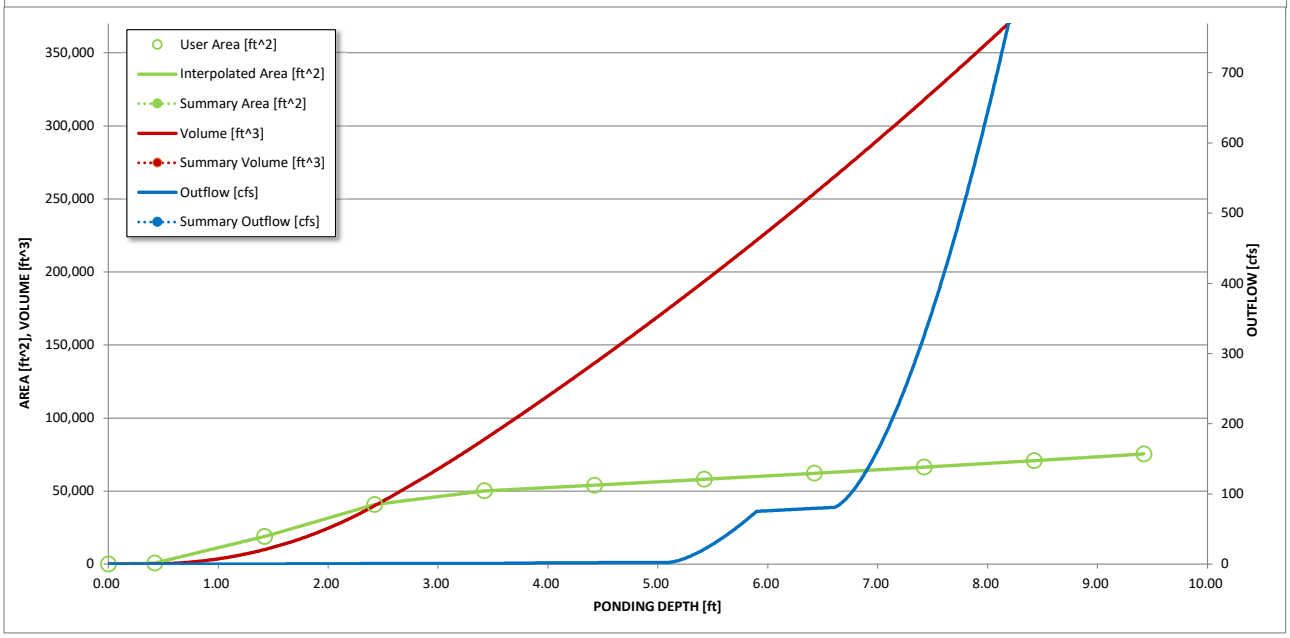
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.11	1.39	1.84	2.24	2.68	3.89
CUHP Runoff Volume (acre-ft) =	1.036	3.358	1.852	2.735	3.817	6.101	7.981	10.291	16.286
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.852	2.735	3.817	6.101	7.981	10.291	16.286
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	0.9	10.0	39.0	59.0	84.4	145.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.18	0.69	1.05	1.50	2.58
Peak Inflow Q (cfs) =	N/A	N/A	30.2	45.1	64.3	107.9	141.9	183.0	284.6
Peak Outflow Q (cfs) =	0.8	2.2	1.0	1.6	2.2	29.5	61.3	78.9	202.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.8	0.2	0.8	1.0	0.9	1.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.3	0.6	0.8	0.8
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) =	39	55	48	54	57	54	50	45	39
Time to Drain 99% of Inflow Volume (hours) =	**41**	61	52	59	64	65	63	61	56
Maximum Ponding Depth (ft) =	2.55	4.59	3.19	3.90	4.70	5.51	5.79	6.36	7.12
Area at Maximum Ponding Depth (acres) =	0.96	1.26	1.10	1.19	1.27	1.34	1.37	1.42	1.49
Maximum Volume Stored (acre-ft) =	1.038	3.365	1.699	2.509	3.504	4.560	4.939	5.734	6.842

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.53	4.12
	0:15:00	0.00	0.00	1.21	4.33	6.79	5.89	8.75	9.58	17.08
	0:20:00	0.00	0.00	10.43	16.36	21.55	16.28	21.22	24.62	41.16
	0:25:00	0.00	0.00	24.10	37.41	51.06	36.41	48.11	58.97	108.23
	0:30:00	0.00	0.00	30.23	45.10	64.27	90.84	121.69	150.15	240.91
	0:35:00	0.00	0.00	27.89	40.64	58.03	107.86	141.92	183.00	284.56
	0:40:00	0.00	0.00	24.25	34.60	48.68	102.12	133.00	171.40	264.99
	0:45:00	0.00	0.00	20.24	29.23	41.09	88.29	114.92	152.24	235.13
	0:50:00	0.00	0.00	16.88	24.89	34.23	77.14	100.37	132.78	204.73
	0:55:00	0.00	0.00	14.49	21.24	29.19	63.10	82.35	111.93	173.20
	1:00:00	0.00	0.00	12.89	18.64	25.86	52.36	68.80	96.94	150.72
	1:05:00	0.00	0.00	11.60	16.52	23.12	44.95	59.42	86.72	135.08
	1:10:00	0.00	0.00	9.79	14.52	20.47	37.18	49.00	69.80	109.67
	1:15:00	0.00	0.00	8.04	12.28	18.06	30.19	39.60	54.27	86.30
	1:20:00	0.00	0.00	6.71	10.28	15.25	23.28	30.41	39.65	63.19
	1:25:00	0.00	0.00	5.96	9.19	12.89	17.85	23.32	28.37	45.66
	1:30:00	0.00	0.00	5.59	8.63	11.43	14.28	18.53	21.57	34.97
	1:35:00	0.00	0.00	5.38	8.27	10.45	11.99	15.41	17.47	28.41
	1:40:00	0.00	0.00	5.27	7.46	9.75	10.55	13.40	14.71	23.93
	1:45:00	0.00	0.00	5.18	6.77	9.26	9.60	12.05	12.84	20.90
	1:50:00	0.00	0.00	5.11	6.30	8.91	9.00	11.18	11.55	18.78
	1:55:00	0.00	0.00	4.49	5.94	8.44	8.58	10.57	10.66	17.32
	2:00:00	0.00	0.00	3.91	5.51	7.64	8.30	10.18	10.19	16.52
	2:05:00	0.00	0.00	2.94	4.14	5.67	6.26	7.65	7.68	12.38
	2:10:00	0.00	0.00	2.11	2.93	4.00	4.40	5.36	5.41	8.69
	2:15:00	0.00	0.00	1.50	2.08	2.83	3.12	3.80	3.86	6.19
	2:20:00	0.00	0.00	1.05	1.44	1.99	2.19	2.66	2.71	4.35
	2:25:00	0.00	0.00	0.72	0.97	1.36	1.50	1.81	1.85	2.96
	2:30:00	0.00	0.00	0.48	0.65	0.92	1.02	1.24	1.26	2.02
	2:35:00	0.00	0.00	0.30	0.42	0.59	0.67	0.81	0.82	1.31
	2:40:00	0.00	0.00	0.16	0.25	0.33	0.39	0.47	0.48	0.76
	2:45:00	0.00	0.00	0.07	0.12	0.15	0.19	0.22	0.23	0.35
	2:50:00	0.00	0.00	0.02	0.04	0.04	0.06	0.07	0.07	0.10
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

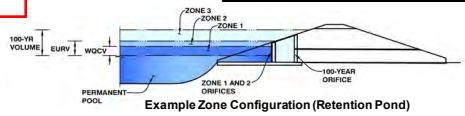
POND B - NO CLOGGING

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND B



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	63.10	acres
Watershed Length =	3,021	ft
Watershed Length to Centroid =	1,827	ft
Watershed Slope =	0.027	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	82.9%	percent
Percentage Hydrologic Soil Group B =	17.1%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.159	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	4.046	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.81 in.) =	2.013	acre-feet	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	2.865	acre-feet	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	3.764	acre-feet	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	5.673	acre-feet	inches
50-yr Runoff Volume (P1 = 2.24 in.) =	7.540	acre-feet	inches
100-yr Runoff Volume (P1 = 2.68 in.) =	9.957	acre-feet	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	16.376	acre-feet	inches
Approximate 2-yr Detention Volume =	1.834	acre-feet	
Approximate 5-yr Detention Volume =	2.628	acre-feet	
Approximate 10-yr Detention Volume =	3.475	acre-feet	
Approximate 25-yr Detention Volume =	4.791	acre-feet	
Approximate 50-yr Detention Volume =	5.695	acre-feet	
Approximate 100-yr Detention Volume =	6.770	acre-feet	

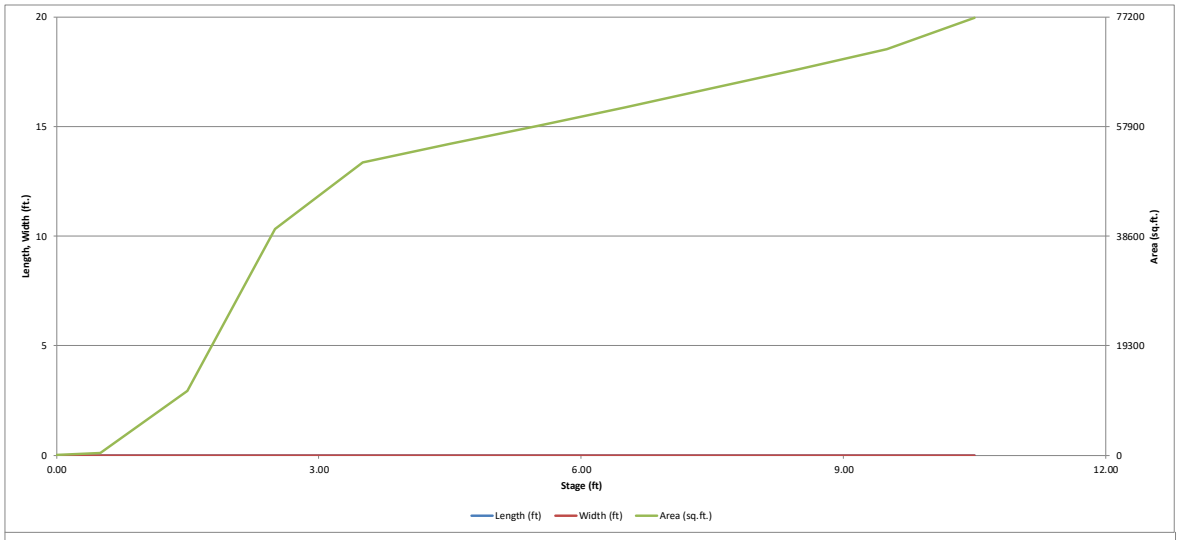
Define Zones and Basin Geometry

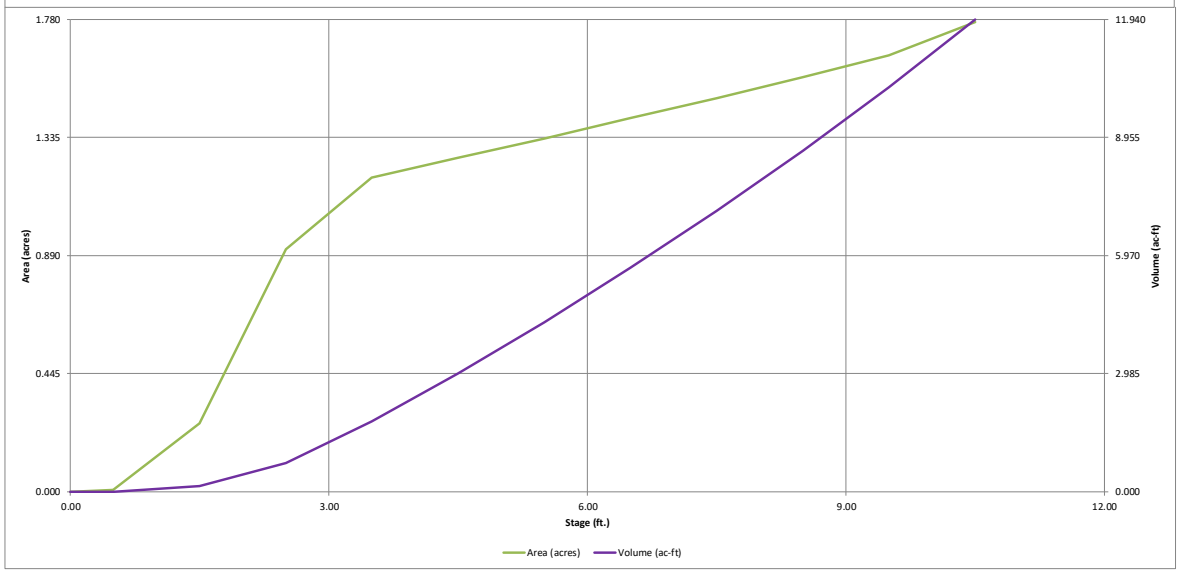
Zone 1 Volume (WQCV) =	1.159	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.887	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	7.889	acre-feet
Total Detention Basin Volume =	11.935	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	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

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
5002	--	0.50	--	--	--	340	0.008	97	0.002
5003	--	1.50	--	--	--	11,271	0.259	5,903	0.136
5004	--	2.50	--	--	--	39,823	0.914	31,450	0.722
5005	--	3.50	--	--	--	51,606	1.185	77,164	1.771
5006	--	4.50	--	--	--	54,805	1.258	130,370	2.993
5007	--	5.50	--	--	--	58,009	1.332	186,777	4.288
5008	--	6.50	--	--	--	61,283	1.407	246,423	5.657
5009	--	7.50	--	--	--	64,627	1.484	309,378	7.102
5010	--	8.50	--	--	--	68,042	1.562	375,712	8.625
5011	--	9.50	--	--	--	71,588	1.643	445,527	10.228
5012	--	10.50	--	--	--	77,124	1.771	519,883	11.935


20
15
10
5
0
77200
57900
38600
19300
0
0.00
3.00
6.00
9.00
12.00
Length, Width (ft.)
Area (sq.ft.)
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

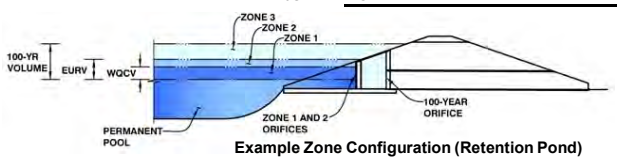

1.780
1.335
0.890
0.445
0.000
11.940
8.955
5.970
2.985
0.000
0.00
3.00
6.00
9.00
12.00
Area (acres)
Volume (ac-ft)
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND B



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.95	1.159	Orifice Plate
Zone 2 (EURV)	5.32	2.887	Orifice Plate
Zone 3 (User)	#VALUE!	7.889	Weir&Pipe (Restrict)
Total (all zones)		11.935	

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 Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	5.40	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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	1.65						
Orifice Area (sq. inches)	4.00	9.00						

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.40	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.40	N/A	feet
Overflow Weir Front Edge Length =	16.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	21.93	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	52.18	N/A	ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	52.18	N/A	ft²
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.38	N/A	ft²
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.79	N/A	feet
Restrictor Plate Height Above Pipe Invert =	17.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.00	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.69	feet
Spillway Crest Length =	75.00	feet	Stage at Top of Freeboard =	9.19	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	1.62	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	9.72	acre-ft

Calculated Parameters for Spillway

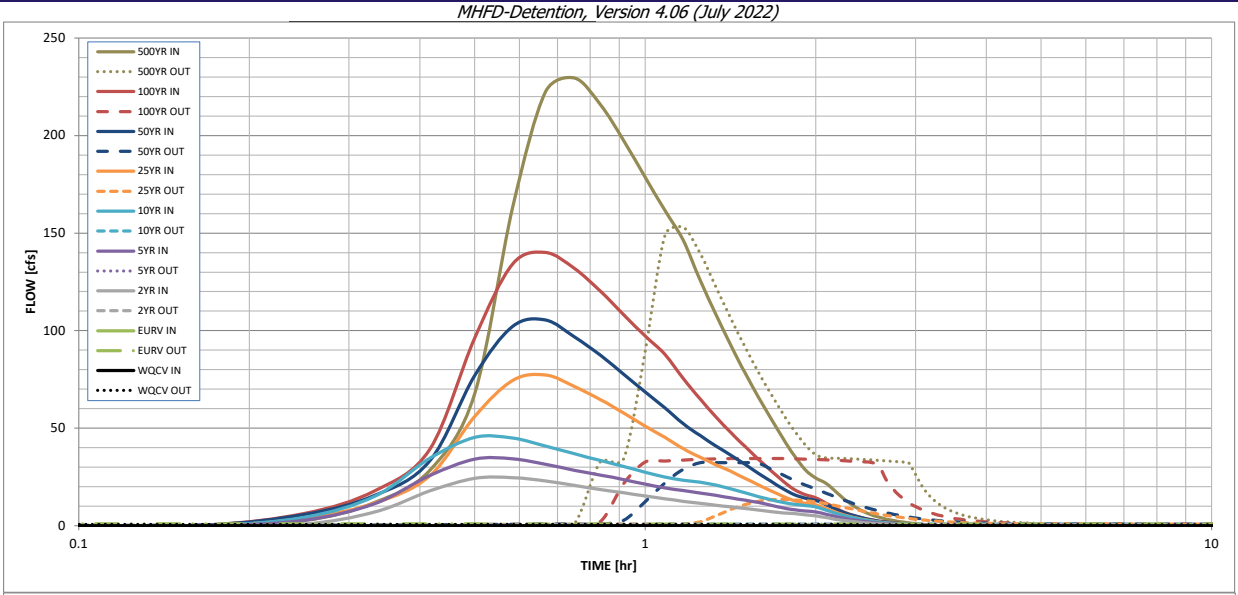
Routed Hydrograph Results

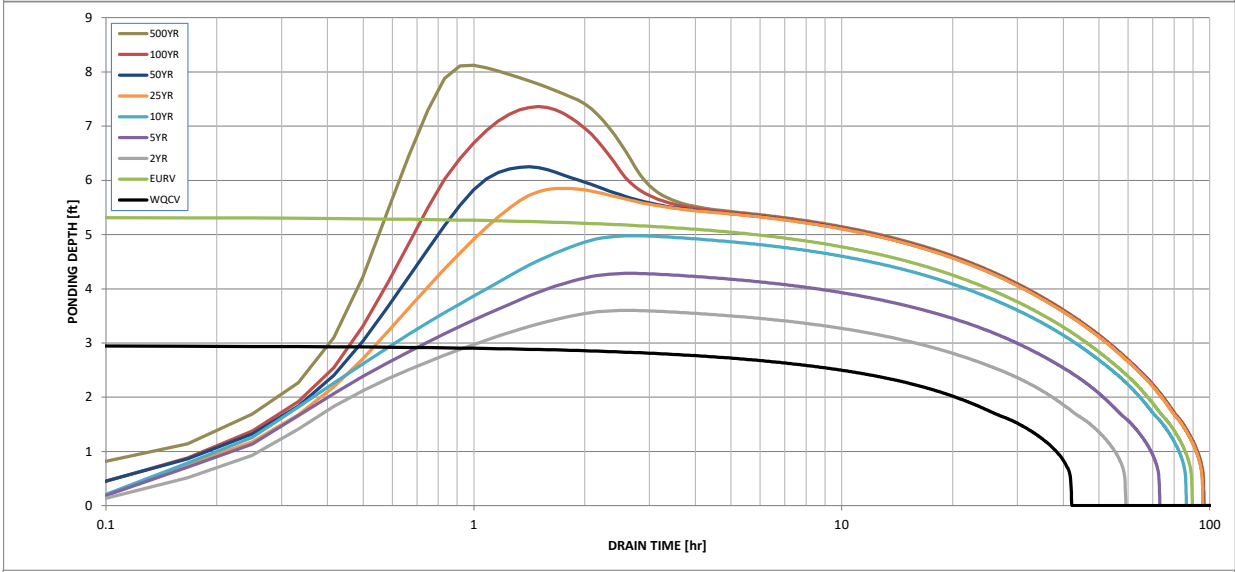
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

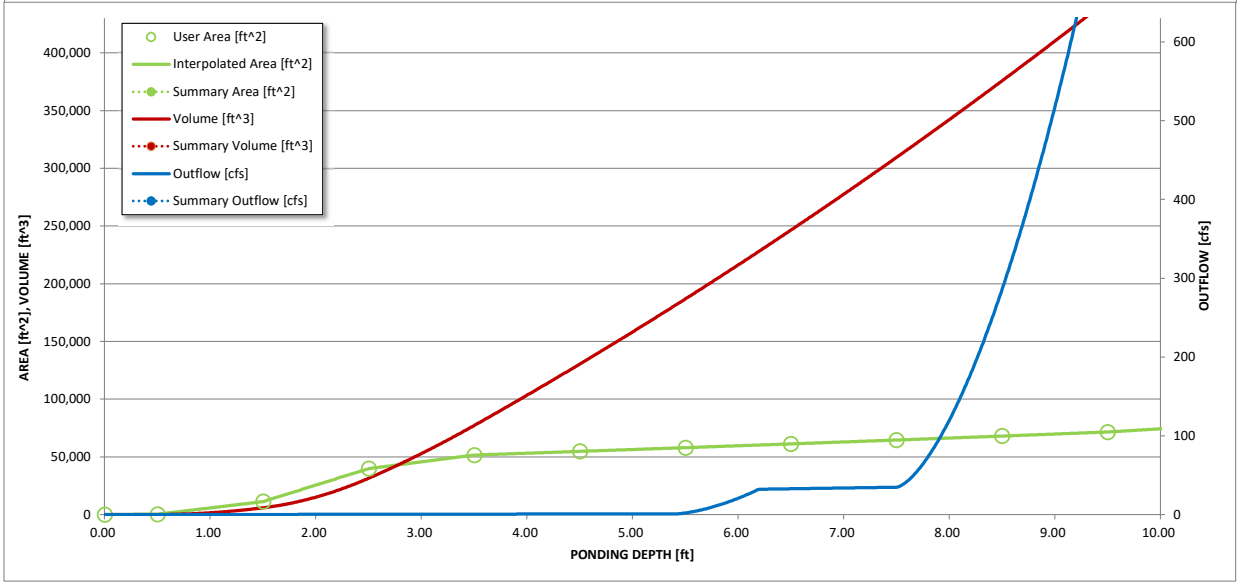
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.11	1.39	1.84	2.24	2.68	3.89
CUHP Runoff Volume (acre-ft) =	1.159	4.046	2.013	2.865	3.764	5.673	7.540	9.957	16.376
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.013	2.865	3.764	5.673	7.540	9.957	16.376
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.3	0.6	10.7	24.9	45.0	97.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.17	0.40	0.71	1.55
Peak Inflow Q (cfs) =	N/A	N/A	24.6	34.2	45.3	77.2	105.5	140.0	229.5
Peak Outflow Q (cfs) =	0.6	0.9	0.7	0.8	0.8	13.4	32.3	34.5	153.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.4	1.3	1.3	1.3	0.8	1.6
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.6	0.6	0.7
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) =	39	79	53	65	76	82	79	76	70
Time to Drain 99% of Inflow Volume (hours) =	**41**	86	57	70	83	90	89	87	83
Maximum Ponding Depth (ft) =	2.95	5.32	3.60	4.28	4.98	5.85	6.25	7.35	8.12
Area at Maximum Ponding Depth (acres) =	1.04	1.32	1.19	1.24	1.29	1.36	1.39	1.47	1.53
Maximum Volume Stored (acre-ft) =	1.161	4.049	1.878	2.718	3.592	4.745	5.294	6.881	8.022

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.34	2.66
	0:15:00	0.00	0.00	0.78	2.77	4.33	3.78	5.74	6.28	11.89
	0:20:00	0.00	0.00	7.00	11.35	15.12	11.65	15.48	17.87	28.37
	0:25:00	0.00	0.00	17.81	25.71	34.52	25.64	33.26	39.26	67.58
	0:30:00	0.00	0.00	24.19	34.08	45.26	56.00	76.97	96.15	163.30
	0:35:00	0.00	0.00	24.65	34.24	44.91	74.45	102.18	134.21	222.34
	0:40:00	0.00	0.00	22.94	31.41	40.82	77.25	105.46	140.03	229.53
	0:45:00	0.00	0.00	20.61	28.38	36.84	71.34	96.79	131.90	215.90
	0:50:00	0.00	0.00	18.56	25.98	33.39	64.70	87.37	120.20	197.36
	0:55:00	0.00	0.00	16.83	23.62	30.29	57.65	77.61	108.04	178.60
	1:00:00	0.00	0.00	15.21	21.31	27.42	51.04	68.50	97.26	161.64
	1:05:00	0.00	0.00	13.83	19.33	24.97	45.21	60.42	87.83	146.39
	1:10:00	0.00	0.00	12.52	17.97	23.33	39.46	52.29	75.49	125.78
	1:15:00	0.00	0.00	11.40	16.78	22.22	35.08	46.20	64.94	108.19
	1:20:00	0.00	0.00	10.45	15.50	20.78	31.23	40.88	55.74	92.38
	1:25:00	0.00	0.00	9.61	14.24	18.84	27.79	36.15	47.65	78.33
	1:30:00	0.00	0.00	8.81	13.04	16.84	24.31	31.40	40.59	66.09
	1:35:00	0.00	0.00	8.01	11.89	14.96	20.98	26.87	34.14	55.01
	1:40:00	0.00	0.00	7.23	10.45	13.27	17.90	22.70	28.22	44.89
	1:45:00	0.00	0.00	6.58	9.09	11.88	15.14	18.95	22.90	35.84
	1:50:00	0.00	0.00	6.18	8.14	10.97	12.84	15.83	18.50	28.70
	1:55:00	0.00	0.00	5.61	7.55	10.34	11.42	14.03	15.89	24.46
	2:00:00	0.00	0.00	5.02	7.04	9.59	10.59	12.97	14.32	21.79
	2:05:00	0.00	0.00	4.17	5.93	8.06	8.86	10.83	11.69	17.64
	2:10:00	0.00	0.00	3.33	4.72	6.43	6.98	8.50	9.01	13.46
	2:15:00	0.00	0.00	2.63	3.72	5.08	5.46	6.62	6.86	10.14
	2:20:00	0.00	0.00	2.07	2.93	4.00	4.26	5.15	5.21	7.61
	2:25:00	0.00	0.00	1.62	2.30	3.13	3.32	4.00	3.97	5.75
	2:30:00	0.00	0.00	1.26	1.78	2.41	2.56	3.08	3.06	4.40
	2:35:00	0.00	0.00	0.98	1.36	1.84	1.94	2.34	2.33	3.34
	2:40:00	0.00	0.00	0.75	1.03	1.40	1.47	1.77	1.78	2.55
	2:45:00	0.00	0.00	0.57	0.78	1.07	1.13	1.36	1.38	1.97
	2:50:00	0.00	0.00	0.42	0.57	0.81	0.85	1.02	1.03	1.47
	2:55:00	0.00	0.00	0.29	0.41	0.58	0.62	0.73	0.74	1.05
	3:00:00	0.00	0.00	0.19	0.27	0.39	0.42	0.49	0.49	0.69
	3:05:00	0.00	0.00	0.11	0.17	0.23	0.26	0.30	0.30	0.41
	3:10:00	0.00	0.00	0.05	0.09	0.12	0.13	0.15	0.15	0.20
	3:15:00	0.00	0.00	0.02	0.04	0.05	0.05	0.05	0.05	0.07
	3:20:00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

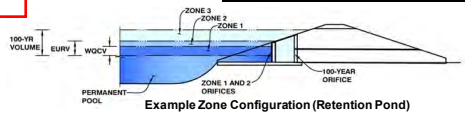
POND B - 50% CLOGGING

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND B



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	63.10	acres
Watershed Length =	3,021	ft
Watershed Length to Centroid =	1,827	ft
Watershed Slope =	0.027	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	82.9%	percent
Percentage Hydrologic Soil Group B =	17.1%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.159	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	4.046	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.81 in.) =	2.013	acre-feet	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	2.865	acre-feet	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	3.764	acre-feet	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	5.673	acre-feet	inches
50-yr Runoff Volume (P1 = 2.24 in.) =	7.540	acre-feet	inches
100-yr Runoff Volume (P1 = 2.68 in.) =	9.957	acre-feet	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	16.376	acre-feet	inches
Approximate 2-yr Detention Volume =	1.834	acre-feet	
Approximate 5-yr Detention Volume =	2.628	acre-feet	
Approximate 10-yr Detention Volume =	3.475	acre-feet	
Approximate 25-yr Detention Volume =	4.791	acre-feet	
Approximate 50-yr Detention Volume =	5.695	acre-feet	
Approximate 100-yr Detention Volume =	6.770	acre-feet	

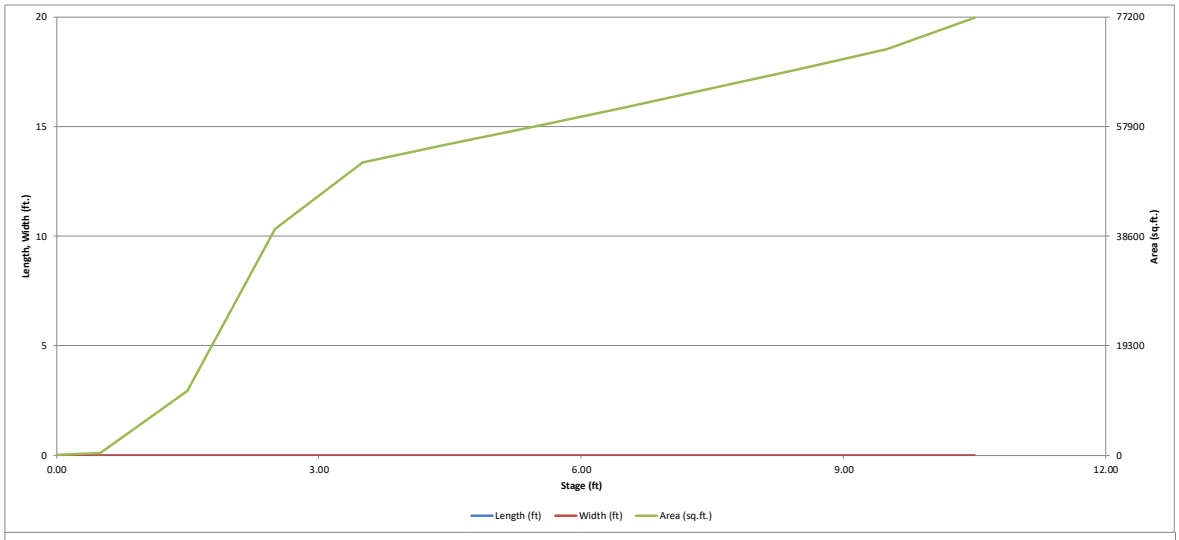
Define Zones and Basin Geometry

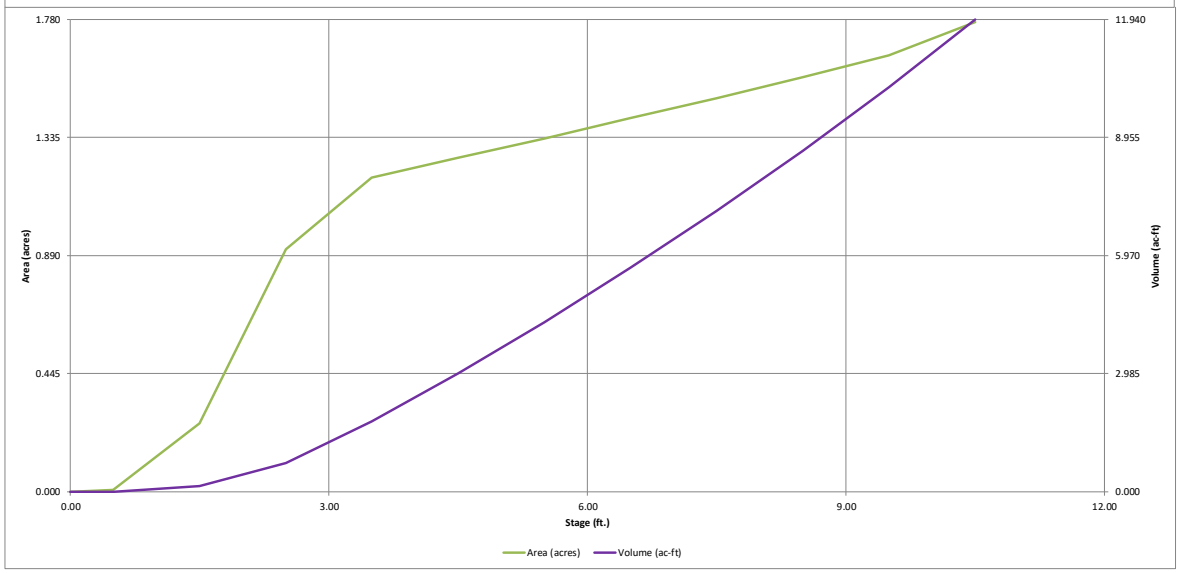
Zone 1 Volume (WQCV) =	1.159	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.887	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	7.889	acre-feet
Total Detention Basin Volume =	11.935	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	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

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
5002	--	0.50	--	--	--	340	0.008	97	0.002
5003	--	1.50	--	--	--	11,271	0.259	5,903	0.136
5004	--	2.50	--	--	--	39,823	0.914	31,450	0.722
5005	--	3.50	--	--	--	51,606	1.185	77,164	1.771
5006	--	4.50	--	--	--	54,805	1.258	130,370	2.993
5007	--	5.50	--	--	--	58,009	1.332	186,777	4.288
5008	--	6.50	--	--	--	61,283	1.407	246,423	5.657
5009	--	7.50	--	--	--	64,627	1.484	309,378	7.102
5010	--	8.50	--	--	--	68,042	1.562	375,712	8.625
5011	--	9.50	--	--	--	71,588	1.643	445,527	10.228
5012	--	10.50	--	--	--	77,124	1.771	519,883	11.935


20
15
10
5
0
77200
57900
38600
19300
0
0.00
3.00
6.00
9.00
12.00
Length, Width (ft.)
Area (sq.ft.)
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

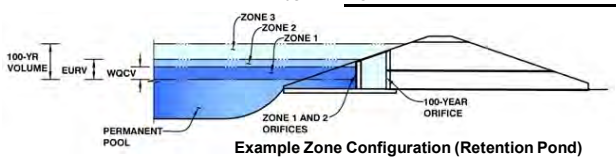

1.780
1.335
0.890
0.445
0.000
11.940
8.955
5.970
2.985
0.000
0.00
3.00
6.00
9.00
12.00
Area (acres)
Volume (ac-ft)
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND B



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.95	1.159	Orifice Plate
Zone 2 (EURV)	5.32	2.887	Orifice Plate
Zone 3 (User)	#VALUE!	7.889	Weir&Pipe (Restrict)
Total (all zones)		11.935	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	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)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	5.40	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	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	1.65						
Orifice Area (sq. inches)	4.00	9.00						

	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)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.40	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.40	N/A	feet
Overflow Weir Front Edge Length =	16.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	18.18	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	52.18	N/A	ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	26.09	N/A	ft²
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.87	N/A	ft²
Outlet Pipe Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	0.81	N/A	feet
Restrictor Plate Height Above Pipe Invert =	17.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.70	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	7.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.69	feet
Spillway Crest Length =	75.00	feet	Stage at Top of Freeboard =	9.19	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	1.62	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	9.72	acre-ft

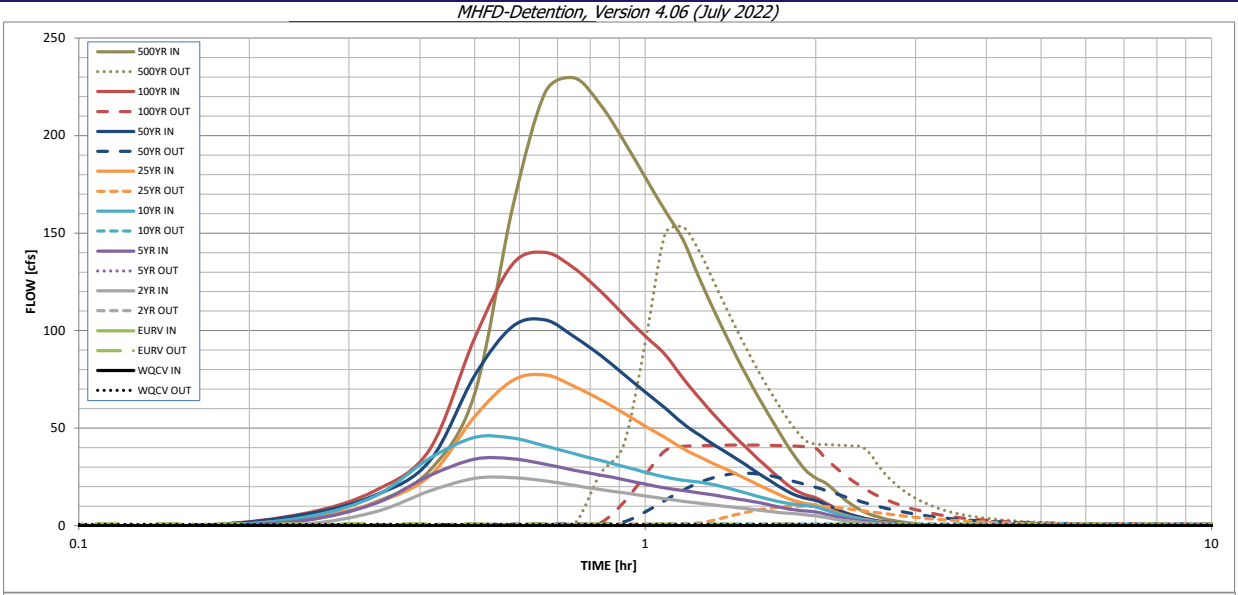
Routed Hydrograph Results

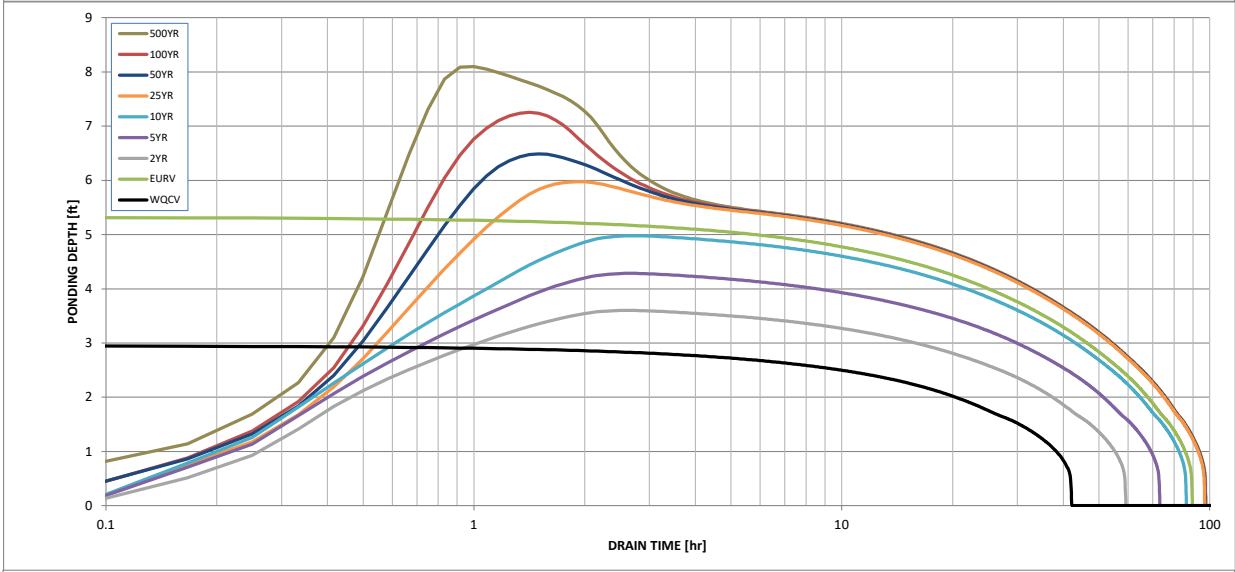
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

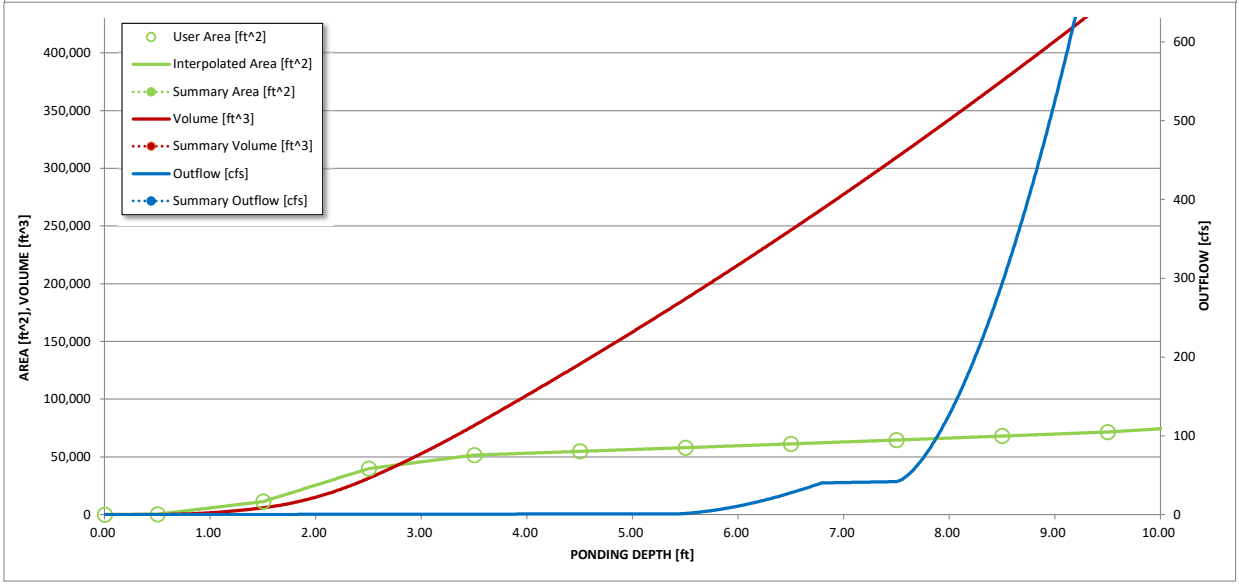
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.11	1.39	1.84	2.24	2.68	3.89
CUHP Runoff Volume (acre-ft) =	1.159	4.046	2.013	2.865	3.764	5.673	7.540	9.957	16.376
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.013	2.865	3.764	5.673	7.540	9.957	16.376
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.3	0.6	10.7	24.9	45.0	97.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.17	0.40	0.71	1.55
Peak Inflow Q (cfs) =	N/A	N/A	24.6	34.2	45.3	77.2	105.5	140.0	229.5
Peak Outflow Q (cfs) =	0.6	0.9	0.7	0.8	0.8	10.0	27.0	41.3	153.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.4	1.3	0.9	1.1	0.9	1.6
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.5	0.8	0.8
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) =	39	79	53	65	76	83	80	77	72
Time to Drain 99% of Inflow Volume (hours) =	**41**	86	57	70	83	92	90	88	84
Maximum Ponding Depth (ft) =	2.95	5.32	3.60	4.28	4.98	5.97	6.49	7.25	8.09
Area at Maximum Ponding Depth (acres) =	1.04	1.32	1.19	1.24	1.29	1.37	1.41	1.46	1.53
Maximum Volume Stored (acre-ft) =	1.161	4.049	1.878	2.718	3.592	4.908	5.629	6.719	7.991

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.34	2.66
	0:15:00	0.00	0.00	0.78	2.77	4.33	3.78	5.74	6.28	11.89
	0:20:00	0.00	0.00	7.00	11.35	15.12	11.65	15.48	17.87	28.37
	0:25:00	0.00	0.00	17.81	25.71	34.52	25.64	33.26	39.26	67.58
	0:30:00	0.00	0.00	24.19	34.08	45.26	56.00	76.97	96.15	163.30
	0:35:00	0.00	0.00	24.65	34.24	44.91	74.45	102.18	134.21	222.34
	0:40:00	0.00	0.00	22.94	31.41	40.82	77.25	105.46	140.03	229.53
	0:45:00	0.00	0.00	20.61	28.38	36.84	71.34	96.79	131.90	215.90
	0:50:00	0.00	0.00	18.56	25.98	33.39	64.70	87.37	120.20	197.36
	0:55:00	0.00	0.00	16.83	23.62	30.29	57.65	77.61	108.04	178.60
	1:00:00	0.00	0.00	15.21	21.31	27.42	51.04	68.50	97.26	161.64
	1:05:00	0.00	0.00	13.83	19.33	24.97	45.21	60.42	87.83	146.39
	1:10:00	0.00	0.00	12.52	17.97	23.33	39.46	52.29	75.49	125.78
	1:15:00	0.00	0.00	11.40	16.78	22.22	35.08	46.20	64.94	108.19
	1:20:00	0.00	0.00	10.45	15.50	20.78	31.23	40.88	55.74	92.38
	1:25:00	0.00	0.00	9.61	14.24	18.84	27.79	36.15	47.65	78.33
	1:30:00	0.00	0.00	8.81	13.04	16.84	24.31	31.40	40.59	66.09
	1:35:00	0.00	0.00	8.01	11.89	14.96	20.98	26.87	34.14	55.01
	1:40:00	0.00	0.00	7.23	10.45	13.27	17.90	22.70	28.22	44.89
	1:45:00	0.00	0.00	6.58	9.09	11.88	15.14	18.95	22.90	35.84
	1:50:00	0.00	0.00	6.18	8.14	10.97	12.84	15.83	18.50	28.70
	1:55:00	0.00	0.00	5.61	7.55	10.34	11.42	14.03	15.89	24.46
	2:00:00	0.00	0.00	5.02	7.04	9.59	10.59	12.97	14.32	21.79
	2:05:00	0.00	0.00	4.17	5.93	8.06	8.86	10.83	11.69	17.64
	2:10:00	0.00	0.00	3.33	4.72	6.43	6.98	8.50	9.01	13.46
	2:15:00	0.00	0.00	2.63	3.72	5.08	5.46	6.62	6.86	10.14
	2:20:00	0.00	0.00	2.07	2.93	4.00	4.26	5.15	5.21	7.61
	2:25:00	0.00	0.00	1.62	2.30	3.13	3.32	4.00	3.97	5.75
	2:30:00	0.00	0.00	1.26	1.78	2.41	2.56	3.08	3.06	4.40
	2:35:00	0.00	0.00	0.98	1.36	1.84	1.94	2.34	2.33	3.34
	2:40:00	0.00	0.00	0.75	1.03	1.40	1.47	1.77	1.78	2.55
	2:45:00	0.00	0.00	0.57	0.78	1.07	1.13	1.36	1.38	1.97
	2:50:00	0.00	0.00	0.42	0.57	0.81	0.85	1.02	1.03	1.47
	2:55:00	0.00	0.00	0.29	0.41	0.58	0.62	0.73	0.74	1.05
	3:00:00	0.00	0.00	0.19	0.27	0.39	0.42	0.49	0.49	0.69
	3:05:00	0.00	0.00	0.11	0.17	0.23	0.26	0.30	0.30	0.41
	3:10:00	0.00	0.00	0.05	0.09	0.12	0.13	0.15	0.15	0.20
	3:15:00	0.00	0.00	0.02	0.04	0.05	0.05	0.05	0.05	0.07
	3:20:00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

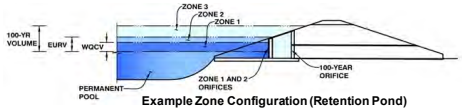
POND C - NO CLOGGING

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND C



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	17.00	acres
Watershed Length =	1,563	ft
Watershed Length to Centroid =	744	ft
Watershed Slope =	0.038	ft/ft
Watershed Imperviousness =	45.00%	percent
Percentage Hydrologic Soil Group A =	42.0%	percent
Percentage Hydrologic Soil Group B =	58.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.273	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.830	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.81 in.) =	0.416	acre-feet	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	0.628	acre-feet	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	0.841	acre-feet	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	1.477	acre-feet	inches
50-yr Runoff Volume (P1 = 2.24 in.) =	2.002	acre-feet	inches
100-yr Runoff Volume (P1 = 2.68 in.) =	2.699	acre-feet	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	4.425	acre-feet	inches
Approximate 2-yr Detention Volume =	0.397	acre-feet	
Approximate 5-yr Detention Volume =	0.584	acre-feet	
Approximate 10-yr Detention Volume =	0.816	acre-feet	
Approximate 25-yr Detention Volume =	1.087	acre-feet	
Approximate 50-yr Detention Volume =	1.267	acre-feet	
Approximate 100-yr Detention Volume =	1.536	acre-feet	

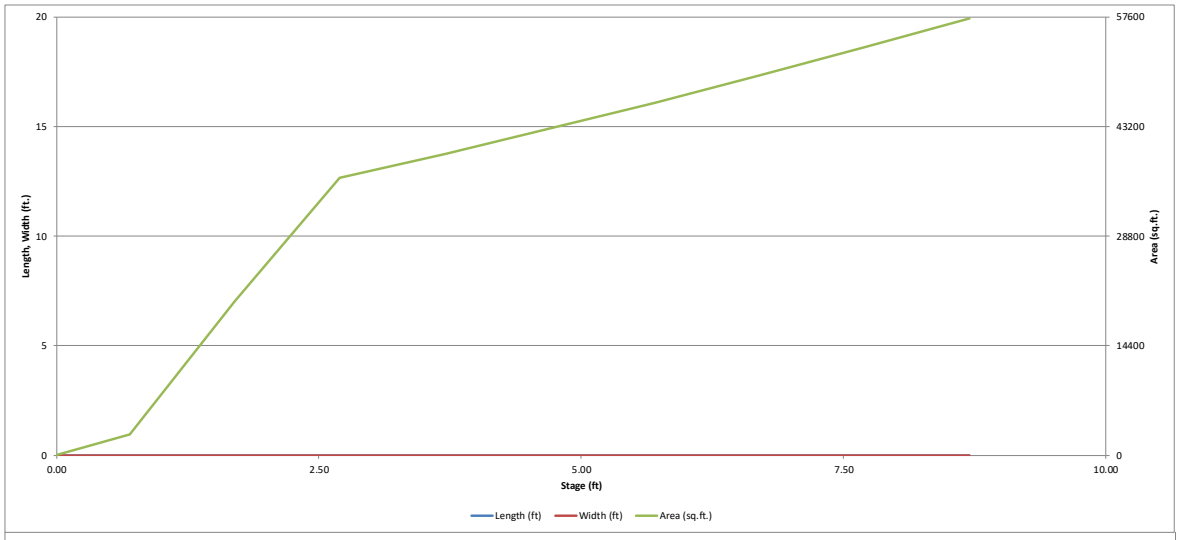
Define Zones and Basin Geometry

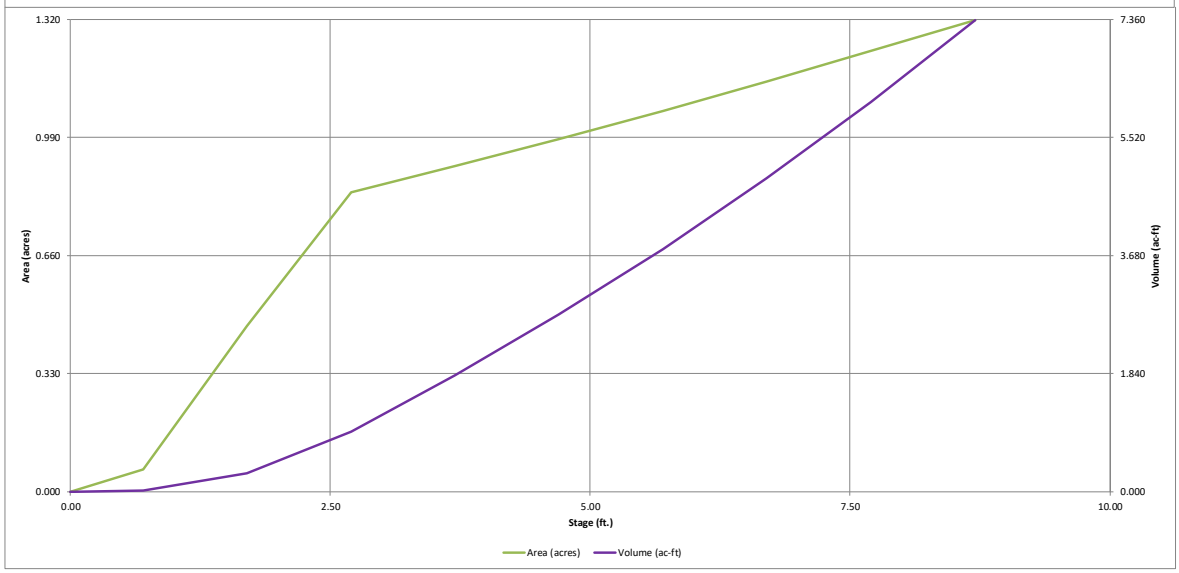
Zone 1 Volume (WQCV) =	0.273	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.557	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	6.520	acre-feet
Total Detention Basin Volume =	7.350	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	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

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
4975	--	0.70	--	--	--	2,744	0.063	978	0.022
4976	--	1.70	--	--	--	20,191	0.464	12,445	0.286
4977	--	2.70	--	--	--	36,439	0.837	40,760	0.936
4978	--	3.70	--	--	--	39,612	0.909	78,786	1.809
4979	--	4.70	--	--	--	42,918	0.985	120,051	2.756
4980	--	5.70	--	--	--	46,353	1.064	164,686	3.781
4981	--	6.70	--	--	--	49,943	1.147	212,834	4.886
4982	--	7.70	--	--	--	53,630	1.231	264,621	6.075
4983	--	8.70	--	--	--	57,463	1.319	320,167	7.350


20
15
10
5
0
57600
43200
28800
14400
0
Length, Width (ft.)
Area (sq.ft.)
0.00
2.50
5.00
7.50
10.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

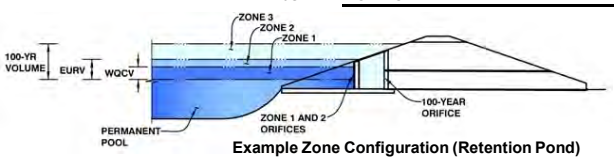

1.320
0.990
0.660
0.330
0.000
7.360
5.520
3.680
1.840
0.000
Area (acres)
Volume (ac-ft)
0.00
2.50
5.00
7.50
10.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND C



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.68	0.273	Orifice Plate
Zone 2 (EURV)	2.57	0.557	Orifice Plate
Zone 3 (User)	8.70	6.520	Weir&Pipe (Restrict)
Total (all zones)		7.350	

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 Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	2.80	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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	1.30						
Orifice Area (sq. inches)	2.00	2.00						

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.80	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.80	N/A	feet
Overflow Weir Front Edge Length =	12.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	31.59	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	39.14	N/A	ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	39.14	N/A	ft²
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.24	N/A	ft²
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.48	N/A	feet
Restrictor Plate Height Above Pipe Invert =	10.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.40	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.90	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.78	feet
Spillway Crest Length =	13.00	feet	Stage at Top of Freeboard =	5.68	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	1.06	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.76	acre-ft

Calculated Parameters for Spillway

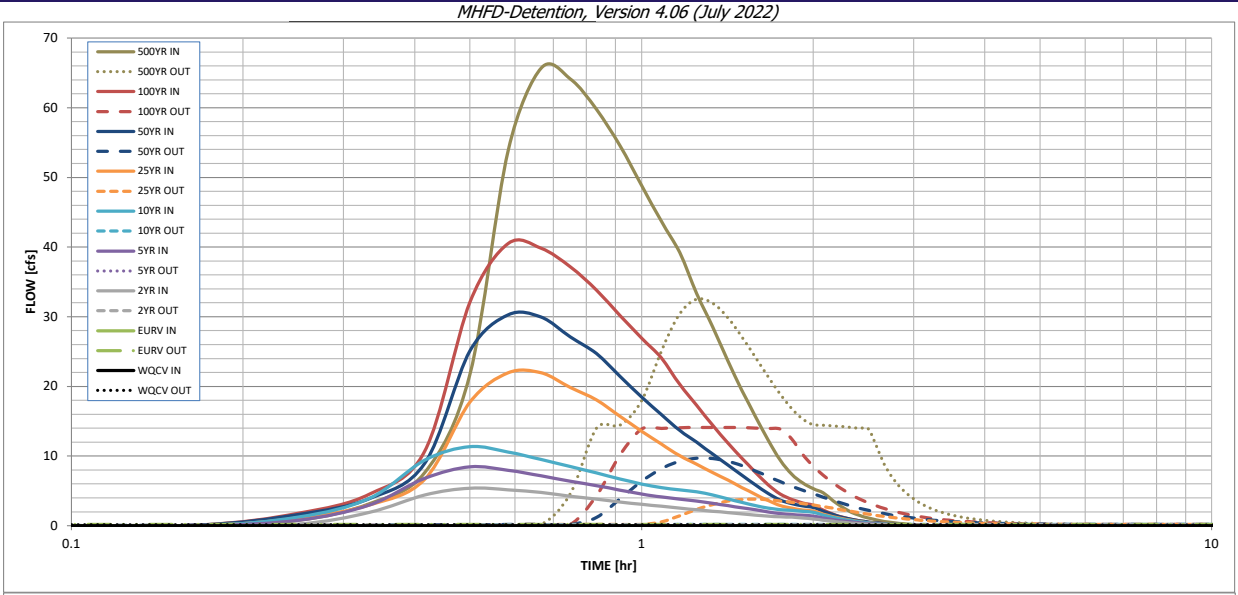
Routed Hydrograph Results

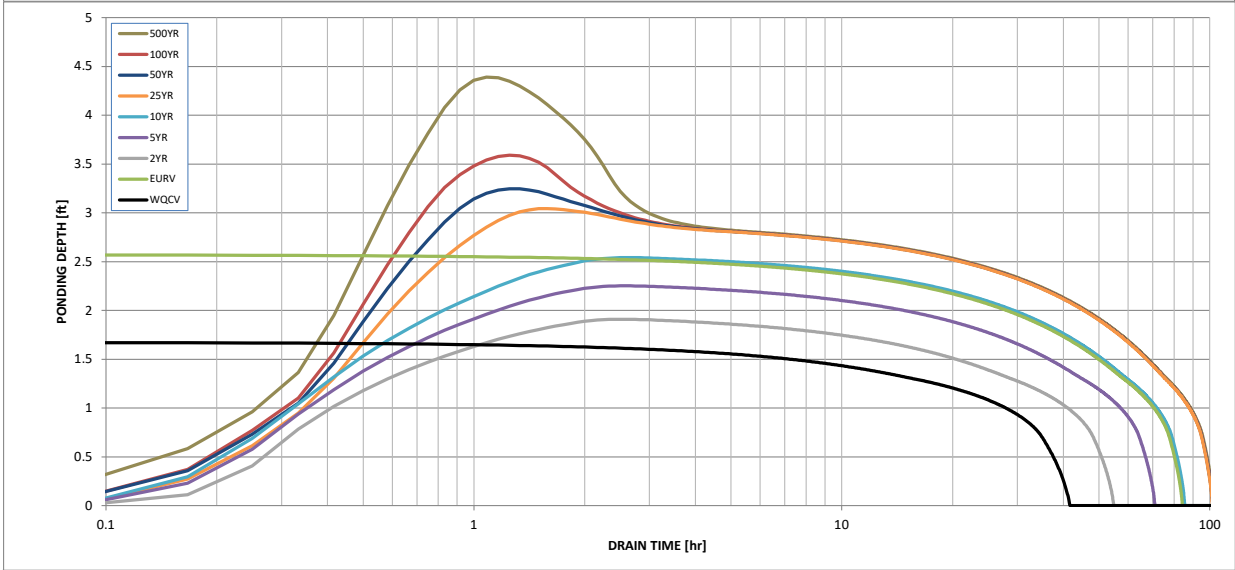
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

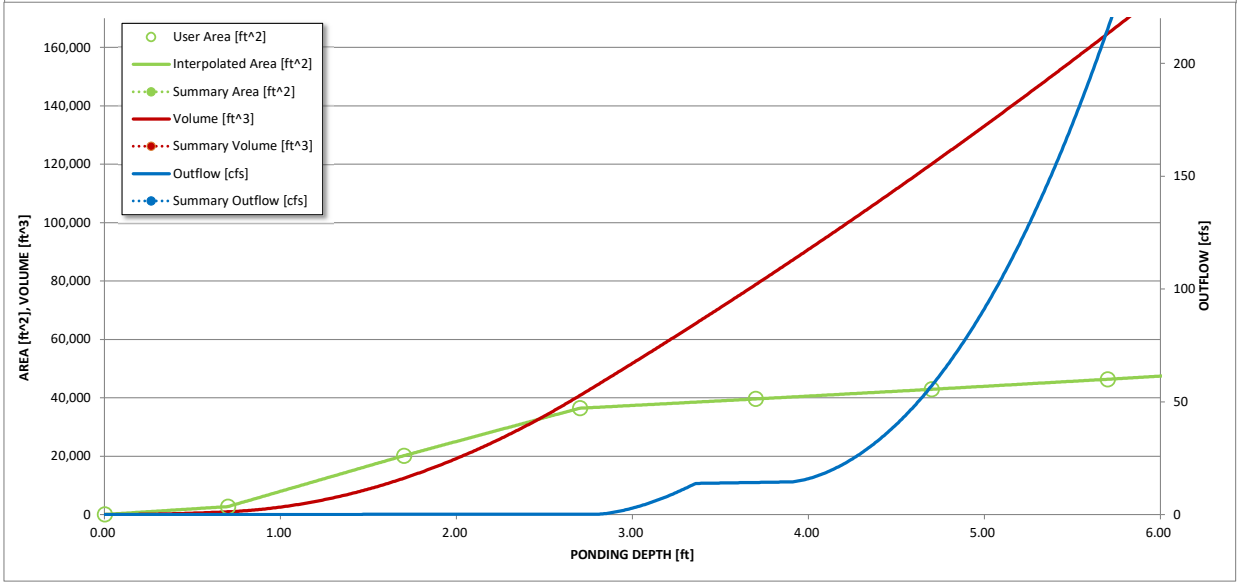
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.11	1.39	1.84	2.24	2.68	3.89
CUHP Runoff Volume (acre-ft) =	0.273	0.830	0.416	0.628	0.841	1.477	2.002	2.699	4.425
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.416	0.628	0.841	1.477	2.002	2.699	4.425
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.4	7.6	13.0	20.0	36.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.03	0.45	0.76	1.18	2.13
Peak Inflow Q (cfs) =	N/A	N/A	5.4	8.5	11.3	21.9	30.3	40.5	65.7
Peak Outflow Q (cfs) =	0.1	0.2	0.1	0.2	0.2	3.8	9.7	14.1	32.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	0.4	0.5	0.7	0.7	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.2	0.4	0.4
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) =	39	77	51	65	79	91	88	85	77
Time to Drain 99% of Inflow Volume (hours) =	**40**	81	53	69	83	97	96	95	92
Maximum Ponding Depth (ft) =	1.68	2.57	1.91	2.25	2.54	3.04	3.25	3.59	4.39
Area at Maximum Ponding Depth (acres) =	0.46	0.79	0.54	0.67	0.77	0.86	0.88	0.90	0.96
Maximum Volume Stored (acre-ft) =	0.277	0.830	0.386	0.597	0.799	1.224	1.398	1.700	2.454

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.76
	0:15:00	0.00	0.00	0.22	0.79	1.25	1.08	1.61	1.77	3.16
	0:20:00	0.00	0.00	1.91	2.97	3.94	2.99	3.91	4.54	7.61
	0:25:00	0.00	0.00	4.41	6.82	9.42	6.68	8.98	10.71	21.68
	0:30:00	0.00	0.00	5.39	8.46	11.34	17.72	25.08	32.07	53.88
	0:35:00	0.00	0.00	5.16	7.96	10.58	21.94	30.27	40.53	65.70
	0:40:00	0.00	0.00	4.76	7.15	9.50	21.94	29.93	39.82	64.14
	0:45:00	0.00	0.00	4.24	6.39	8.52	19.85	27.11	37.15	59.76
	0:50:00	0.00	0.00	3.80	5.76	7.57	18.06	24.71	33.82	54.55
	0:55:00	0.00	0.00	3.41	5.12	6.72	15.70	21.45	30.18	48.84
	1:00:00	0.00	0.00	3.06	4.55	5.99	13.56	18.49	26.94	43.66
	1:05:00	0.00	0.00	2.80	4.12	5.47	11.72	15.95	24.06	39.23
	1:10:00	0.00	0.00	2.52	3.83	5.14	10.06	13.68	20.28	33.32
	1:15:00	0.00	0.00	2.29	3.53	4.86	8.82	11.97	17.25	28.51
	1:20:00	0.00	0.00	2.08	3.20	4.41	7.63	10.28	14.40	23.70
	1:25:00	0.00	0.00	1.89	2.88	3.86	6.55	8.74	11.90	19.44
	1:30:00	0.00	0.00	1.70	2.57	3.34	5.48	7.25	9.69	15.71
	1:35:00	0.00	0.00	1.51	2.29	2.88	4.49	5.87	7.67	12.32
	1:40:00	0.00	0.00	1.36	1.96	2.52	3.61	4.64	5.89	9.42
	1:45:00	0.00	0.00	1.28	1.73	2.32	2.91	3.70	4.57	7.38
	1:50:00	0.00	0.00	1.24	1.60	2.20	2.51	3.17	3.79	6.13
	1:55:00	0.00	0.00	1.10	1.50	2.08	2.28	2.85	3.28	5.31
	2:00:00	0.00	0.00	0.99	1.40	1.91	2.13	2.64	2.93	4.72
	2:05:00	0.00	0.00	0.79	1.12	1.53	1.68	2.07	2.24	3.59
	2:10:00	0.00	0.00	0.62	0.88	1.20	1.29	1.59	1.66	2.65
	2:15:00	0.00	0.00	0.49	0.69	0.93	1.00	1.22	1.23	1.95
	2:20:00	0.00	0.00	0.38	0.53	0.72	0.76	0.93	0.92	1.45
	2:25:00	0.00	0.00	0.29	0.41	0.54	0.58	0.70	0.70	1.10
	2:30:00	0.00	0.00	0.23	0.31	0.41	0.44	0.53	0.53	0.82
	2:35:00	0.00	0.00	0.17	0.23	0.31	0.33	0.39	0.40	0.62
	2:40:00	0.00	0.00	0.13	0.17	0.23	0.25	0.30	0.30	0.47
	2:45:00	0.00	0.00	0.09	0.12	0.17	0.18	0.22	0.22	0.34
	2:50:00	0.00	0.00	0.06	0.09	0.12	0.13	0.15	0.16	0.24
	2:55:00	0.00	0.00	0.04	0.06	0.08	0.08	0.10	0.10	0.15
	3:00:00	0.00	0.00	0.02	0.04	0.04	0.05	0.06	0.06	0.09
	3:05:00	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.03	0.04
	3:10:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

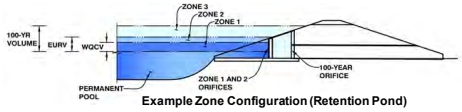
POND C - 50% CLOGGING

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND C



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	17.00	acres
Watershed Length =	1,563	ft
Watershed Length to Centroid =	744	ft
Watershed Slope =	0.038	ft/ft
Watershed Imperviousness =	45.00%	percent
Percentage Hydrologic Soil Group A =	42.0%	percent
Percentage Hydrologic Soil Group B =	58.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.273	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.830	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.81 in.) =	0.416	acre-feet	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	0.628	acre-feet	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	0.841	acre-feet	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	1.477	acre-feet	inches
50-yr Runoff Volume (P1 = 2.24 in.) =	2.002	acre-feet	inches
100-yr Runoff Volume (P1 = 2.68 in.) =	2.699	acre-feet	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	4.425	acre-feet	inches
Approximate 2-yr Detention Volume =	0.397	acre-feet	
Approximate 5-yr Detention Volume =	0.584	acre-feet	
Approximate 10-yr Detention Volume =	0.816	acre-feet	
Approximate 25-yr Detention Volume =	1.087	acre-feet	
Approximate 50-yr Detention Volume =	1.267	acre-feet	
Approximate 100-yr Detention Volume =	1.536	acre-feet	

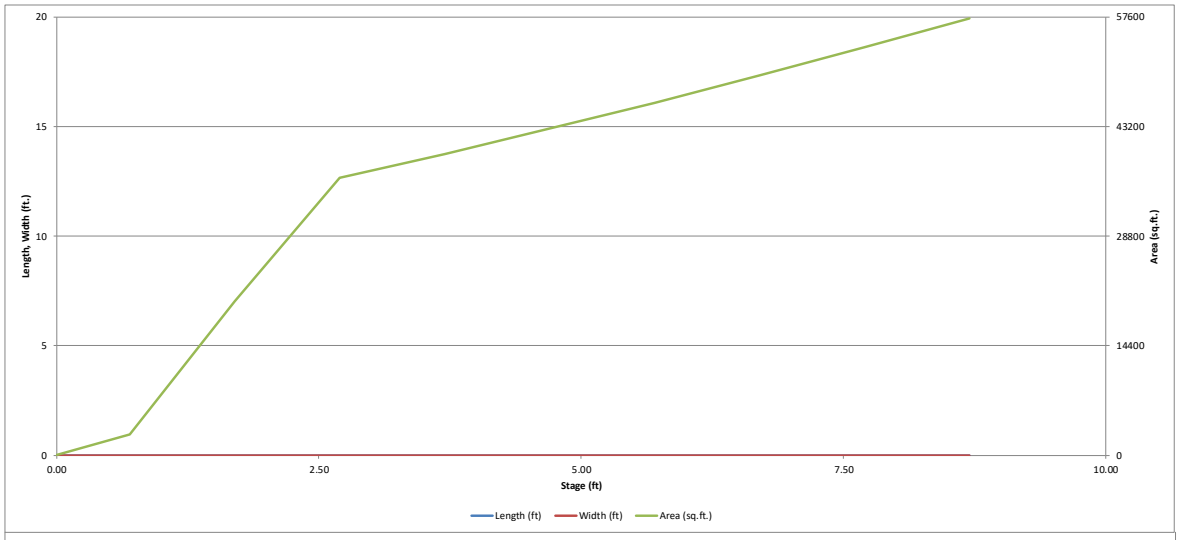
Define Zones and Basin Geometry

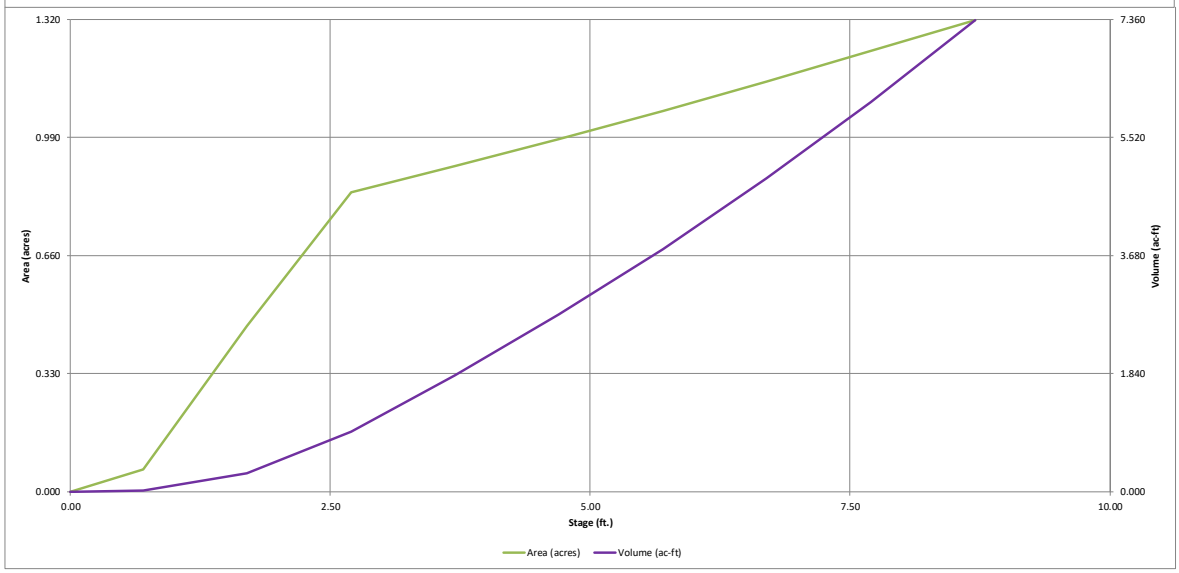
Zone 1 Volume (WQCV) =	0.273	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.557	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	6.520	acre-feet
Total Detention Basin Volume =	7.350	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	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

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
4975	--	0.70	--	--	--	2,744	0.063	978	0.022
4976	--	1.70	--	--	--	20,191	0.464	12,445	0.286
4977	--	2.70	--	--	--	36,439	0.837	40,760	0.936
4978	--	3.70	--	--	--	39,612	0.909	78,786	1.809
4979	--	4.70	--	--	--	42,918	0.985	120,051	2.756
4980	--	5.70	--	--	--	46,353	1.064	164,686	3.781
4981	--	6.70	--	--	--	49,943	1.147	212,834	4.886
4982	--	7.70	--	--	--	53,630	1.231	264,621	6.075
4983	--	8.70	--	--	--	57,463	1.319	320,167	7.350


20
15
10
5
0
57600
43200
28800
14400
0
Length, Width (ft.)
Area (sq.ft.)
0.00
2.50
5.00
7.50
10.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

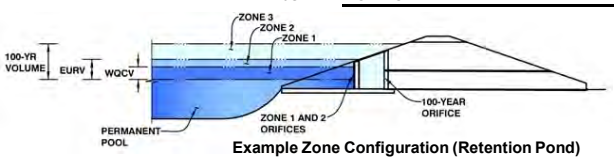

1.320
0.990
0.660
0.330
0.000
7.360
5.520
3.680
1.840
0.000
Area (acres)
Volume (ac-ft)
0.00
2.50
5.00
7.50
10.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND C



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.68	0.273	Orifice Plate
Zone 2 (EURV)	2.57	0.557	Orifice Plate
Zone 3 (User)	8.70	6.520	Weir&Pipe (Restrict)
Total (all zones)		7.350	

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 Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	2.80	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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	1.30						
Orifice Area (sq. inches)	2.00	2.00						

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.80	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.80	N/A	feet
Overflow Weir Front Edge Length =	12.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	31.59	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	39.14	N/A	ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	19.57	N/A	ft²
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.24	N/A	ft²
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.48	N/A	feet
Restrictor Plate Height Above Pipe Invert =	10.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.40	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.90	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.78	feet
Spillway Crest Length =	13.00	feet	Stage at Top of Freeboard =	5.68	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	1.06	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.76	acre-ft

Calculated Parameters for Spillway

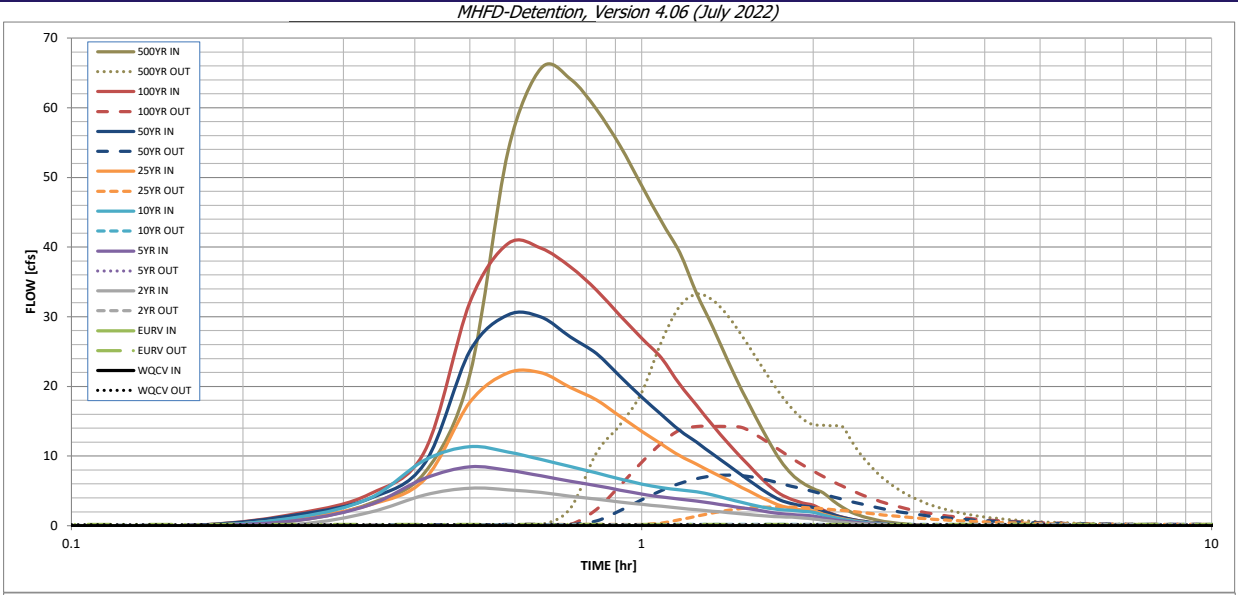
Routed Hydrograph Results

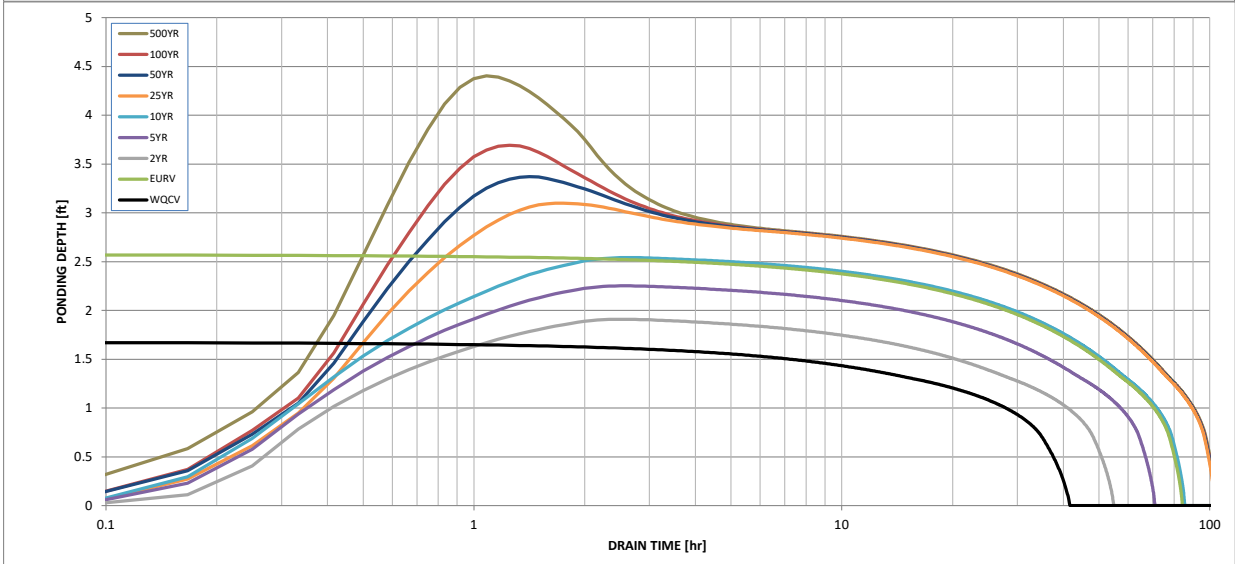
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

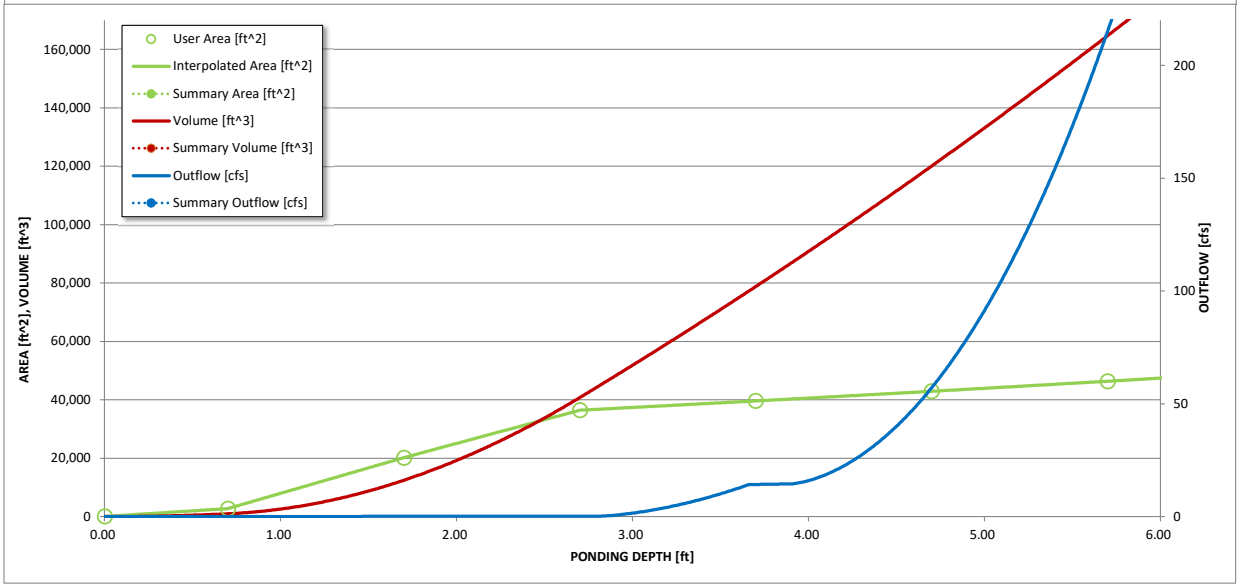
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.11	1.39	1.84	2.24	2.68	3.89
CUHP Runoff Volume (acre-ft) =	0.273	0.830	0.416	0.628	0.841	1.477	2.002	2.699	4.425
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.416	0.628	0.841	1.477	2.002	2.699	4.425
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.4	7.6	13.0	20.0	36.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.03	0.45	0.76	1.18	2.13
Peak Inflow Q (cfs) =	N/A	N/A	5.4	8.5	11.3	21.9	30.3	40.5	65.7
Peak Outflow Q (cfs) =	0.1	0.2	0.1	0.2	0.2	2.7	7.3	14.3	33.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	0.4	0.4	0.6	0.7	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.2	0.4	0.4
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) =	39	77	51	65	79	93	90	86	78
Time to Drain 99% of Inflow Volume (hours) =	**40**	81	53	69	83	99	98	96	93
Maximum Ponding Depth (ft) =	1.68	2.57	1.91	2.25	2.54	3.10	3.37	3.69	4.40
Area at Maximum Ponding Depth (acres) =	0.46	0.79	0.54	0.67	0.77	0.86	0.89	0.91	0.96
Maximum Volume Stored (acre-ft) =	0.277	0.830	0.386	0.597	0.799	1.268	1.513	1.800	2.464

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.76
	0:15:00	0.00	0.00	0.22	0.79	1.25	1.08	1.61	1.77	3.16
	0:20:00	0.00	0.00	1.91	2.97	3.94	2.99	3.91	4.54	7.61
	0:25:00	0.00	0.00	4.41	6.82	9.42	6.68	8.98	10.71	21.68
	0:30:00	0.00	0.00	5.39	8.46	11.34	17.72	25.08	32.07	53.88
	0:35:00	0.00	0.00	5.16	7.96	10.58	21.94	30.27	40.53	65.70
	0:40:00	0.00	0.00	4.76	7.15	9.50	21.94	29.93	39.82	64.14
	0:45:00	0.00	0.00	4.24	6.39	8.52	19.85	27.11	37.15	59.76
	0:50:00	0.00	0.00	3.80	5.76	7.57	18.06	24.71	33.82	54.55
	0:55:00	0.00	0.00	3.41	5.12	6.72	15.70	21.45	30.18	48.84
	1:00:00	0.00	0.00	3.06	4.55	5.99	13.56	18.49	26.94	43.66
	1:05:00	0.00	0.00	2.80	4.12	5.47	11.72	15.95	24.06	39.23
	1:10:00	0.00	0.00	2.52	3.83	5.14	10.06	13.68	20.28	33.32
	1:15:00	0.00	0.00	2.29	3.53	4.86	8.82	11.97	17.25	28.51
	1:20:00	0.00	0.00	2.08	3.20	4.41	7.63	10.28	14.40	23.70
	1:25:00	0.00	0.00	1.89	2.88	3.86	6.55	8.74	11.90	19.44
	1:30:00	0.00	0.00	1.70	2.57	3.34	5.48	7.25	9.69	15.71
	1:35:00	0.00	0.00	1.51	2.29	2.88	4.49	5.87	7.67	12.32
	1:40:00	0.00	0.00	1.36	1.96	2.52	3.61	4.64	5.89	9.42
	1:45:00	0.00	0.00	1.28	1.73	2.32	2.91	3.70	4.57	7.38
	1:50:00	0.00	0.00	1.24	1.60	2.20	2.51	3.17	3.79	6.13
	1:55:00	0.00	0.00	1.10	1.50	2.08	2.28	2.85	3.28	5.31
	2:00:00	0.00	0.00	0.99	1.40	1.91	2.13	2.64	2.93	4.72
	2:05:00	0.00	0.00	0.79	1.12	1.53	1.68	2.07	2.24	3.59
	2:10:00	0.00	0.00	0.62	0.88	1.20	1.29	1.59	1.66	2.65
	2:15:00	0.00	0.00	0.49	0.69	0.93	1.00	1.22	1.23	1.95
	2:20:00	0.00	0.00	0.38	0.53	0.72	0.76	0.93	0.92	1.45
	2:25:00	0.00	0.00	0.29	0.41	0.54	0.58	0.70	0.70	1.10
	2:30:00	0.00	0.00	0.23	0.31	0.41	0.44	0.53	0.53	0.82
	2:35:00	0.00	0.00	0.17	0.23	0.31	0.33	0.39	0.40	0.62
	2:40:00	0.00	0.00	0.13	0.17	0.23	0.25	0.30	0.30	0.47
	2:45:00	0.00	0.00	0.09	0.12	0.17	0.18	0.22	0.22	0.34
	2:50:00	0.00	0.00	0.06	0.09	0.12	0.13	0.15	0.16	0.24
	2:55:00	0.00	0.00	0.04	0.06	0.08	0.08	0.10	0.10	0.15
	3:00:00	0.00	0.00	0.02	0.04	0.04	0.05	0.06	0.06	0.09
	3:05:00	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.03	0.04
	3:10:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

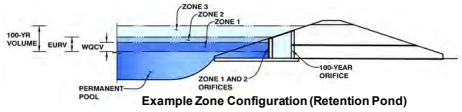
POND D - NO CLOGGING

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND D



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	14.90	acres
Watershed Length =	1,563	ft
Watershed Length to Centroid =	744	ft
Watershed Slope =	0.038	ft/ft
Watershed Imperviousness =	45.00%	percent
Percentage Hydrologic Soil Group A =	18.2%	percent
Percentage Hydrologic Soil Group B =	77.2%	percent
Percentage Hydrologic Soil Groups C/D =	4.6%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.240	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.714	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.81 in.) =	0.377	acre-feet	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	0.567	acre-feet	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	0.810	acre-feet	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	1.395	acre-feet	inches
50-yr Runoff Volume (P1 = 2.24 in.) =	1.875	acre-feet	inches
100-yr Runoff Volume (P1 = 2.68 in.) =	2.485	acre-feet	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	4.031	acre-feet	inches
Approximate 2-yr Detention Volume =	0.356	acre-feet	
Approximate 5-yr Detention Volume =	0.533	acre-feet	
Approximate 10-yr Detention Volume =	0.754	acre-feet	
Approximate 25-yr Detention Volume =	0.980	acre-feet	
Approximate 50-yr Detention Volume =	1.124	acre-feet	
Approximate 100-yr Detention Volume =	1.360	acre-feet	

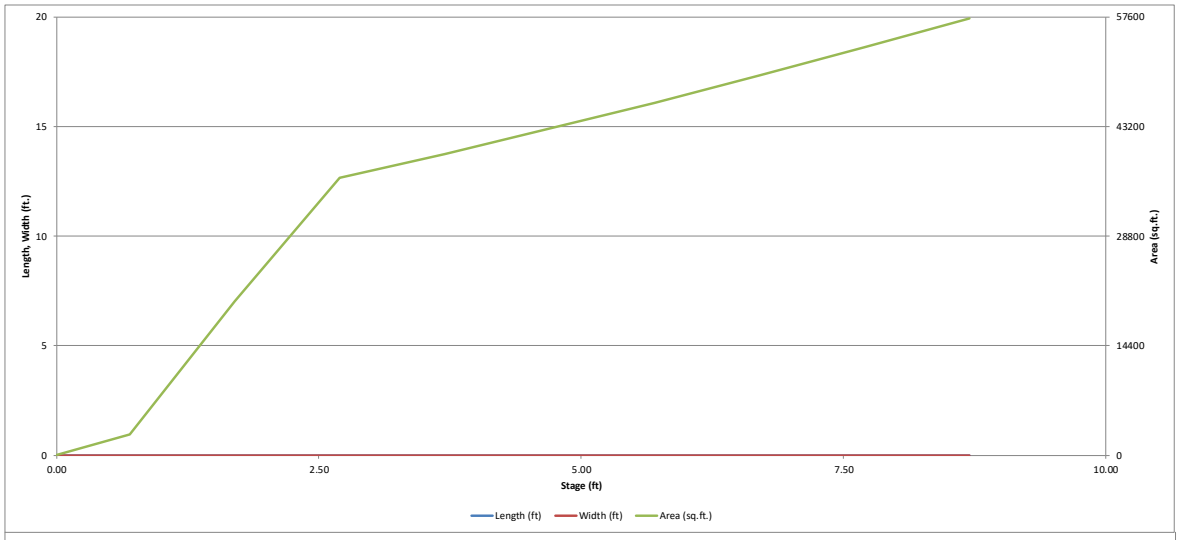
Define Zones and Basin Geometry

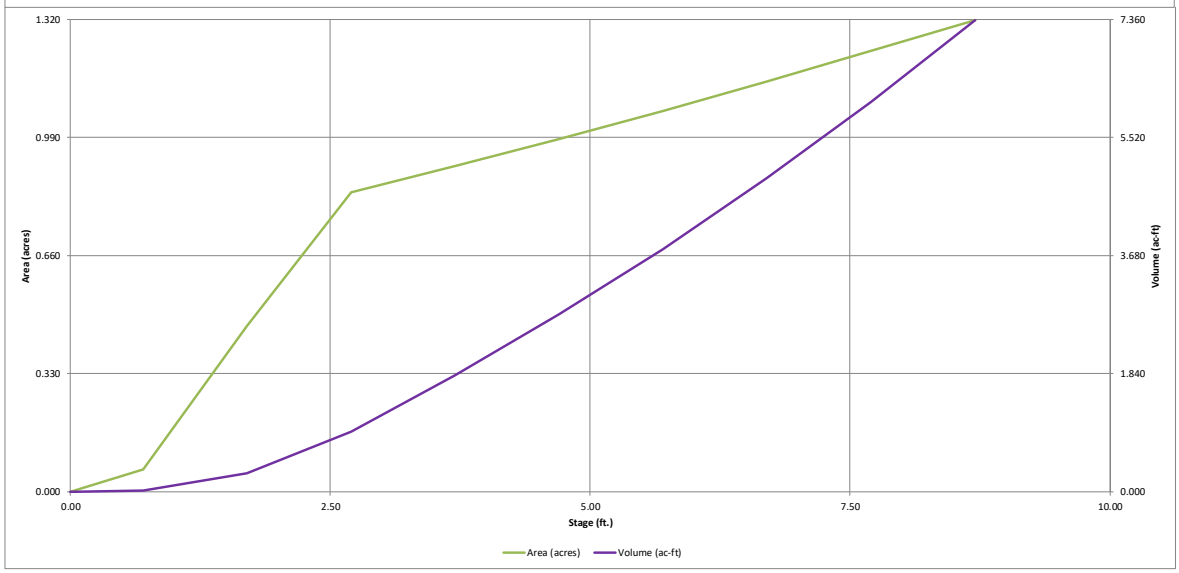
Zone 1 Volume (WQCV) =	0.240	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.475	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	6.636	acre-feet
Total Detention Basin Volume =	7.350	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	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

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
4975	--	0.70	--	--	--	2,744	0.063	978	0.022
4976	--	1.70	--	--	--	20,191	0.464	12,445	0.286
4977	--	2.70	--	--	--	36,439	0.837	40,760	0.936
4978	--	3.70	--	--	--	39,612	0.909	78,786	1.809
4979	--	4.70	--	--	--	42,918	0.985	120,051	2.756
4980	--	5.70	--	--	--	46,353	1.064	164,686	3.781
4981	--	6.70	--	--	--	49,943	1.147	212,834	4.886
4982	--	7.70	--	--	--	53,630	1.231	264,621	6.075
4983	--	8.70	--	--	--	57,463	1.319	320,167	7.350


20
15
10
5
0
57600
43200
28800
14400
0
Length, Width (ft.)
Area (sq.ft.)
0.00
2.50
5.00
7.50
10.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

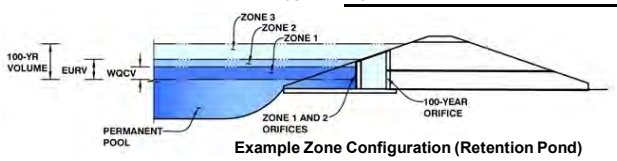

1.320
0.990
0.660
0.330
0.000
7.360
5.520
3.680
1.840
0.000
Area (acres)
Volume (ac-ft)
0.00
2.50
5.00
7.50
10.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND D



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.60	0.240	Orifice Plate
Zone 2 (EURV)	2.42	0.475	Orifice Plate
Zone 3 (User)	#VALUE!	6.636	Weir&Pipe (Restrict)
Total (all zones)		7.350	

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 Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	2.60	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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	1.50						
Orifice Area (sq. inches)	2.00	2.00						

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.60	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.60	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	11.53	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	13.05	N/A	ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	13.05	N/A	ft²
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.13	N/A	ft²
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.52	N/A	feet
Restrictor Plate Height Above Pipe Invert =	11.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.79	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.80	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.80	feet
Spillway Crest Length =	10.00	feet	Stage at Top of Freeboard =	5.60	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	1.06	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.67	acre-ft

Calculated Parameters for Spillway

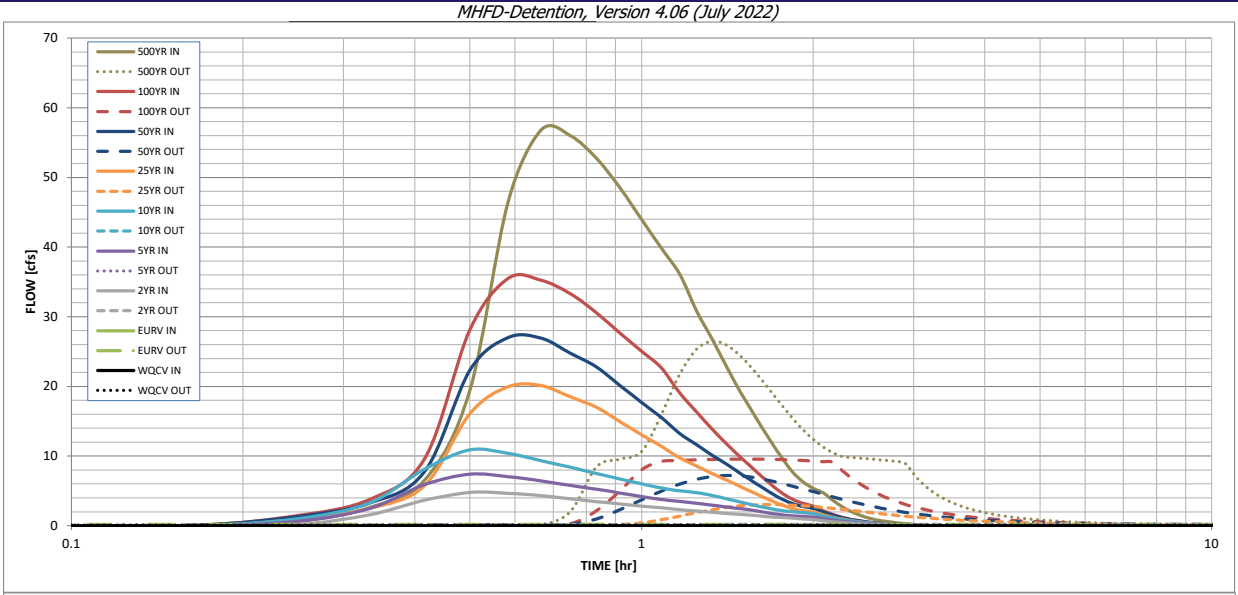
Routed Hydrograph Results

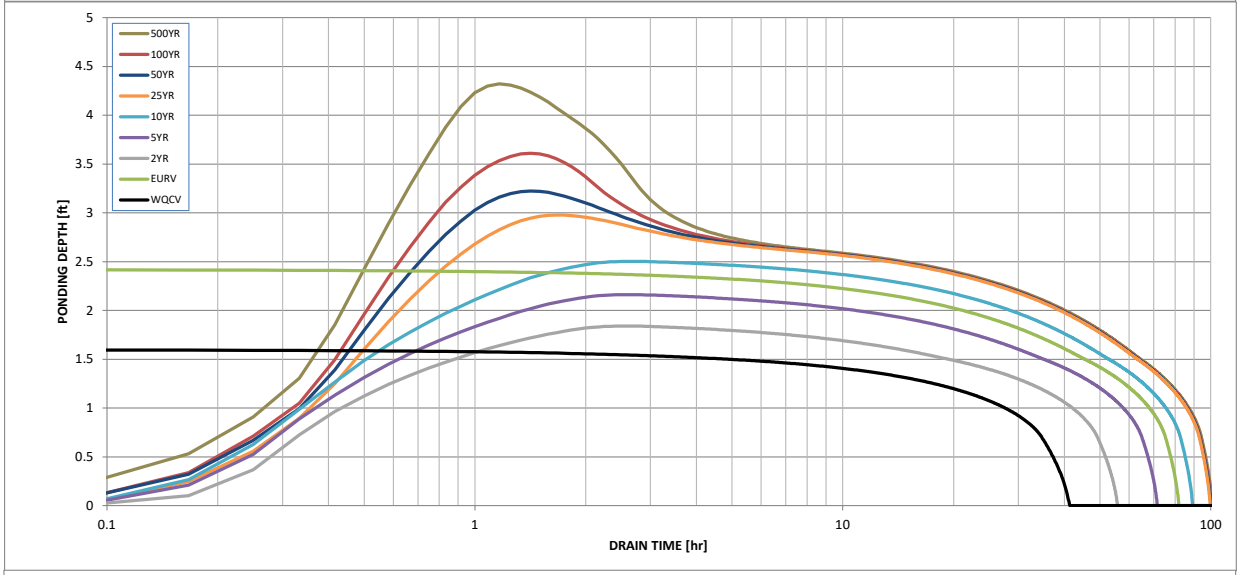
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

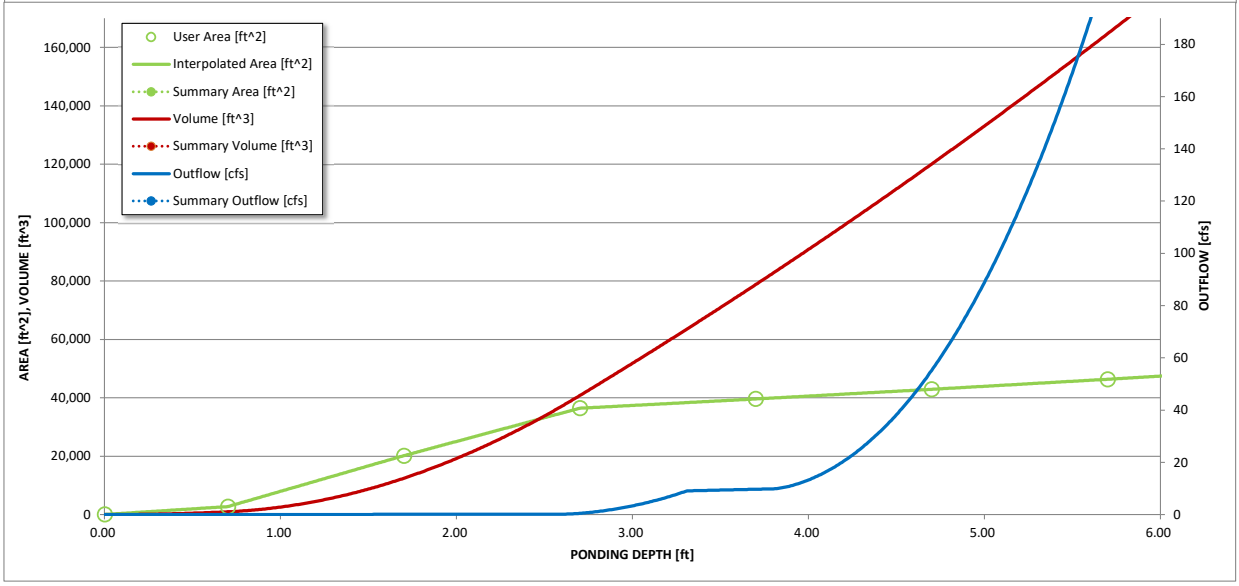
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.11	1.39	1.84	2.24	2.68	3.89
CUHP Runoff Volume (acre-ft) =	0.240	0.714	0.377	0.567	0.810	1.395	1.875	2.485	4.031
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.377	0.567	0.810	1.395	1.875	2.485	4.031
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	1.8	8.2	12.7	18.6	32.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.12	0.55	0.85	1.25	2.18
Peak Inflow Q (cfs) =	N/A	N/A	4.8	7.4	10.9	20.1	27.0	35.5	56.8
Peak Outflow Q (cfs) =	0.1	0.2	0.1	0.2	0.2	3.1	7.2	9.6	26.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.1	0.4	0.6	0.5	0.8
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.5	0.7	0.8
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) =	39	76	52	66	82	89	87	84	77
Time to Drain 99% of Inflow Volume (hours) =	**40**	79	54	69	86	95	94	93	91
Maximum Ponding Depth (ft) =	1.60	2.42	1.84	2.16	2.50	2.98	3.22	3.61	4.32
Area at Maximum Ponding Depth (acres) =	0.42	0.73	0.51	0.64	0.76	0.86	0.87	0.90	0.96
Maximum Volume Stored (acre-ft) =	0.241	0.716	0.349	0.538	0.776	1.164	1.381	1.718	2.378

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.08	0.63
	0:15:00	0.00	0.00	0.18	0.66	1.04	0.90	1.34	1.47	2.62
	0:20:00	0.00	0.00	1.58	2.48	3.28	2.49	3.25	3.78	6.57
	0:25:00	0.00	0.00	3.66	5.91	8.14	5.78	7.80	9.65	19.45
	0:30:00	0.00	0.00	4.78	7.39	10.90	16.10	22.33	28.13	46.55
	0:35:00	0.00	0.00	4.66	7.05	10.39	19.94	27.01	35.52	56.81
	0:40:00	0.00	0.00	4.31	6.43	9.34	20.10	26.93	35.25	56.00
	0:45:00	0.00	0.00	3.85	5.77	8.39	18.49	24.77	33.28	52.73
	0:50:00	0.00	0.00	3.47	5.26	7.49	17.01	22.78	30.57	48.52
	0:55:00	0.00	0.00	3.14	4.71	6.71	14.94	20.13	27.64	43.95
	1:00:00	0.00	0.00	2.82	4.18	6.00	13.06	17.69	25.03	39.83
	1:05:00	0.00	0.00	2.56	3.75	5.40	11.41	15.54	22.64	36.12
	1:10:00	0.00	0.00	2.29	3.47	5.01	9.74	13.25	19.06	30.79
	1:15:00	0.00	0.00	2.09	3.21	4.75	8.56	11.61	16.30	26.63
	1:20:00	0.00	0.00	1.92	2.93	4.33	7.44	10.07	13.78	22.49
	1:25:00	0.00	0.00	1.76	2.67	3.83	6.47	8.72	11.57	18.83
	1:30:00	0.00	0.00	1.61	2.42	3.35	5.51	7.37	9.65	15.65
	1:35:00	0.00	0.00	1.45	2.17	2.91	4.62	6.12	7.89	12.73
	1:40:00	0.00	0.00	1.30	1.86	2.51	3.80	4.98	6.28	10.10
	1:45:00	0.00	0.00	1.18	1.59	2.20	3.06	3.96	4.87	7.86
	1:50:00	0.00	0.00	1.11	1.44	2.01	2.50	3.21	3.85	6.32
	1:55:00	0.00	0.00	0.99	1.34	1.89	2.17	2.78	3.23	5.36
	2:00:00	0.00	0.00	0.88	1.25	1.73	1.98	2.50	2.83	4.71
	2:05:00	0.00	0.00	0.72	1.01	1.40	1.56	1.97	2.17	3.63
	2:10:00	0.00	0.00	0.57	0.80	1.11	1.21	1.51	1.62	2.72
	2:15:00	0.00	0.00	0.46	0.63	0.87	0.94	1.17	1.21	2.02
	2:20:00	0.00	0.00	0.36	0.50	0.68	0.73	0.90	0.90	1.50
	2:25:00	0.00	0.00	0.28	0.39	0.53	0.56	0.69	0.68	1.13
	2:30:00	0.00	0.00	0.22	0.30	0.40	0.43	0.52	0.51	0.85
	2:35:00	0.00	0.00	0.17	0.23	0.30	0.32	0.39	0.39	0.64
	2:40:00	0.00	0.00	0.13	0.17	0.23	0.24	0.30	0.30	0.49
	2:45:00	0.00	0.00	0.10	0.13	0.18	0.19	0.23	0.23	0.37
	2:50:00	0.00	0.00	0.07	0.09	0.13	0.14	0.17	0.17	0.27
	2:55:00	0.00	0.00	0.05	0.06	0.09	0.10	0.12	0.12	0.19
	3:00:00	0.00	0.00	0.03	0.04	0.06	0.06	0.07	0.08	0.12
	3:05:00	0.00	0.00	0.02	0.03	0.03	0.04	0.04	0.04	0.07
	3:10:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.03
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

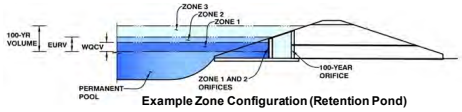
POND D - 50% CLOGGING

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND D



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	14.90	acres
Watershed Length =	1,563	ft
Watershed Length to Centroid =	744	ft
Watershed Slope =	0.038	ft/ft
Watershed Imperviousness =	45.00%	percent
Percentage Hydrologic Soil Group A =	18.2%	percent
Percentage Hydrologic Soil Group B =	77.2%	percent
Percentage Hydrologic Soil Groups C/D =	4.6%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.240	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.714	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.81 in.) =	0.377	acre-feet	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	0.567	acre-feet	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	0.810	acre-feet	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	1.395	acre-feet	inches
50-yr Runoff Volume (P1 = 2.24 in.) =	1.875	acre-feet	inches
100-yr Runoff Volume (P1 = 2.68 in.) =	2.485	acre-feet	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	4.031	acre-feet	inches
Approximate 2-yr Detention Volume =	0.356	acre-feet	
Approximate 5-yr Detention Volume =	0.533	acre-feet	
Approximate 10-yr Detention Volume =	0.754	acre-feet	
Approximate 25-yr Detention Volume =	0.980	acre-feet	
Approximate 50-yr Detention Volume =	1.124	acre-feet	
Approximate 100-yr Detention Volume =	1.360	acre-feet	

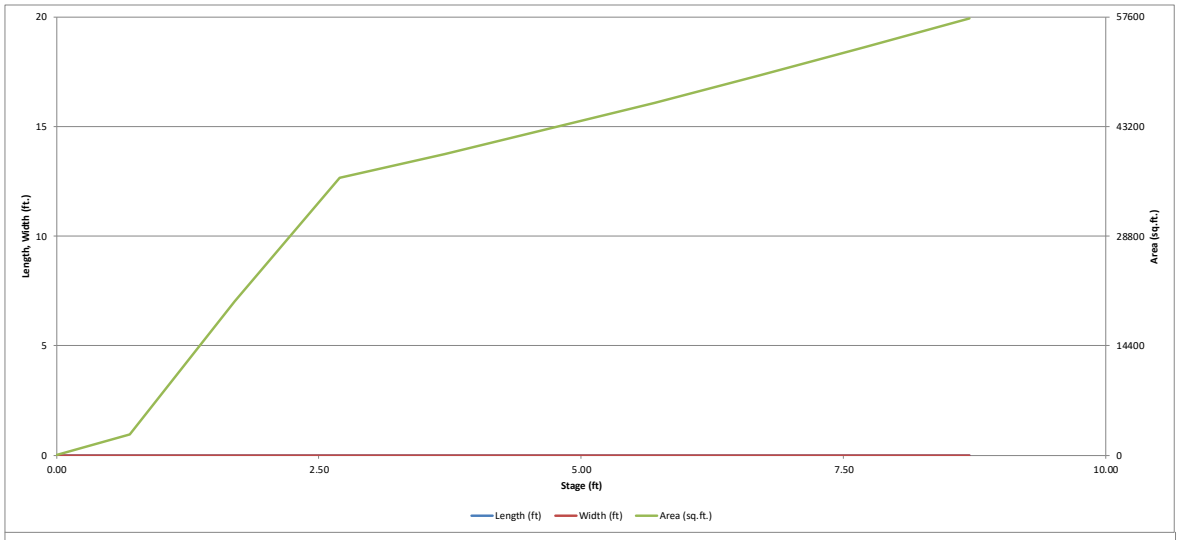
Define Zones and Basin Geometry

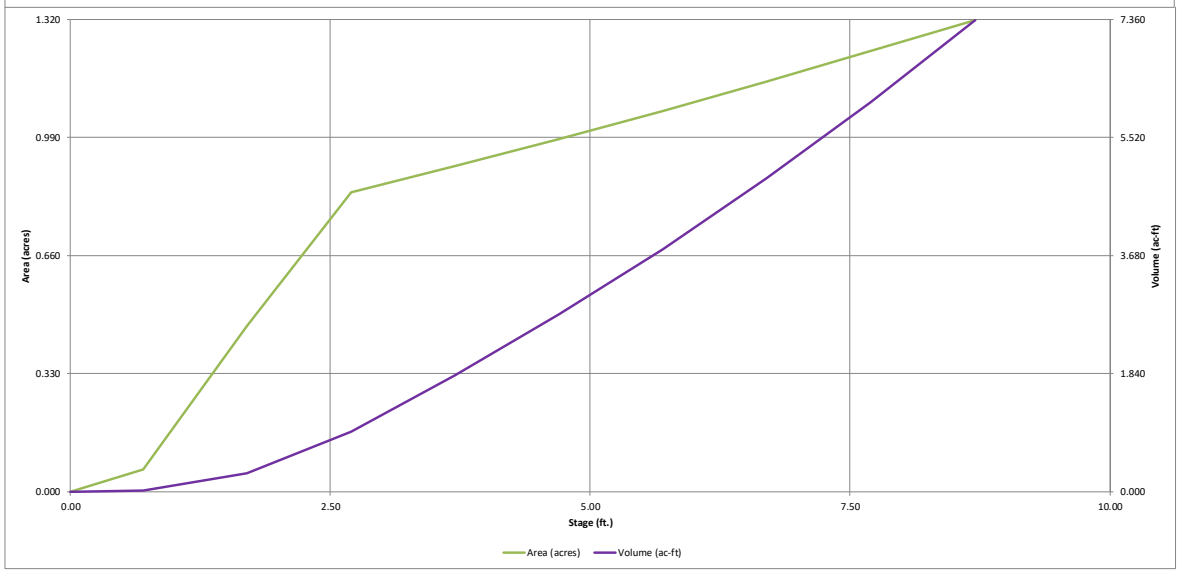
Zone 1 Volume (WQCV) =	0.240	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.475	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	6.636	acre-feet
Total Detention Basin Volume =	7.350	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	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

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
4975	--	0.70	--	--	--	2,744	0.063	978	0.022
4976	--	1.70	--	--	--	20,191	0.464	12,445	0.286
4977	--	2.70	--	--	--	36,439	0.837	40,760	0.936
4978	--	3.70	--	--	--	39,612	0.909	78,786	1.809
4979	--	4.70	--	--	--	42,918	0.985	120,051	2.756
4980	--	5.70	--	--	--	46,353	1.064	164,686	3.781
4981	--	6.70	--	--	--	49,943	1.147	212,834	4.886
4982	--	7.70	--	--	--	53,630	1.231	264,621	6.075
4983	--	8.70	--	--	--	57,463	1.319	320,167	7.350


20
15
10
5
0
57600
43200
28800
14400
0
Length, Width (ft.)
Area (sq.ft.)
0.00
2.50
5.00
7.50
10.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

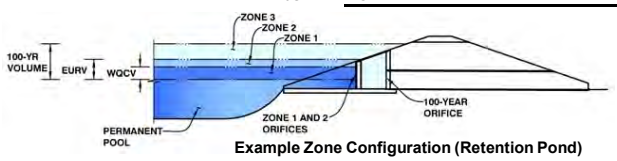

1.320
0.990
0.660
0.330
0.000
7.360
5.520
3.680
1.840
0.000
Area (acres)
Volume (ac-ft)
0.00
2.50
5.00
7.50
10.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND D



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.60	0.240	Orifice Plate
Zone 2 (EURV)	2.42	0.475	Orifice Plate
Zone 3 (User)	#VALUE!	6.636	Weir&Pipe (Restrict)
Total (all zones)		7.350	

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 Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	2.60	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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	1.50						
Orifice Area (sq. inches)	2.00	2.00						

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.60	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.60	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	11.53	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	13.05	N/A	ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	6.52	N/A	ft²
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.13	N/A	ft²
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.52	N/A	feet
Restrictor Plate Height Above Pipe Invert =	11.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.79	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.80	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.80	feet
Spillway Crest Length =	10.00	feet	Stage at Top of Freeboard =	5.60	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	1.06	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.67	acre-ft

Calculated Parameters for Spillway

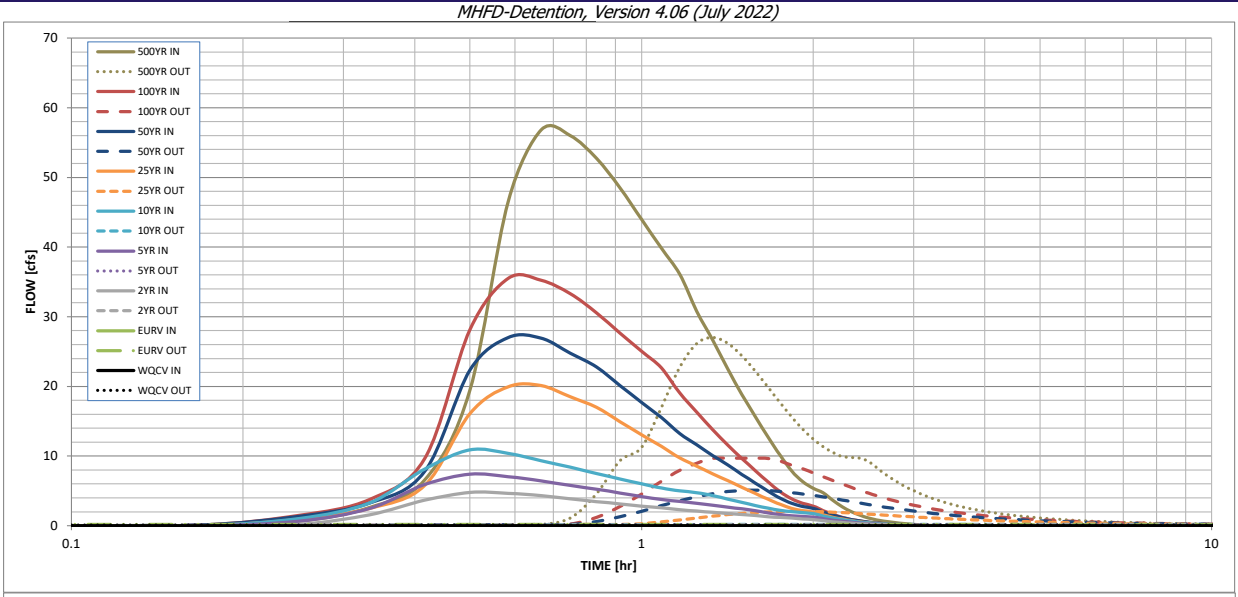
Routed Hydrograph Results

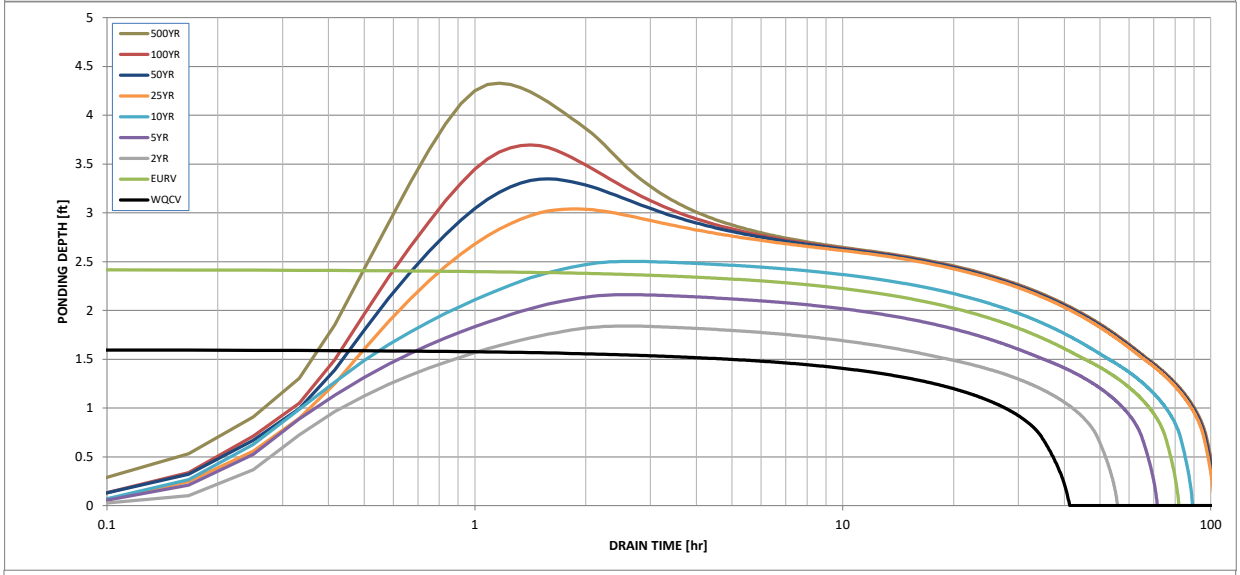
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

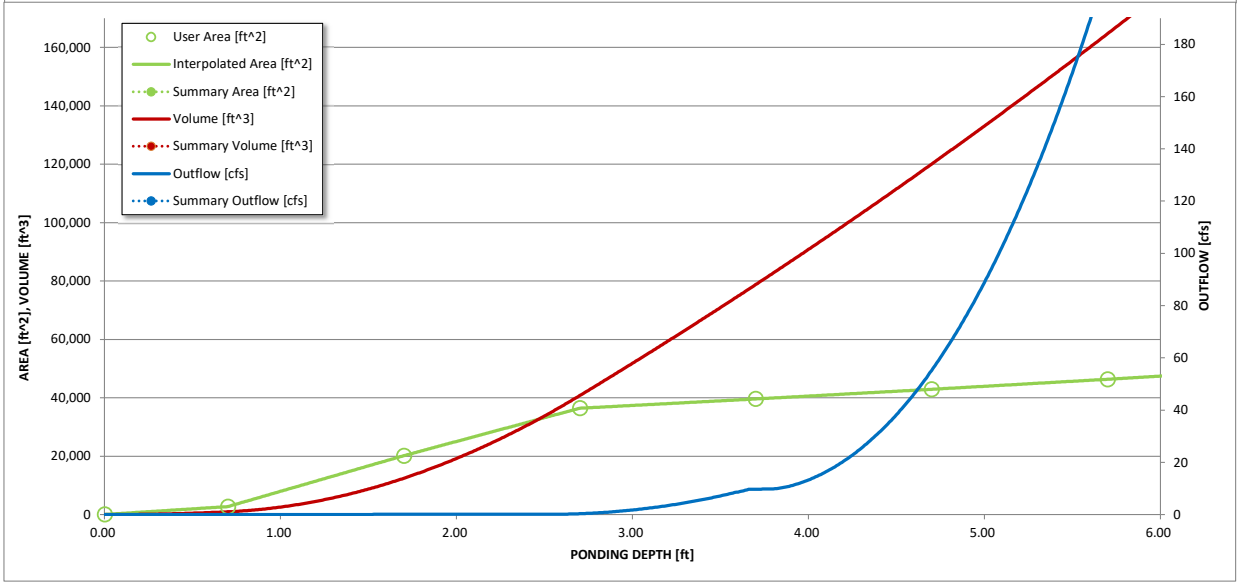
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.11	1.39	1.84	2.24	2.68	3.89
CUHP Runoff Volume (acre-ft) =	0.240	0.714	0.377	0.567	0.810	1.395	1.875	2.485	4.031
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.377	0.567	0.810	1.395	1.875	2.485	4.031
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	1.8	8.2	12.7	18.6	32.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.12	0.55	0.85	1.25	2.18
Peak Inflow Q (cfs) =	N/A	N/A	4.8	7.4	10.9	20.1	27.0	35.5	56.8
Peak Outflow Q (cfs) =	0.1	0.2	0.1	0.2	0.2	2.1	5.1	9.7	27.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.1	0.3	0.4	0.5	0.8
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.4	0.7	0.8
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) =	39	76	52	66	82	92	90	87	80
Time to Drain 99% of Inflow Volume (hours) =	**40**	79	54	69	86	98	98	97	94
Maximum Ponding Depth (ft) =	1.60	2.42	1.84	2.16	2.50	3.04	3.35	3.69	4.33
Area at Maximum Ponding Depth (acres) =	0.42	0.73	0.51	0.64	0.76	0.86	0.88	0.91	0.96
Maximum Volume Stored (acre-ft) =	0.241	0.716	0.349	0.538	0.776	1.216	1.486	1.800	2.387

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.08	0.63
	0:15:00	0.00	0.00	0.18	0.66	1.04	0.90	1.34	1.47	2.62
	0:20:00	0.00	0.00	1.58	2.48	3.28	2.49	3.25	3.78	6.57
	0:25:00	0.00	0.00	3.66	5.91	8.14	5.78	7.80	9.65	19.45
	0:30:00	0.00	0.00	4.78	7.39	10.90	16.10	22.33	28.13	46.55
	0:35:00	0.00	0.00	4.66	7.05	10.39	19.94	27.01	35.52	56.81
	0:40:00	0.00	0.00	4.31	6.43	9.34	20.10	26.93	35.25	56.00
	0:45:00	0.00	0.00	3.85	5.77	8.39	18.49	24.77	33.28	52.73
	0:50:00	0.00	0.00	3.47	5.26	7.49	17.01	22.78	30.57	48.52
	0:55:00	0.00	0.00	3.14	4.71	6.71	14.94	20.13	27.64	43.95
	1:00:00	0.00	0.00	2.82	4.18	6.00	13.06	17.69	25.03	39.83
	1:05:00	0.00	0.00	2.56	3.75	5.40	11.41	15.54	22.64	36.12
	1:10:00	0.00	0.00	2.29	3.47	5.01	9.74	13.25	19.06	30.79
	1:15:00	0.00	0.00	2.09	3.21	4.75	8.56	11.61	16.30	26.63
	1:20:00	0.00	0.00	1.92	2.93	4.33	7.44	10.07	13.78	22.49
	1:25:00	0.00	0.00	1.76	2.67	3.83	6.47	8.72	11.57	18.83
	1:30:00	0.00	0.00	1.61	2.42	3.35	5.51	7.37	9.65	15.65
	1:35:00	0.00	0.00	1.45	2.17	2.91	4.62	6.12	7.89	12.73
	1:40:00	0.00	0.00	1.30	1.86	2.51	3.80	4.98	6.28	10.10
	1:45:00	0.00	0.00	1.18	1.59	2.20	3.06	3.96	4.87	7.86
	1:50:00	0.00	0.00	1.11	1.44	2.01	2.50	3.21	3.85	6.32
	1:55:00	0.00	0.00	0.99	1.34	1.89	2.17	2.78	3.23	5.36
	2:00:00	0.00	0.00	0.88	1.25	1.73	1.98	2.50	2.83	4.71
	2:05:00	0.00	0.00	0.72	1.01	1.40	1.56	1.97	2.17	3.63
	2:10:00	0.00	0.00	0.57	0.80	1.11	1.21	1.51	1.62	2.72
	2:15:00	0.00	0.00	0.46	0.63	0.87	0.94	1.17	1.21	2.02
	2:20:00	0.00	0.00	0.36	0.50	0.68	0.73	0.90	0.90	1.50
	2:25:00	0.00	0.00	0.28	0.39	0.53	0.56	0.69	0.68	1.13
	2:30:00	0.00	0.00	0.22	0.30	0.40	0.43	0.52	0.51	0.85
	2:35:00	0.00	0.00	0.17	0.23	0.30	0.32	0.39	0.39	0.64
	2:40:00	0.00	0.00	0.13	0.17	0.23	0.24	0.30	0.30	0.49
	2:45:00	0.00	0.00	0.10	0.13	0.18	0.19	0.23	0.23	0.37
	2:50:00	0.00	0.00	0.07	0.09	0.13	0.14	0.17	0.17	0.27
	2:55:00	0.00	0.00	0.05	0.06	0.09	0.10	0.12	0.12	0.19
	3:00:00	0.00	0.00	0.03	0.04	0.06	0.06	0.07	0.08	0.12
	3:05:00	0.00	0.00	0.02	0.03	0.03	0.04	0.04	0.04	0.07
	3:10:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.03
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

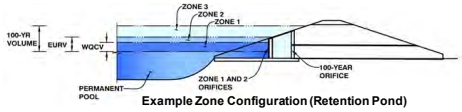
POND E - NO CLOGGING

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND E



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	17.70	acres
Watershed Length =	2,000	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.014	ft/ft
Watershed Imperviousness =	60.00%	percent
Percentage Hydrologic Soil Group A =	4.7%	percent
Percentage Hydrologic Soil Group B =	78.1%	percent
Percentage Hydrologic Soil Groups C/D =	17.2%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.348	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	1.136	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.81 in.) =	0.650	acre-feet	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	0.953	acre-feet	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	1.320	acre-feet	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	2.044	acre-feet	inches
50-yr Runoff Volume (P1 = 2.24 in.) =	2.645	acre-feet	inches
100-yr Runoff Volume (P1 = 2.68 in.) =	3.369	acre-feet	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	5.268	acre-feet	inches
Approximate 2-yr Detention Volume =	0.606	acre-feet	
Approximate 5-yr Detention Volume =	0.895	acre-feet	
Approximate 10-yr Detention Volume =	1.209	acre-feet	
Approximate 25-yr Detention Volume =	1.519	acre-feet	
Approximate 50-yr Detention Volume =	1.716	acre-feet	
Approximate 100-yr Detention Volume =	2.006	acre-feet	

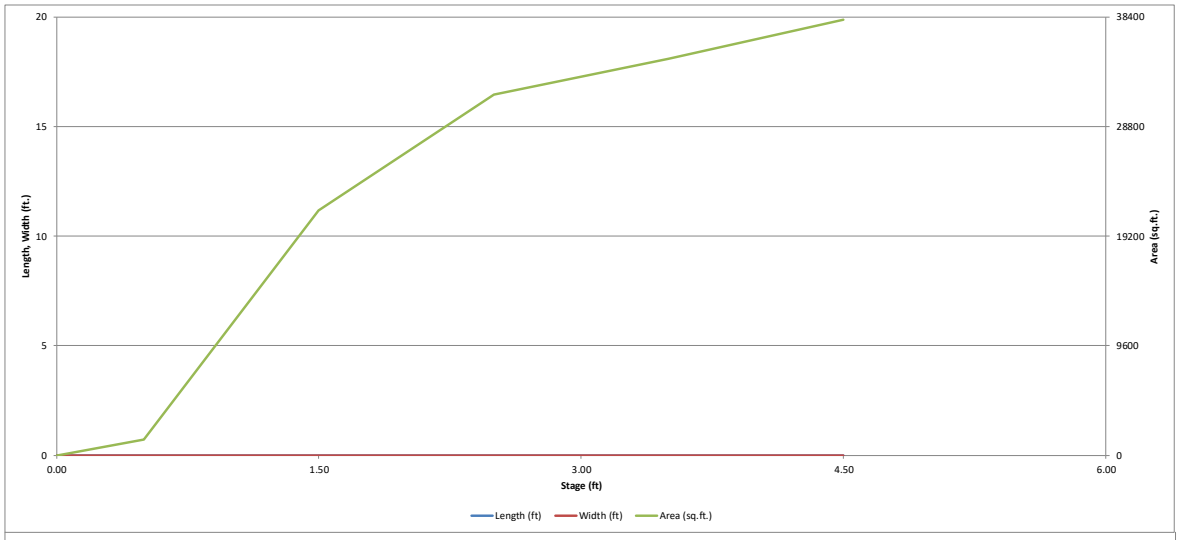
Define Zones and Basin Geometry

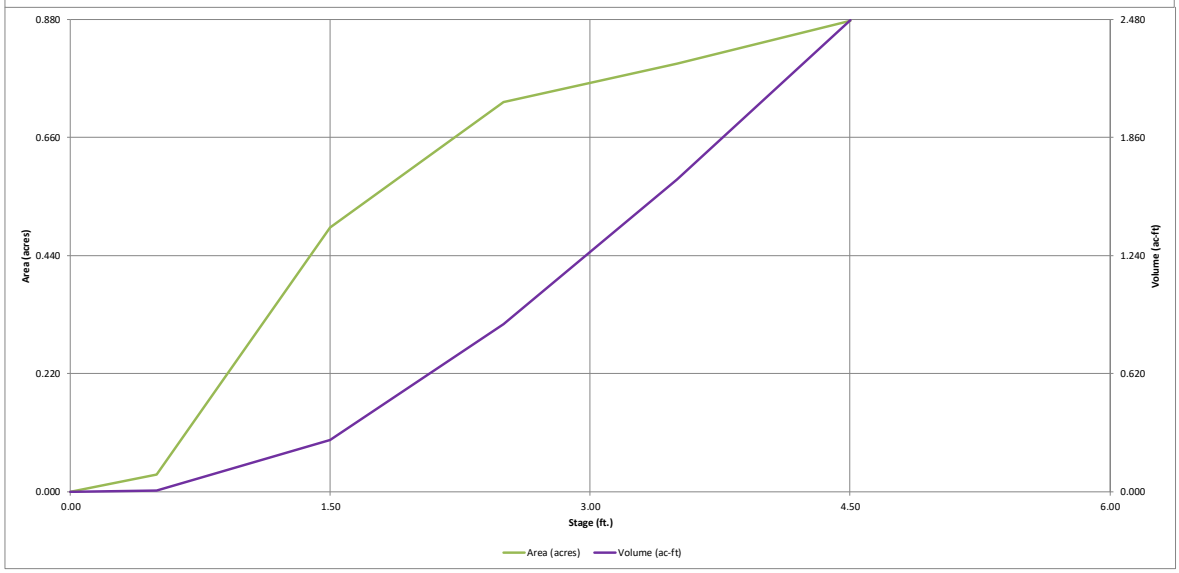
Zone 1 Volume (WQCV) =	0.348	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.787	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	1.342	acre-feet
Total Detention Basin Volume =	2.478	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	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

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
4951	--	0.50	--	--	--	1,384	0.032	346	0.008
4952	--	1.50	--	--	--	21,455	0.493	11,765	0.270
4953	--	2.50	--	--	--	31,612	0.726	38,298	0.879
4954	--	3.50	--	--	--	34,730	0.797	71,469	1.641
4955	--	4.50	--	--	--	38,218	0.877	107,943	2.478


20
15
10
5
0
38400
28800
19200
9600
0
Length, Width (ft.)
Area (sq.ft.)
0.00
1.50
3.00
4.50
6.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

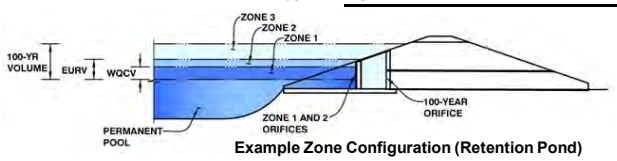

0.880
0.660
0.440
0.220
0.000
2.480
1.860
1.240
0.620
0.000
Area (acres)
Volume (ac-ft)
0.00
1.50
3.00
4.50
6.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND E



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.66	0.348	Orifice Plate
Zone 2 (EURV)	2.85	0.787	Orifice Plate
Zone 3 (User)	#VALUE!	1.342	Weir&Pipe (Restrict)
Total (all zones)		2.478	

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 Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	3.00	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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	0.80	1.80					
Orifice Area (sq. inches)	2.00	2.00	15.00					

	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.00	N/A	feet
Overflow Weir Front Edge Length =	8.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	15.72	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	26.09	N/A	ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	26.09	N/A	ft²
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.66	N/A	ft²
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.71	N/A	feet
Restrictor Plate Height Above Pipe Invert =	16.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.46	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.20	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.51	feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	5.71	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	0.88	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	2.48	acre-ft

Calculated Parameters for Spillway

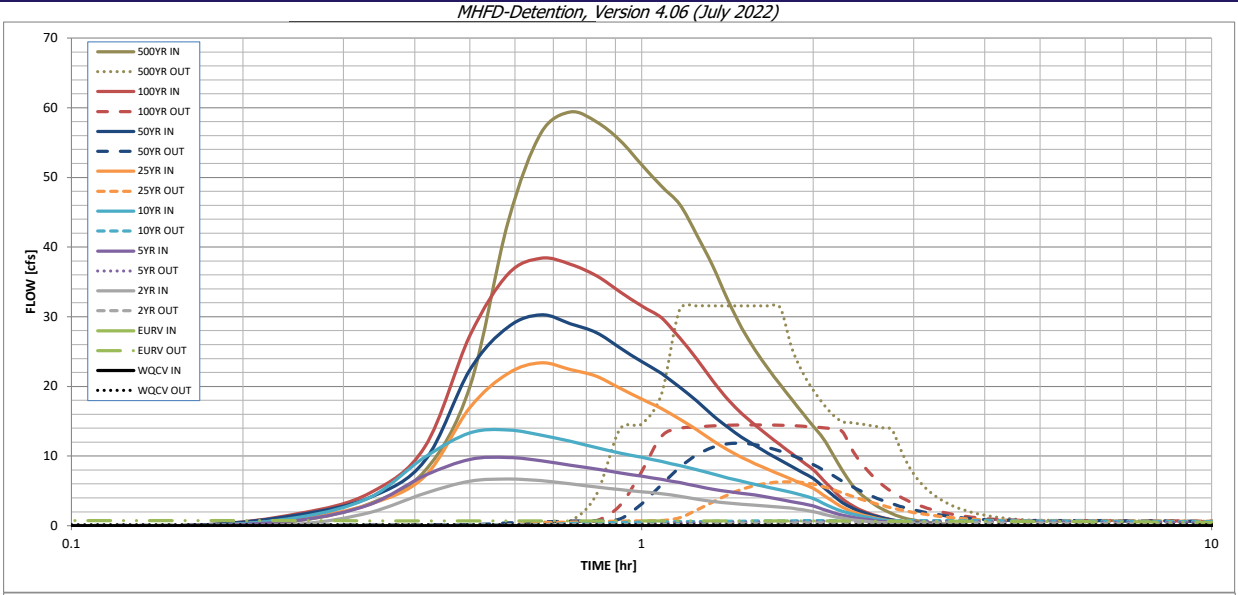
Routed Hydrograph Results

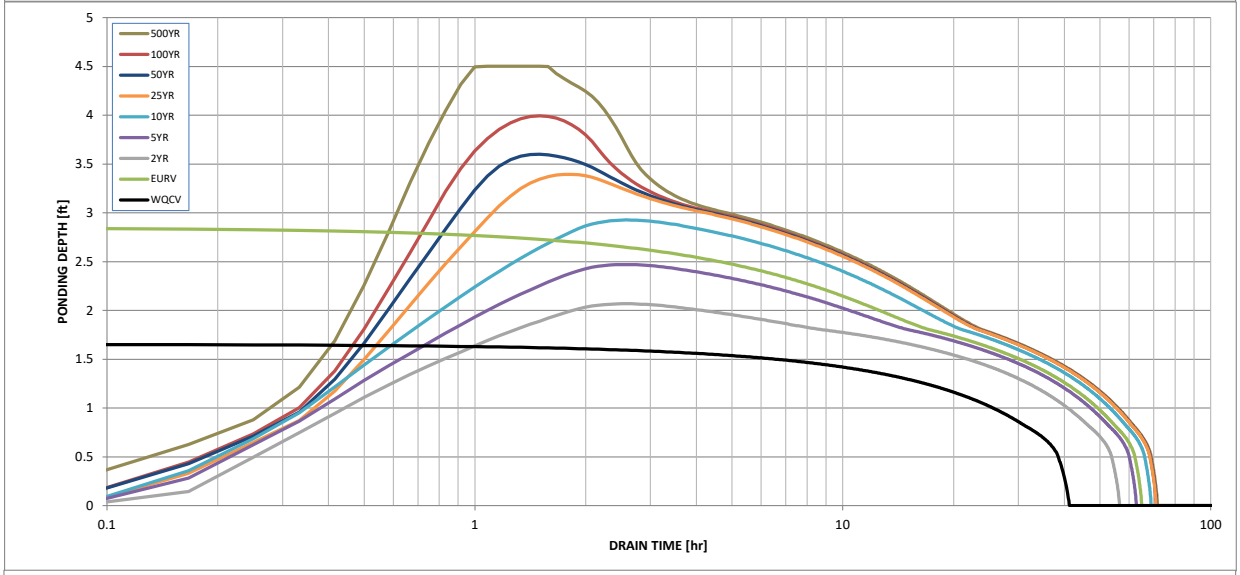
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

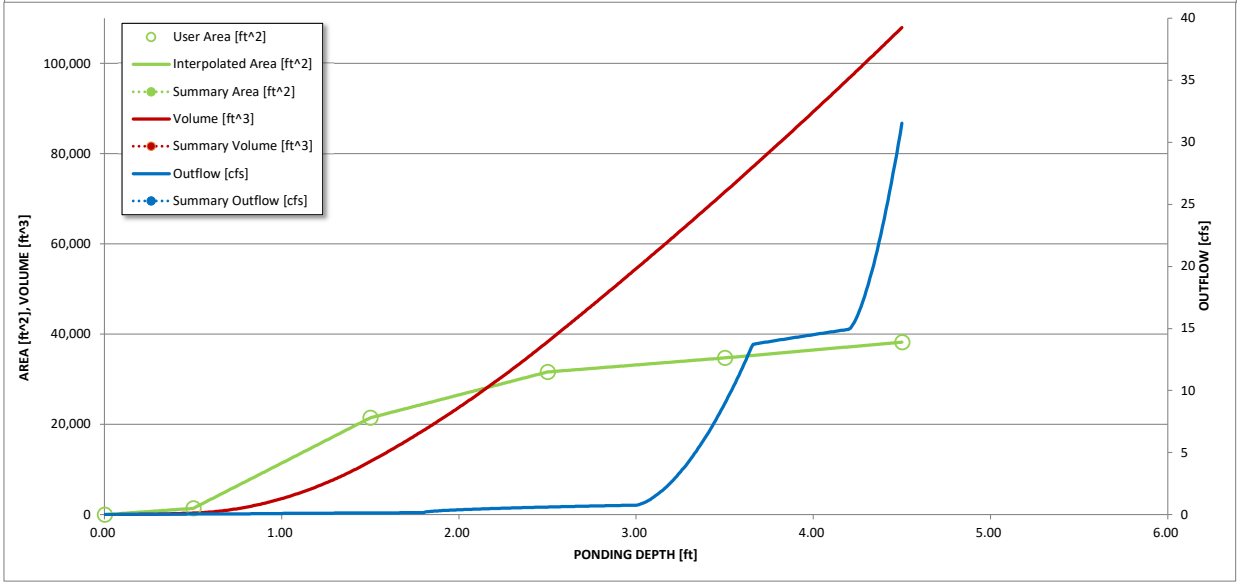
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.11	1.39	1.84	2.24	2.68	3.89
CUHP Runoff Volume (acre-ft) =	0.348	1.136	0.650	0.953	1.320	2.044	2.645	3.369	5.268
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.650	0.953	1.320	2.044	2.645	3.369	5.268
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	1.9	7.3	10.9	15.8	27.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.11	0.41	0.62	0.89	1.55
Peak Inflow Q (cfs) =	N/A	N/A	6.7	9.8	13.8	23.4	30.3	38.4	59.4
Peak Outflow Q (cfs) =	0.1	0.7	0.4	0.6	0.7	6.3	11.8	14.5	31.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.7	0.4	0.9	1.1	0.9	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	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	N/A	0.2	0.4	0.5	0.6
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	57	51	56	59	58	56	53	48
Time to Drain 99% of Inflow Volume (hours) =	**40**	61	54	60	65	66	64	63	60
Maximum Ponding Depth (ft) =	1.66	2.85	2.07	2.47	2.93	3.39	3.60	3.99	4.50
Area at Maximum Ponding Depth (acres) =	0.53	0.75	0.62	0.72	0.76	0.79	0.80	0.84	0.88
Maximum Volume Stored (acre-ft) =	0.352	1.138	0.582	0.850	1.190	1.553	1.713	2.041	2.478

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.09	0.73
	0:15:00	0.00	0.00	0.22	0.78	1.21	1.05	1.58	1.73	3.16
	0:20:00	0.00	0.00	1.91	3.05	4.05	3.08	4.06	4.69	7.86
	0:25:00	0.00	0.00	4.66	7.20	9.85	7.08	9.32	11.31	19.96
	0:30:00	0.00	0.00	6.39	9.52	13.32	16.96	22.39	27.30	43.67
	0:35:00	0.00	0.00	6.69	9.80	13.76	21.88	28.54	36.13	56.40
	0:40:00	0.00	0.00	6.47	9.32	13.01	23.37	30.27	38.38	59.38
	0:45:00	0.00	0.00	6.00	8.69	12.13	22.44	29.00	37.55	57.98
	0:50:00	0.00	0.00	5.55	8.14	11.22	21.45	27.71	35.88	55.33
	0:55:00	0.00	0.00	5.18	7.59	10.45	19.73	25.52	33.57	51.81
	1:00:00	0.00	0.00	4.88	7.11	9.81	18.17	23.56	31.54	48.73
	1:05:00	0.00	0.00	4.60	6.65	9.21	16.82	21.85	29.85	46.14
	1:10:00	0.00	0.00	4.21	6.19	8.61	15.29	19.87	26.94	41.77
	1:15:00	0.00	0.00	3.82	5.70	8.05	13.79	17.91	23.95	37.28
	1:20:00	0.00	0.00	3.49	5.24	7.44	12.22	15.86	20.80	32.42
	1:25:00	0.00	0.00	3.26	4.91	6.87	10.89	14.13	18.14	28.35
	1:30:00	0.00	0.00	3.09	4.65	6.38	9.80	12.70	16.10	25.17
	1:35:00	0.00	0.00	2.94	4.41	5.94	8.89	11.48	14.43	22.56
	1:40:00	0.00	0.00	2.80	4.09	5.53	8.08	10.40	12.96	20.25
	1:45:00	0.00	0.00	2.66	3.76	5.15	7.35	9.42	11.62	18.14
	1:50:00	0.00	0.00	2.52	3.45	4.78	6.67	8.51	10.36	16.16
	1:55:00	0.00	0.00	2.28	3.15	4.38	6.01	7.63	9.17	14.29
	2:00:00	0.00	0.00	2.02	2.83	3.90	5.37	6.78	8.05	12.53
	2:05:00	0.00	0.00	1.67	2.35	3.22	4.42	5.56	6.57	10.21
	2:10:00	0.00	0.00	1.35	1.89	2.58	3.48	4.37	5.12	7.94
	2:15:00	0.00	0.00	1.08	1.52	2.08	2.66	3.32	3.85	6.00
	2:20:00	0.00	0.00	0.89	1.25	1.72	2.08	2.60	2.97	4.66
	2:25:00	0.00	0.00	0.73	1.03	1.42	1.65	2.07	2.32	3.66
	2:30:00	0.00	0.00	0.61	0.86	1.18	1.33	1.66	1.82	2.87
	2:35:00	0.00	0.00	0.50	0.71	0.97	1.06	1.32	1.42	2.24
	2:40:00	0.00	0.00	0.41	0.58	0.79	0.85	1.05	1.09	1.73
	2:45:00	0.00	0.00	0.33	0.47	0.63	0.67	0.83	0.84	1.33
	2:50:00	0.00	0.00	0.27	0.37	0.51	0.53	0.65	0.64	1.02
	2:55:00	0.00	0.00	0.22	0.30	0.40	0.43	0.52	0.51	0.81
	3:00:00	0.00	0.00	0.18	0.24	0.32	0.34	0.41	0.41	0.65
	3:05:00	0.00	0.00	0.14	0.19	0.25	0.27	0.33	0.33	0.52
	3:10:00	0.00	0.00	0.11	0.14	0.20	0.21	0.25	0.26	0.40
	3:15:00	0.00	0.00	0.08	0.11	0.15	0.16	0.19	0.19	0.30
	3:20:00	0.00	0.00	0.06	0.08	0.11	0.11	0.14	0.14	0.22
	3:25:00	0.00	0.00	0.04	0.05	0.07	0.08	0.09	0.09	0.15
	3:30:00	0.00	0.00	0.02	0.03	0.04	0.05	0.06	0.06	0.09
	3:35:00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.04
	3:40:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

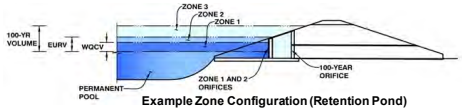
POND E - 50% CLOGGING

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND E



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	17.70	acres
Watershed Length =	2,000	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.014	ft/ft
Watershed Imperviousness =	60.00%	percent
Percentage Hydrologic Soil Group A =	4.7%	percent
Percentage Hydrologic Soil Group B =	78.1%	percent
Percentage Hydrologic Soil Groups C/D =	17.2%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.348	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	1.136	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.81 in.) =	0.650	acre-feet	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	0.953	acre-feet	inches
10-yr Runoff Volume (P1 = 1.39 in.) =	1.320	acre-feet	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	2.044	acre-feet	inches
50-yr Runoff Volume (P1 = 2.24 in.) =	2.645	acre-feet	inches
100-yr Runoff Volume (P1 = 2.68 in.) =	3.369	acre-feet	inches
500-yr Runoff Volume (P1 = 3.89 in.) =	5.268	acre-feet	inches
Approximate 2-yr Detention Volume =	0.606	acre-feet	
Approximate 5-yr Detention Volume =	0.895	acre-feet	
Approximate 10-yr Detention Volume =	1.209	acre-feet	
Approximate 25-yr Detention Volume =	1.519	acre-feet	
Approximate 50-yr Detention Volume =	1.716	acre-feet	
Approximate 100-yr Detention Volume =	2.006	acre-feet	

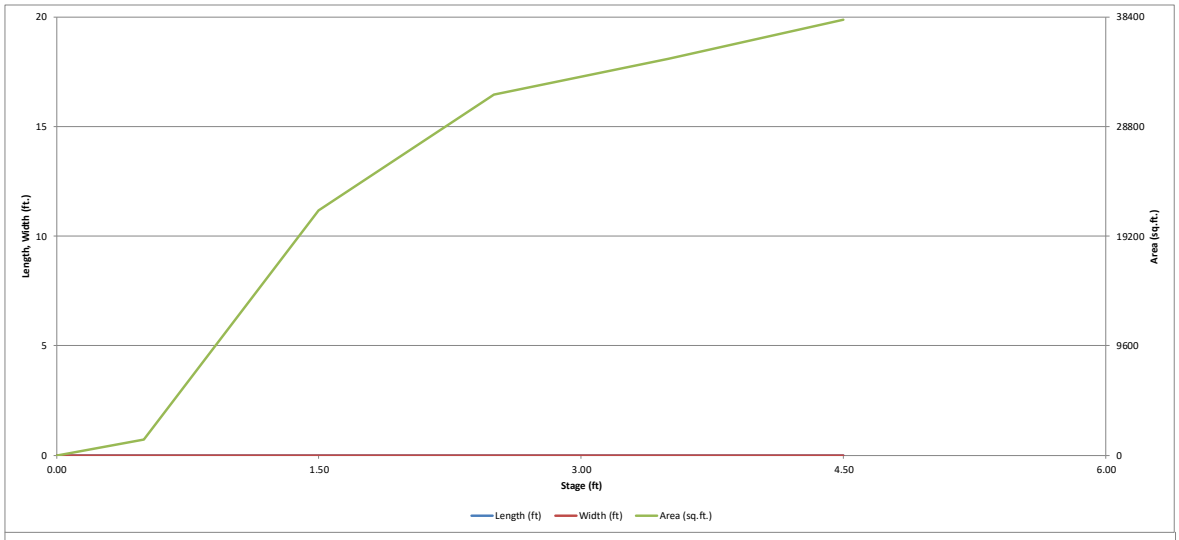
Define Zones and Basin Geometry

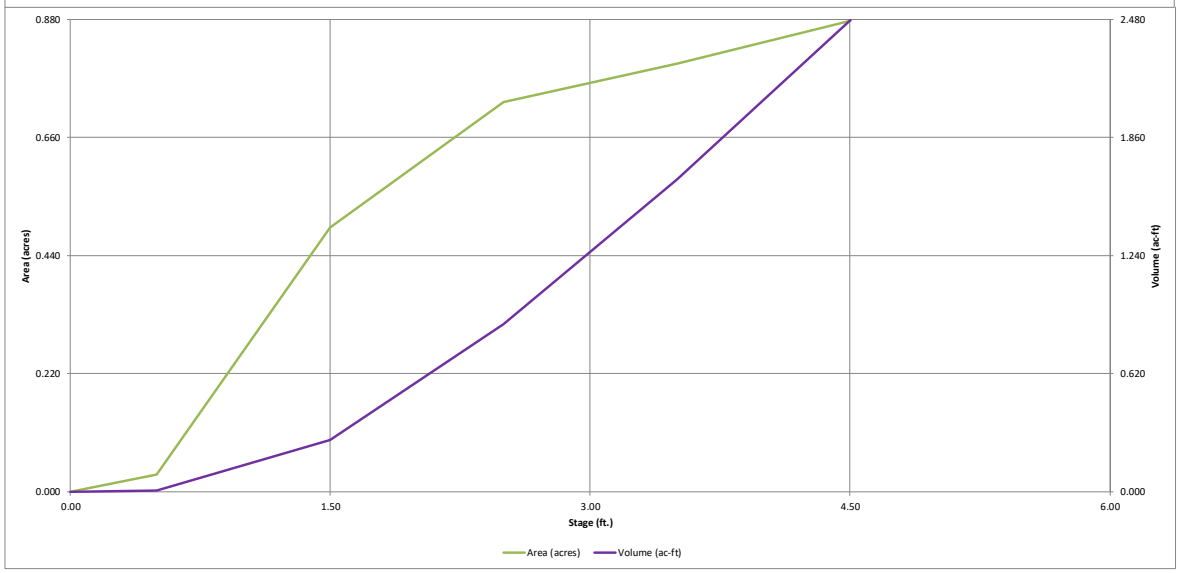
Zone 1 Volume (WQCV) =	0.348	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.787	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	1.342	acre-feet
Total Detention Basin Volume =	2.478	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	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

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
4951	--	0.50	--	--	--	1,384	0.032	346	0.008
4952	--	1.50	--	--	--	21,455	0.493	11,765	0.270
4953	--	2.50	--	--	--	31,612	0.726	38,298	0.879
4954	--	3.50	--	--	--	34,730	0.797	71,469	1.641
4955	--	4.50	--	--	--	38,218	0.877	107,943	2.478


20
15
10
5
0
38400
28800
19200
9600
0
Length, Width (ft.)
Area (sq.ft.)
0.00
1.50
3.00
4.50
6.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

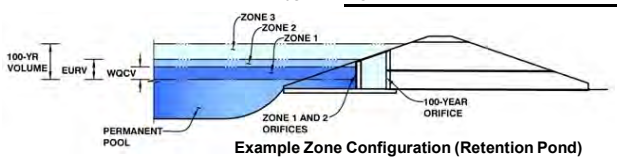

0.880
0.660
0.440
0.220
0.000
2.480
1.860
1.240
0.620
0.000
Area (acres)
Volume (ac-ft)
0.00
1.50
3.00
4.50
6.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: SPRING HILL

Basin ID: POND E



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.66	0.348	Orifice Plate
Zone 2 (EURV)	2.85	0.787	Orifice Plate
Zone 3 (User)	#VALUE!	1.342	Weir&Pipe (Restrict)
Total (all zones)		2.478	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	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)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	3.00	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	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	0.80	1.80					
Orifice Area (sq. inches)	2.00	2.00	15.00					

	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		Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A feet
Vertical Orifice Diameter =	N/A	N/A	inches			

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		Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.00	N/A feet
Overflow Weir Front Edge Length =	8.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	15.72	N/A
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	26.09	N/A ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	13.05	N/A ft²
Debris Clogging % =	50%	N/A	%			

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		Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.66	N/A ft²
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.71	N/A feet
Restrictor Plate Height Above Pipe Invert =	16.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.46	N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	4.20	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.51	feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	5.71	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	0.88	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	2.48	acre-ft

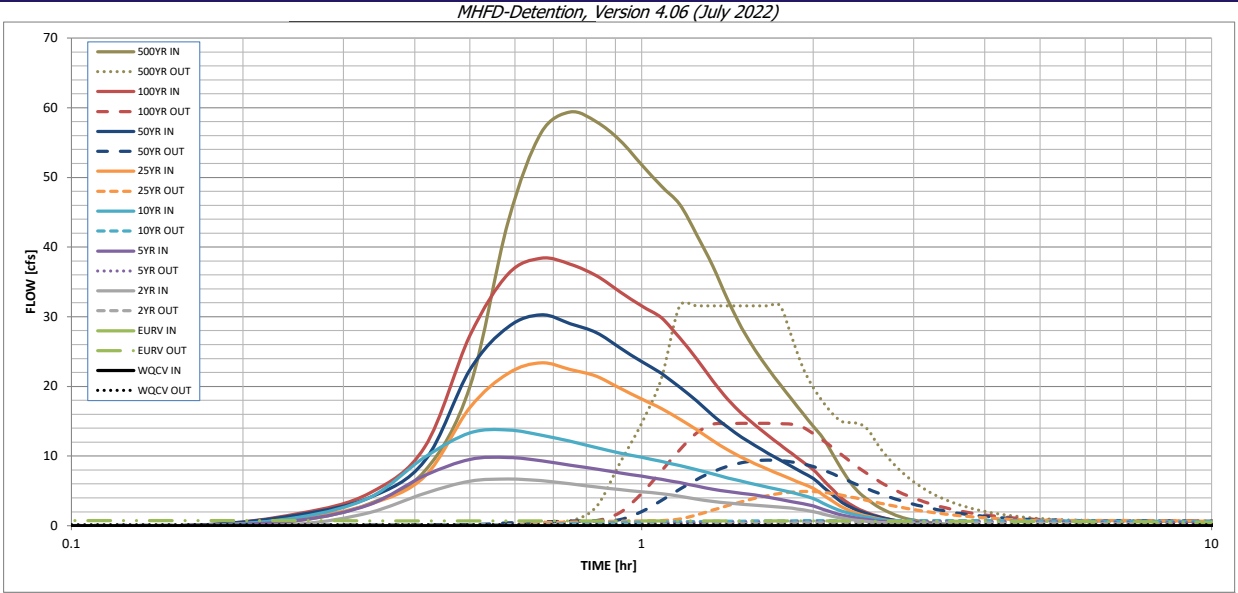
Routed Hydrograph Results

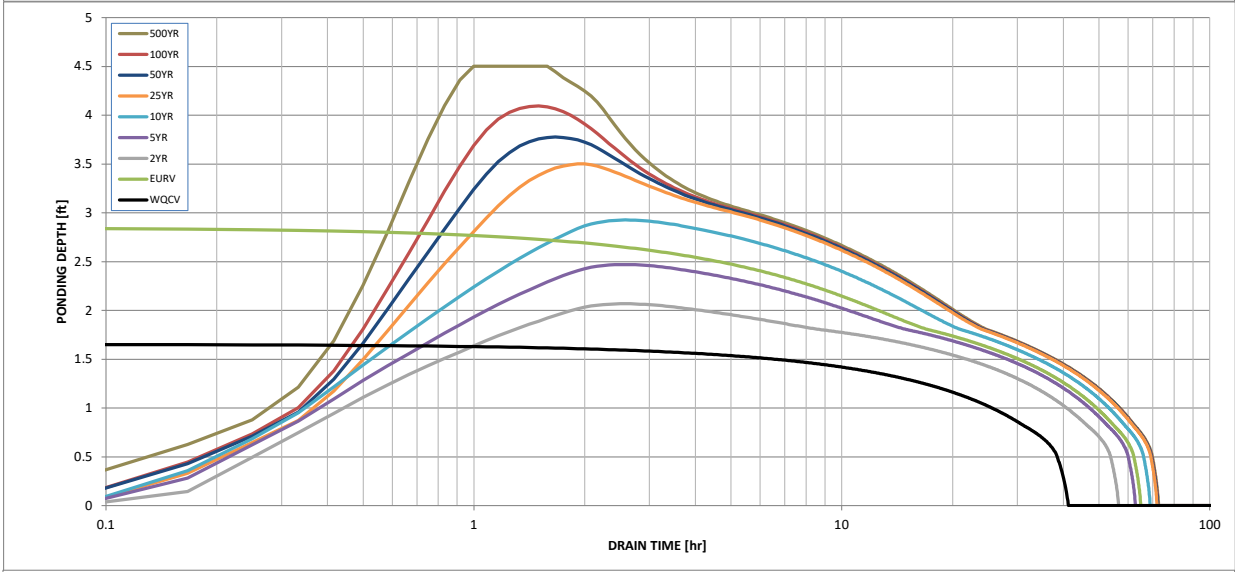
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

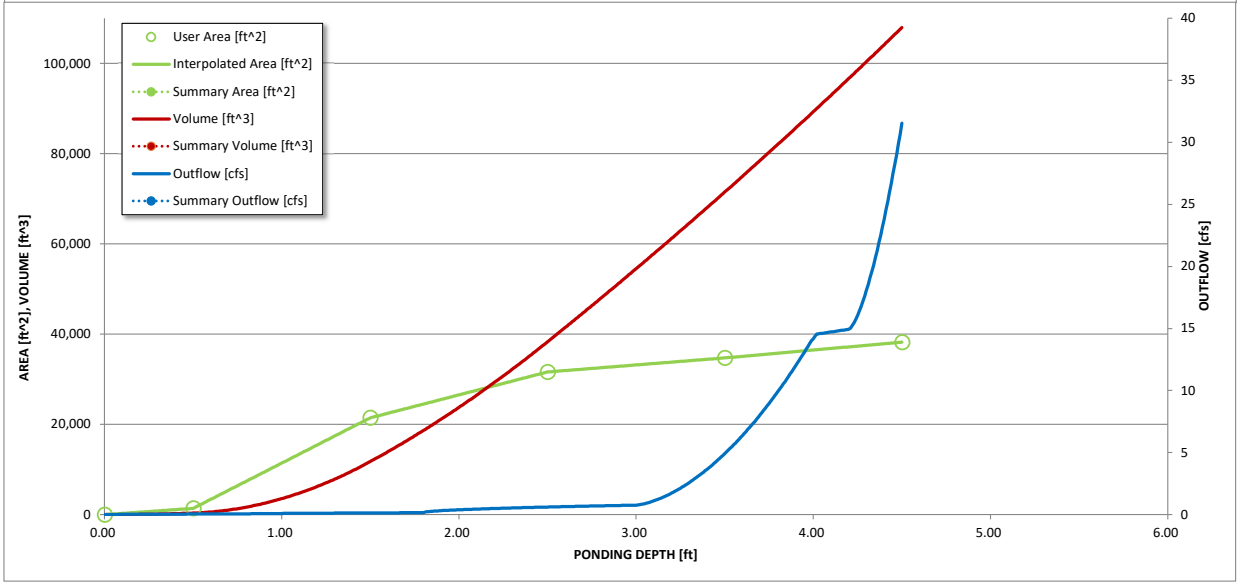
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.11	1.39	1.84	2.24	2.68	3.89
CUHP Runoff Volume (acre-ft) =	0.348	1.136	0.650	0.953	1.320	2.044	2.645	3.369	5.268
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.650	0.953	1.320	2.044	2.645	3.369	5.268
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	1.9	7.3	10.9	15.8	27.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.11	0.41	0.62	0.89	1.55
Peak Inflow Q (cfs) =	N/A	N/A	6.7	9.8	13.8	23.4	30.3	38.4	59.4
Peak Outflow Q (cfs) =	0.1	0.7	0.4	0.6	0.7	4.9	9.4	14.7	31.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.7	0.4	0.7	0.9	0.9	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	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	N/A	0.2	0.3	0.5	0.6
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	57	51	56	59	59	57	54	49
Time to Drain 99% of Inflow Volume (hours) =	**40**	61	54	60	65	66	65	64	61
Maximum Ponding Depth (ft) =	1.66	2.85	2.07	2.47	2.93	3.50	3.77	4.09	4.50
Area at Maximum Ponding Depth (acres) =	0.53	0.75	0.62	0.72	0.76	0.80	0.82	0.84	0.88
Maximum Volume Stored (acre-ft) =	0.352	1.138	0.582	0.850	1.190	1.633	1.859	2.125	2.478

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.09	0.73
	0:15:00	0.00	0.00	0.22	0.78	1.21	1.05	1.58	1.73	3.16
	0:20:00	0.00	0.00	1.91	3.05	4.05	3.08	4.06	4.69	7.86
	0:25:00	0.00	0.00	4.66	7.20	9.85	7.08	9.32	11.31	19.96
	0:30:00	0.00	0.00	6.39	9.52	13.32	16.96	22.39	27.30	43.67
	0:35:00	0.00	0.00	6.69	9.80	13.76	21.88	28.54	36.13	56.40
	0:40:00	0.00	0.00	6.47	9.32	13.01	23.37	30.27	38.38	59.38
	0:45:00	0.00	0.00	6.00	8.69	12.13	22.44	29.00	37.55	57.98
	0:50:00	0.00	0.00	5.55	8.14	11.22	21.45	27.71	35.88	55.33
	0:55:00	0.00	0.00	5.18	7.59	10.45	19.73	25.52	33.57	51.81
	1:00:00	0.00	0.00	4.88	7.11	9.81	18.17	23.56	31.54	48.73
	1:05:00	0.00	0.00	4.60	6.65	9.21	16.82	21.85	29.85	46.14
	1:10:00	0.00	0.00	4.21	6.19	8.61	15.29	19.87	26.94	41.77
	1:15:00	0.00	0.00	3.82	5.70	8.05	13.79	17.91	23.95	37.28
	1:20:00	0.00	0.00	3.49	5.24	7.44	12.22	15.86	20.80	32.42
	1:25:00	0.00	0.00	3.26	4.91	6.87	10.89	14.13	18.14	28.35
	1:30:00	0.00	0.00	3.09	4.65	6.38	9.80	12.70	16.10	25.17
	1:35:00	0.00	0.00	2.94	4.41	5.94	8.89	11.48	14.43	22.56
	1:40:00	0.00	0.00	2.80	4.09	5.53	8.08	10.40	12.96	20.25
	1:45:00	0.00	0.00	2.66	3.76	5.15	7.35	9.42	11.62	18.14
	1:50:00	0.00	0.00	2.52	3.45	4.78	6.67	8.51	10.36	16.16
	1:55:00	0.00	0.00	2.28	3.15	4.38	6.01	7.63	9.17	14.29
	2:00:00	0.00	0.00	2.02	2.83	3.90	5.37	6.78	8.05	12.53
	2:05:00	0.00	0.00	1.67	2.35	3.22	4.42	5.56	6.57	10.21
	2:10:00	0.00	0.00	1.35	1.89	2.58	3.48	4.37	5.12	7.94
	2:15:00	0.00	0.00	1.08	1.52	2.08	2.66	3.32	3.85	6.00
	2:20:00	0.00	0.00	0.89	1.25	1.72	2.08	2.60	2.97	4.66
	2:25:00	0.00	0.00	0.73	1.03	1.42	1.65	2.07	2.32	3.66
	2:30:00	0.00	0.00	0.61	0.86	1.18	1.33	1.66	1.82	2.87
	2:35:00	0.00	0.00	0.50	0.71	0.97	1.06	1.32	1.42	2.24
	2:40:00	0.00	0.00	0.41	0.58	0.79	0.85	1.05	1.09	1.73
	2:45:00	0.00	0.00	0.33	0.47	0.63	0.67	0.83	0.84	1.33
	2:50:00	0.00	0.00	0.27	0.37	0.51	0.53	0.65	0.64	1.02
	2:55:00	0.00	0.00	0.22	0.30	0.40	0.43	0.52	0.51	0.81
	3:00:00	0.00	0.00	0.18	0.24	0.32	0.34	0.41	0.41	0.65
	3:05:00	0.00	0.00	0.14	0.19	0.25	0.27	0.33	0.33	0.52
	3:10:00	0.00	0.00	0.11	0.14	0.20	0.21	0.25	0.26	0.40
	3:15:00	0.00	0.00	0.08	0.11	0.15	0.16	0.19	0.19	0.30
	3:20:00	0.00	0.00	0.06	0.08	0.11	0.11	0.14	0.14	0.22
	3:25:00	0.00	0.00	0.04	0.05	0.07	0.08	0.09	0.09	0.15
	3:30:00	0.00	0.00	0.02	0.03	0.04	0.05	0.06	0.06	0.09
	3:35:00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.04
	3:40:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

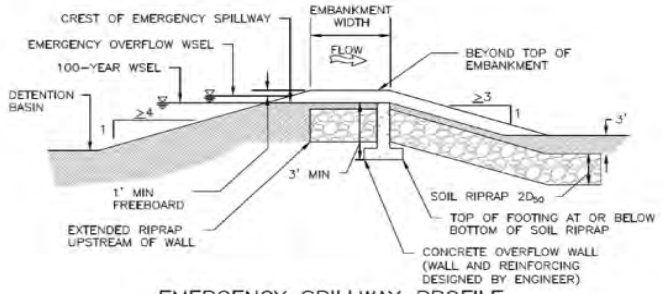
Appendix B – Hydraulic Computations

Spillway Riprap Sizing

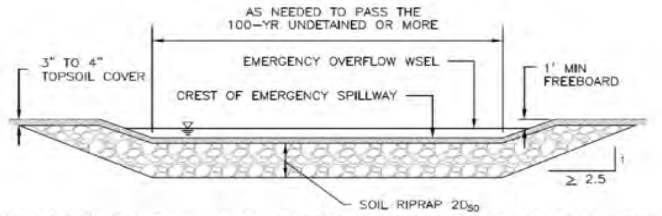
Emergency Spillway Sizing

Project Name: SPRING HILL
Calculated By: GR
Checked By: MS
Date: 6/2/2025

	POND A								
	Q	C	H	Z	Qsides	Middle W	Side W	Top W	Unit discharge Q/L
Min Width	78.9	3	1	10	24.0	18.3	20	58.3	4.31
Actual Width	78.9	3	1.04956	10	27.1	20.0	20.4956	61.0	3.945
USE TYPE	**M**	**RIPRAP**							



EMERGENCY SPILLWAY PROFILE



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

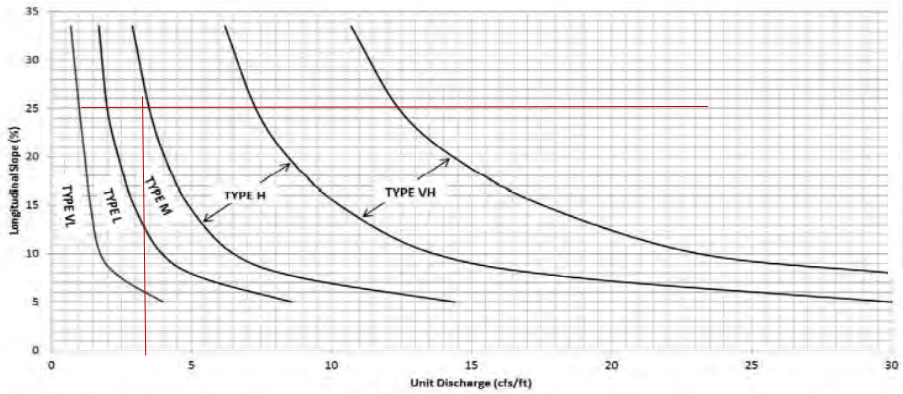


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

Table 17.1 Standard CDOT gradations for rock riprap.

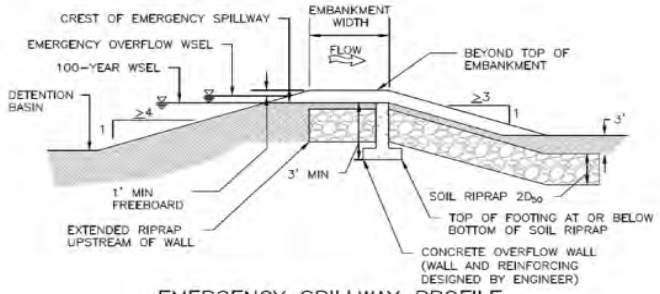
Pay Item	Stone Size d50[1] (Inches)	Percent of Material Smaller Than Typical Stone[2]	Typical Stone Dimensions[3] (Inches)	Typical Stone Weight[4] (Pounds)
Riprap	6	70-100 50-70 35-50 2-10	12 9 6 2	85 35 10 0.4
Riprap	9	70-100 50-70 35-50 2-10	15 12 9 3	160 85 35 1.3
Riprap	12	70-100 50-70 35-50 2-10	21 18 12 4	440 275 85 3
Riprap	18	100 50-70 35-50 2-10	30 24 18 6	1280 650 275 10
Riprap	24	100 50-70 35-50 2-10	42 33 24 9	3500 1700 650 35

[1]d50 = nominal stone size
[2]based on typical rock mass
[3]equivalent spherical diameter
[4]based on a specific gravity = 2.5

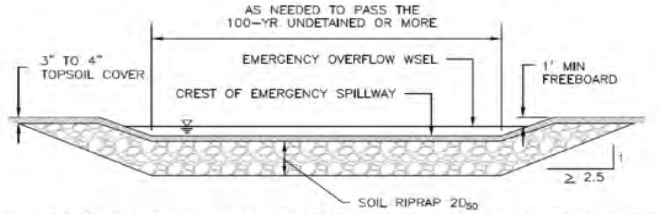
Emergency Spillway Sizing

Project Name: SPRING HILL
Calculated By: GR
Checked By: MS
Date: 6/2/2025

	POND B								
	Q	C	H	Z	Qsides	Middle W	Side W	Top W	Unit discharge Q/L
Min Width	41.3	3	1	10	24.0	5.8	20	45.8	7.16
Actual Width	41.3	3	1.04956	10	27.1	20.0	20.4956	61.0	2.065
USE TYPE	**L**	**RIPRAP**							



EMERGENCY SPILLWAY PROFILE



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

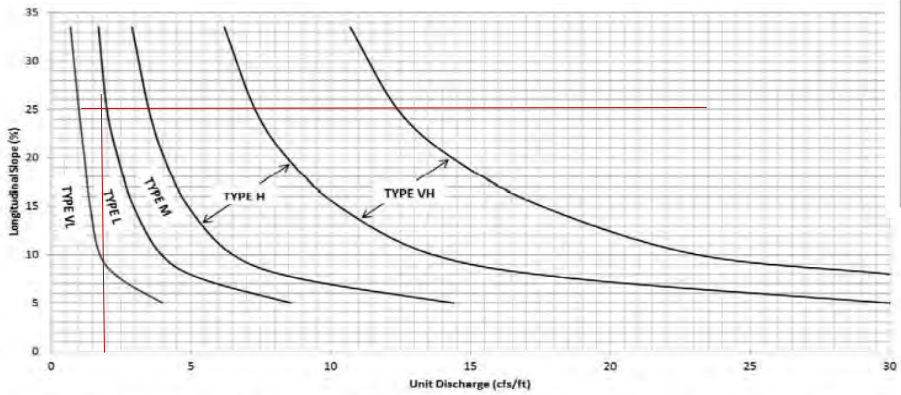


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

Table 17.1 Standard CDOT gradations for rock riprap.

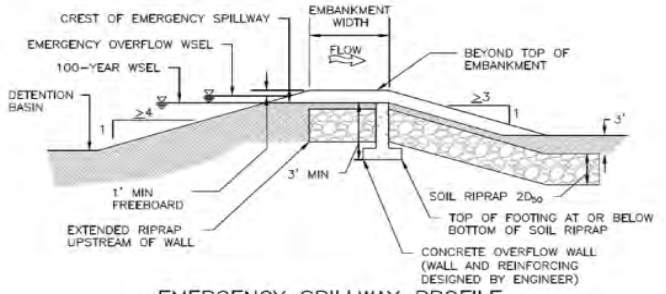
Pay Item	Stone Size d50[1] (Inches)	Percent of Material Smaller Than Typical Stone[2]	Typical Stone Dimensions[3] (Inches)	Typical Stone Weight[4] (Pounds)
Riprap	6	70-100 50-70 35-50 2-10	12 9 6 2	85 35 10 0.4
Riprap	9	70-100 50-70 35-50 2-10	15 12 9 3	160 85 35 1.3
Riprap	12	70-100 50-70 35-50 2-10	21 18 12 4	440 275 85 3
Riprap	18	100 50-70 35-50 2-10	30 24 18 6	1280 650 275 10
Riprap	24	100 50-70 35-50 2-10	42 33 24 9	3500 1700 650 35

[1]d50 = nominal stone size
[2]based on typical rock mass
[3]equivalent spherical diameter
[4]based on a specific gravity = 2.5

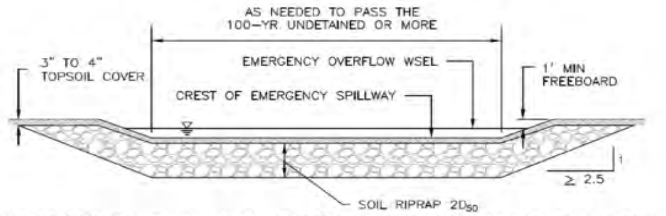
Emergency Spillway Sizing

Project Name: SPRING HILL
Calculated By: GR
Checked By: MS
Date: 6/2/2025

POND C	Q	C	H	Z	Qsides	Middle W	Side W	Top W	Unit discharge Q/L
Min Width	14.3	3	1	10	24.0	-3.2	20	36.8	-4.42
Actual Width	14.3	3	1.04956	10	27.1	10.0	20.4956	61.0	1.43
USE TYPE	**L**	**RIPRAP**							



EMERGENCY SPILLWAY PROFILE



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

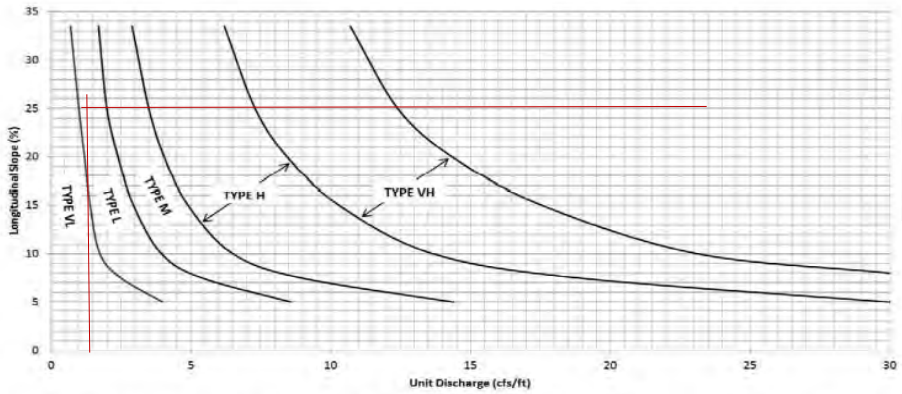


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

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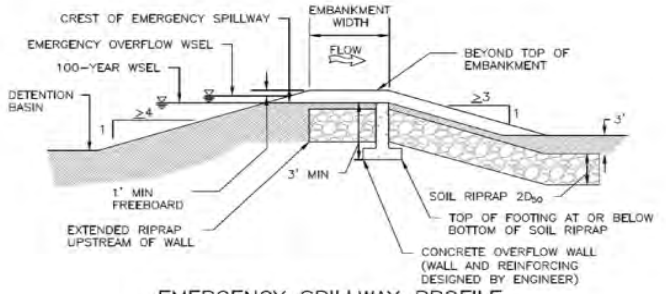
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Riprap	9	70-100 50-70 35-50 2-10	15 12 9 3	160 85 35 1.3
Riprap	12	70-100 50-70 35-50 2-10	21 18 12 4	440 275 85 3
Riprap	18	100 50-70 35-50 2-10	30 24 18 6	1280 650 275 10
Riprap	24	100 50-70 35-50 2-10	42 33 24 9	3500 1700 650 35

[1]d50 = nominal stone size
[2]based on typical rock mass
[3]equivalent spherical diameter
[4]based on a specific gravity = 2.5

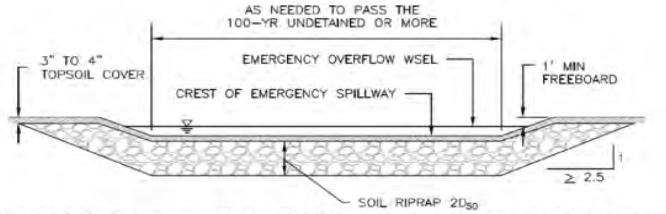
Emergency Spillway Sizing

Project Name: SPRING HILL
Calculated By: GR
Checked By: MS
Date: 6/2/2025

	POND D								
	Q	C	H	Z	Qsides	Middle W	Side W	Top W	Unit discharge Q/L
Min Width	9.7	3	1	10	24.0	-4.8	20	35.2	-2.03
Actual Width	9.7	3	1.04956	10	27.1	10.0	20.4956	61.0	0.97
USE TYPE	**VL**	**RIPRAP**							



EMERGENCY SPILLWAY PROFILE



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

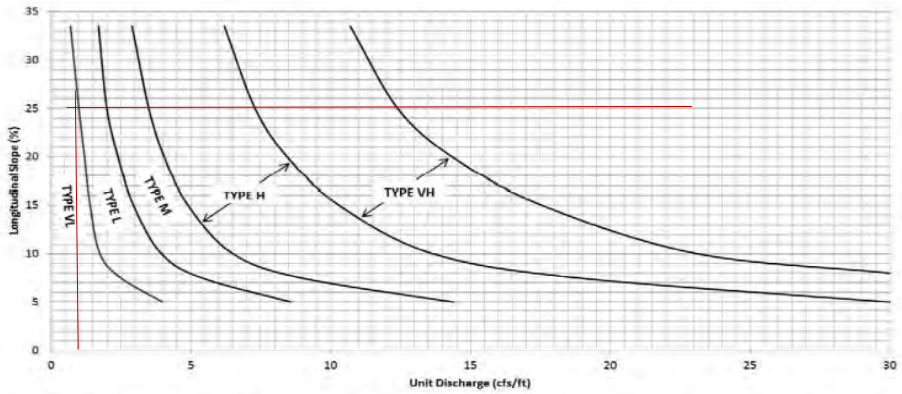


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

Table 17.1 Standard CDOT gradations for rock riprap.

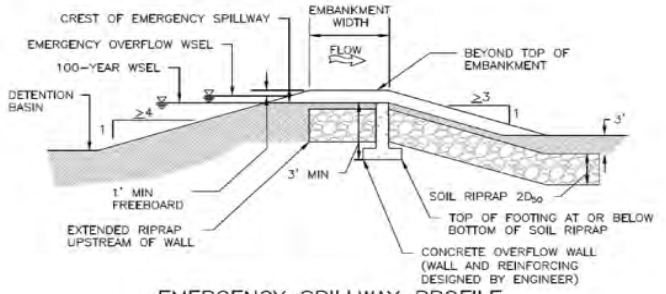
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Riprap	9	70-100 50-70 35-50 2-10	15 12 9 3	160 85 35 1.3
Riprap	12	70-100 50-70 35-50 2-10	21 18 12 4	440 275 85 3
Riprap	18	100 50-70 35-50 2-10	30 24 18 6	1280 650 275 10
Riprap	24	100 50-70 35-50 2-10	42 33 24 9	3500 1700 650 35

[1]d50 = nominal stone size
[2]based on typical rock mass
[3]equivalent spherical diameter
[4]based on a specific gravity = 2.5

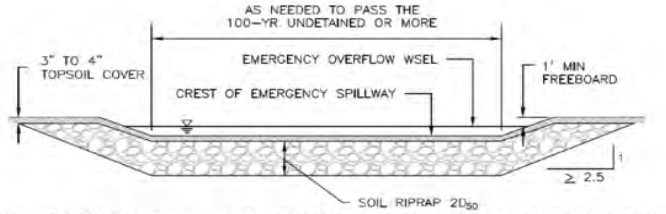
Emergency Spillway Sizing

Project Name: SPRING HILL
Calculated By: GR
Checked By: MS
Date: 6/2/2025

	POND E								
	Q	C	H	Z	Qsides	Middle W	Side W	Top W	Unit discharge Q/L
Min Width	14.7	3	1	10	24.0	-3.1	20	36.9	-4.74
Actual Width	14.7	3	1.04956	10	27.1	10.0	20.4956	61.0	1.47
USE TYPE		**L**	**RIPRAP**						



EMERGENCY SPILLWAY PROFILE



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

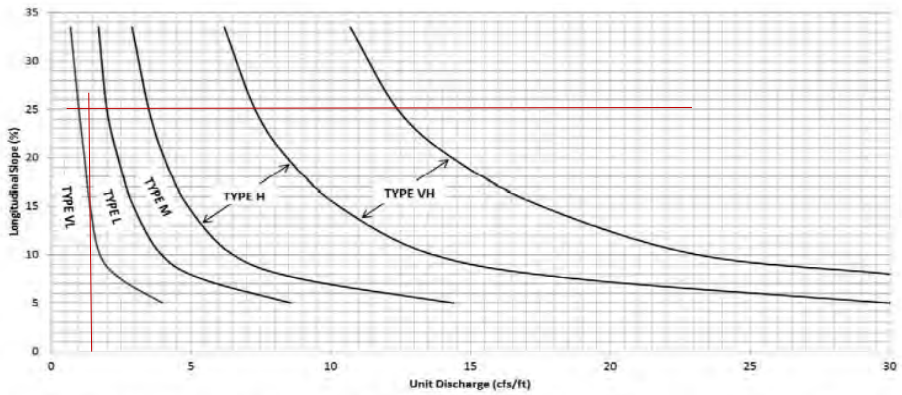


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

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Riprap	9	70-100 50-70 35-50 2-10	15 12 9 3	160 85 35 1.3
Riprap	12	70-100 50-70 35-50 2-10	21 18 12 4	440 275 85 3
Riprap	18	100 50-70 35-50 2-10	30 24 18 6	1280 650 275 10
Riprap	24	100 50-70 35-50 2-10	42 33 24 9	3500 1700 650 35

[1]d50 = nominal stone size
[2]based on typical rock mass
[3]equivalent spherical diameter
[4]based on a specific gravity = 2.5

Westwood

Appendix B – Hydraulic Computations

Inlet and Street Capacity Calculations

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	29-A	29a-A
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.25	0.77
Major Q_{Known} (cfs)	12.88	4.33

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**2.25**	**0.77**
Major Total Design Peak Flow, Q (cfs)	**12.88**	**4.33**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	1.81	0.02

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	28-A	27-A
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.44	1.19
Major Q_{Known} (cfs)	2.69	5.96

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**0.44**	**1.19**
Major Total Design Peak Flow, Q (cfs)	**2.69**	**5.96**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	0.37	0.30

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	20-A	20a-A
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	4.38	1.68
Major Q_{Known} (cfs)	24.49	14.86

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**4.38**	**1.68**
Major Total Design Peak Flow, Q (cfs)	**24.49**	**14.86**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.01	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	5.71	2.78

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	19-A	16-A
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.98	1.45
Major Q_{Known} (cfs)	5.32	8.70

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**0.98**	**1.45**
Major Total Design Peak Flow, Q (cfs)	**5.32**	**8.70**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	0.06	0.19

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	15-A	14-A
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.20	0.90
Major Q_{Known} (cfs)	9.26	3.83

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.20**	**0.90**
Major Total Design Peak Flow, Q (cfs)	**9.26**	**3.83**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	1.77	0.00

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	9-A	7a-A
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.02	2.58
Major Q_{Known} (cfs)	4.47	12.50

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.02**	**2.58**
Major Total Design Peak Flow, Q (cfs)	**4.47**	**12.50**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	0.00	1.65

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	7-A	6-A
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.93	1.02
Major Q_{Known} (cfs)	11.04	10.03

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.93**	**1.02**
Major Total Design Peak Flow, Q (cfs)	**11.04**	**10.03**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	2.88	2.29

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	4-A	3a-A
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.40	1.30
Major Q_{Known} (cfs)	5.68	7.93

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.40**	**1.30**
Major Total Design Peak Flow, Q (cfs)	**5.68**	**7.93**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	0.08	1.15

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	3-A	2-A
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.62	0.78
Major Q_{Known} (cfs)	8.96	3.51

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.62**	**0.78**
Major Total Design Peak Flow, Q (cfs)	**8.96**	**3.51**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	0.50	0.00

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	1a-A
Site Type (Urban or Rural)	
Inlet Application (Street or Area)	STREET
Hydraulic Condition	On Grade
Inlet Type	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.01
Major Q_{Known} (cfs)	6.41

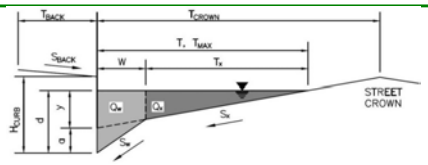
CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.01**
Major Total Design Peak Flow, Q (cfs)	**6.41**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	2.81

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 29-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

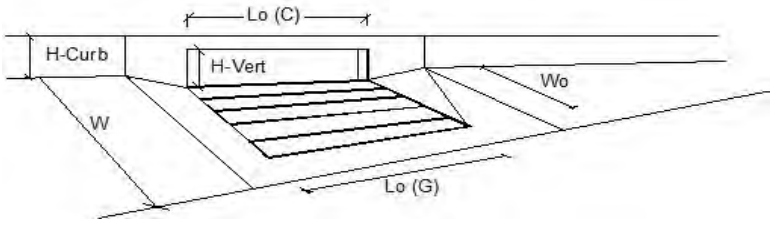
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.25 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 12.88 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

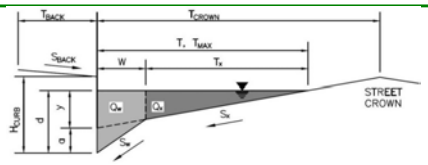


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit 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	
Warning 2 Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.04	0.04	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	2.3	12.9	cfs
Water Spread Width		T =	9.1	17.0	ft
Water Depth at Flowline (outside of local depression)		d =	3.7	5.9	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.3	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.625	0.325	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.8	7.8	cfs
Discharge within the Gutter Section W		Q_w =	1.4	3.8	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	1.3	cfs
Flow Area within the Gutter Section W		A_W =	0.45	0.82	sq ft
Velocity within the Gutter Section W		V_W =	3.1	4.6	fps
Water Depth for Design Condition		d_{LOCAL} =	8.7	10.9	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.190	0.108	ft/ft
Required Length L_T to Have 100% Interception		L_T =	6.00	17.92	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	6.00	15.00	ft
Interception Capacity		Q_i =	2.3	11.1	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.02	0.02	
Effective (Unclogged) Length		L_e =	6.00	14.71	ft
Actual Interception Capacity		**Q_a =**	**2.3**	**11.1**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.5**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**2.3**	**11.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**1.8**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**86**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 29a-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

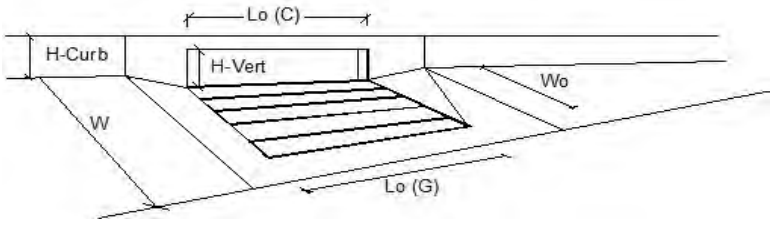
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.77 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.33 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

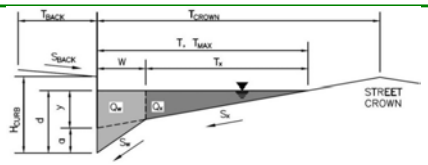


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	0.8	4.3	cfs
Water Spread Width		T =	5.0	12.1	ft
Water Depth at Flowline (outside of local depression)		d =	2.7	4.4	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.891	0.486	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.1	2.2	cfs
Discharge within the Gutter Section W		Q_w =	0.7	2.1	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.29	0.57	sq ft
Velocity within the Gutter Section W		V_W =	2.4	3.7	fps
Water Depth for Design Condition		d_{LOCAL} =	7.7	9.4	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.262	0.152	ft/ft
Required Length L_T to Have 100% Interception		L_T =	2.99	9.25	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	2.99	9.25	ft
Interception Capacity		Q_i =	0.8	4.3	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	2.99	9.25	ft
Actual Interception Capacity		**Q_a =**	**0.8**	**4.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.0**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.8**	**4.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**99**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 28-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

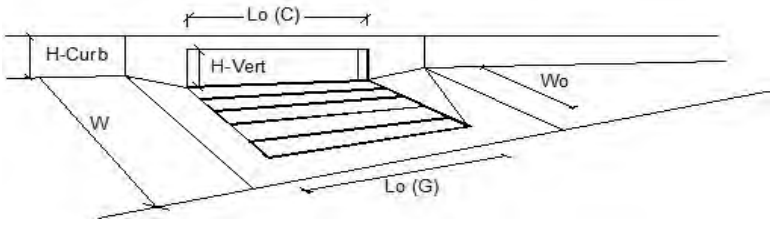
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.44 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 2.69 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

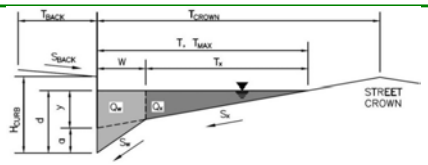


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	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'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	0.4	2.7	cfs
Water Spread Width	T =	2.3	9.9	ft
Water Depth at Flowline (outside of local depression)	d =	2.1	3.9	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	1.000	0.584	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.0	1.1	cfs
Discharge within the Gutter Section W	Q_w =	0.4	1.6	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.18	0.48	sq ft
Velocity within the Gutter Section W	V_W =	2.5	3.3	fps
Water Depth for Design Condition	d_{LOCAL} =	7.1	8.9	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.291	0.178	ft/ft
Required Length L_T to Have 100% Interception	L_T =	2.14	6.76	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	2.14	5.00	ft
Interception Capacity	Q_i =	0.4	2.5	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.00	1.00	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.10	0.10	
Effective (Unclogged) Length	L_e =	2.14	4.50	ft
Actual Interception Capacity	**Q_a =**	**0.4**	**2.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.4**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.4**	**2.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.4**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**86**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 27-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.9	6.9	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.7	3.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.9	0.9	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.5**	**11.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.8	4.8	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.3	2.3	

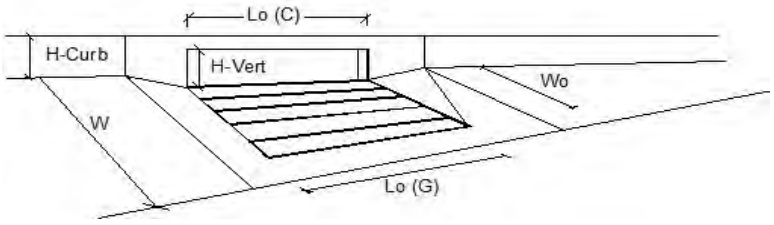
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	17.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.2	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.3	27.9	cfs
Average Flow Velocity Within the Gutter Section	V =	3.7	5.8	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.4	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.3**	**27.9**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.3**	**27.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.19 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.96 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

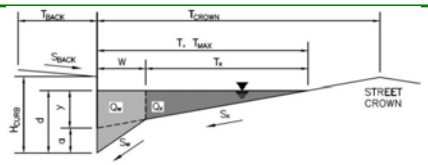


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.2	6.0	cfs
Water Spread Width	T =	6.2	13.3	ft
Water Depth at Flowline (outside of local depression)	d =	3.0	4.7	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.807	0.445	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.2	3.3	cfs
Discharge within the Gutter Section W	Q_w =	1.0	2.6	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.33	0.62	sq ft
Velocity within the Gutter Section W	V_W =	2.9	4.2	fps
Water Depth for Design Condition	d_{LOCAL} =	8.0	9.7	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.239	0.141	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.94	11.33	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.94	10.00	ft
Interception Capacity	Q_i =	1.2	5.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.94	9.61	ft
Actual Interception Capacity	**Q_a =**	**1.2**	**5.7**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.2**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.2**	**5.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.3**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**95**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 20-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.9	6.9	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.7	3.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.9	0.9	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.5**	**11.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.8	4.8	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.3	2.3	

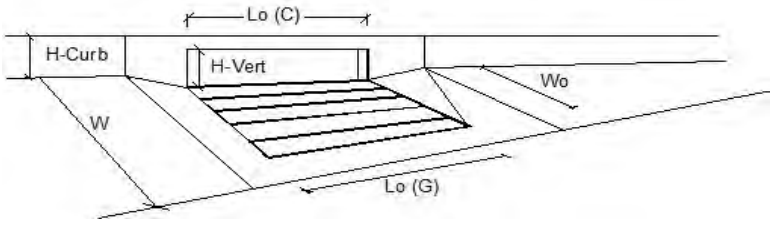
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	17.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.2	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.3	27.9	cfs
Average Flow Velocity Within the Gutter Section	V =	3.7	5.8	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.4	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.3**	**27.9**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.3**	**27.9**	**cfs**

WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 4.38 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 24.49 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

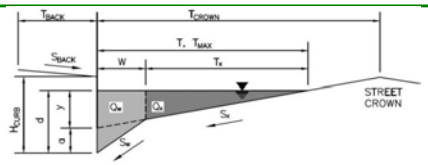


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR & MAJOR STORM		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	4.4	24.5	cfs
Water Spread Width	T =	11.7	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	4.3	6.8	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	1.3	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.501	0.271	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	2.2	14.8	cfs
Discharge within the Gutter Section W	Q_w =	2.2	5.5	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	4.1	cfs
Flow Area within the Gutter Section W	A_W =	0.56	0.98	sq ft
Velocity within the Gutter Section W	V_W =	3.9	5.6	fps
Water Depth for Design Condition	d_{LOCAL} =	9.3	11.8	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.156	0.093	ft/ft
Required Length L_T to Have 100% Interception	L_T =	9.30	25.82	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	9.30	20.00	ft
Interception Capacity	Q_i =	4.4	19.0	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.33	1.33	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.02	0.02	
Effective (Unclogged) Length	L_e =	9.30	19.58	ft
Actual Interception Capacity	**Q_a =**	**4.4**	**18.8**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**1.6**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.4**	**18.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**5.7**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**77**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 20a-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

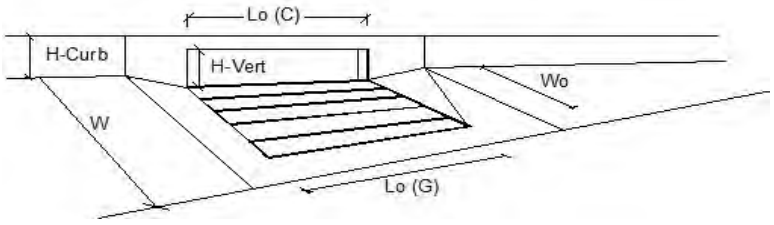
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.68 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 14.86 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

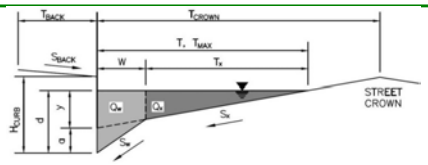


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit 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	
Warning 2 Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.04	0.04	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.7	14.9	cfs
Water Spread Width		T =	7.8	17.0	ft
Water Depth at Flowline (outside of local depression)		d =	3.4	6.1	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.5	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.697	0.309	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.5	9.1	cfs
Discharge within the Gutter Section W		Q_w =	1.2	4.0	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	1.7	cfs
Flow Area within the Gutter Section W		A_W =	0.40	0.86	sq ft
Velocity within the Gutter Section W		V_W =	2.9	4.7	fps
Water Depth for Design Condition		d_{LOCAL} =	8.4	11.1	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.209	0.104	ft/ft
Required Length L_T to Have 100% Interception		L_T =	4.94	19.46	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	4.94	15.00	ft
Interception Capacity		Q_i =	1.7	12.2	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.02	0.02	
Effective (Unclogged) Length		L_e =	4.94	14.71	ft
Actual Interception Capacity		**Q_a =**	**1.7**	**12.1**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**1.0**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.7**	**12.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**2.8**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**81**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **19-A**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.022	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	9.3	9.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	5.0	5.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.2	1.2	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**15.5**	**15.5**	**cfs**
Flow Velocity within the Gutter Section	V =	6.5	6.5	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	3.1	3.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	2.0	23.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	2.0	22.7	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.5	8.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	7.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	4.5	37.8	cfs
Average Flow Velocity Within the Gutter Section	V =	5.0	7.9	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.7	4.7	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	0.77	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**4.5**	**29.2**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	6.61	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.02	inches

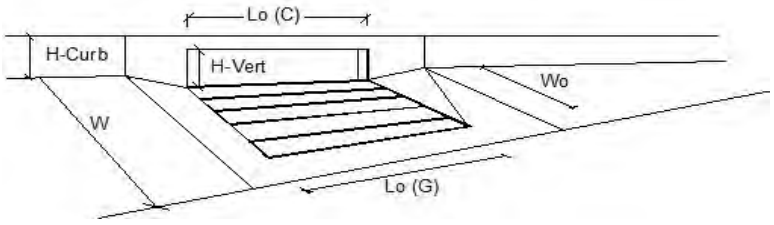
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**4.5**	**29.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.98 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.32 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

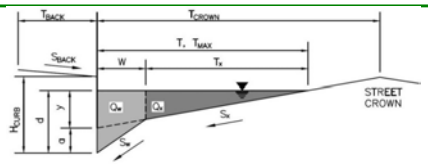


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.0	5.3	cfs
Water Spread Width	T =	4.5	11.2	ft
Water Depth at Flowline (outside of local depression)	d =	2.6	4.2	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.923	0.522	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.1	2.5	cfs
Discharge within the Gutter Section W	Q_w =	0.9	2.8	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.26	0.53	sq ft
Velocity within the Gutter Section W	V_W =	3.4	5.2	fps
Water Depth for Design Condition	d_{LOCAL} =	7.6	9.2	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.271	0.162	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.49	10.48	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.49	10.00	ft
Interception Capacity	Q_i =	1.0	5.3	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.49	9.63	ft
Actual Interception Capacity	**Q_a =**	**1.0**	**5.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.1**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.0**	**5.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**99**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 16-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.022	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	9.3	9.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	5.0	5.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.2	1.2	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**15.5**	**15.5**	**cfs**
Flow Velocity within the Gutter Section	V =	6.5	6.5	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	3.1	3.1	

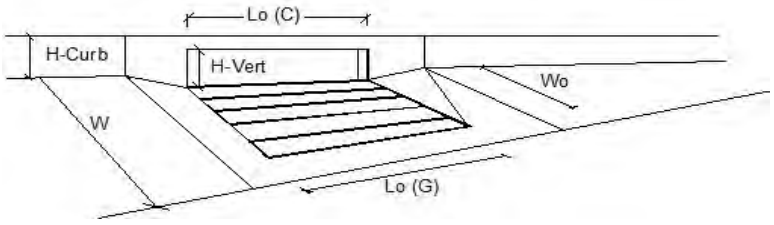
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	2.0	23.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	2.0	22.7	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.5	8.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	7.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	4.5	37.8	cfs
Average Flow Velocity Within the Gutter Section	V =	5.0	7.9	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.7	4.7	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	0.77	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**4.5**	**29.2**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	6.61	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.02	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.5**	**29.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.45 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 8.70 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

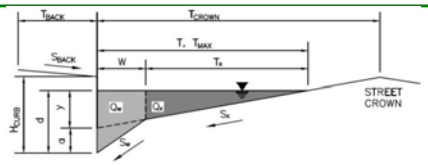


	Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
	Type of Inlet	Type =	CDOT Type R Curb Opening		
	Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
	Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
	Length of a Single Unit 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	
Warning 2	Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.04	0.04	
	Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
	Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.5	8.7	cfs
	Water Spread Width	T =	5.8	13.7	ft
	Water Depth at Flowline (outside of local depression)	d =	2.9	4.8	inches
	Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
	Ratio of Gutter Flow to Design Flow	E_o =	0.833	0.432	
	Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.2	4.8	cfs
	Discharge within the Gutter Section W	Q_w =	1.2	3.7	cfs
	Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.2	cfs
	Flow Area within the Gutter Section W	A_W =	0.32	0.64	sq ft
	Velocity within the Gutter Section W	V_W =	3.8	5.8	fps
	Water Depth for Design Condition	d_{LOCAL} =	7.9	9.8	inches
	Grate Analysis (Calculated)		MINOR	MAJOR	
	Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
	Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
	Under No-Clogging Condition		MINOR	MAJOR	
	Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
	Interception Rate of Frontal Flow	R_f =	N/A	N/A	
	Interception Rate of Side Flow	R_x =	N/A	N/A	
	Interception Capacity	Q_i =	N/A	N/A	cfs
	Under Clogging Condition		MINOR	MAJOR	
	Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
	Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
	Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
	Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
	Interception Rate of Frontal Flow	R_f =	N/A	N/A	
	Interception Rate of Side Flow	R_x =	N/A	N/A	
	Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
	Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
	Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
	Equivalent Slope S_e	S_e =	0.246	0.137	ft/ft
	Required Length L_T to Have 100% Interception	L_T =	4.45	14.36	ft
	Under No-Clogging Condition		MINOR	MAJOR	
	Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	4.45	14.36	ft
	Interception Capacity	Q_i =	1.5	8.5	cfs
	Under Clogging Condition		MINOR	MAJOR	
	Clogging Coefficient	CurbCoeff =	1.31	1.31	
	Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.02	0.02	
	Effective (Unclogged) Length	L_e =	4.45	14.36	ft
	Actual Interception Capacity	**Q_a =**	**1.5**	**8.5**	**cfs**
	Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	**cfs**
	Summary		MINOR	MAJOR	
	Total Inlet Interception Capacity	**Q =**	**1.5**	**8.5**	**cfs**
	Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.2**	**cfs**
	Capture Percentage = Q_a/Q_o	**C% =**	**100**	**98**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **15-A**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	7.7	7.7	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	4.1	4.1	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.0	1.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**12.8**	**12.8**	**cfs**
Flow Velocity within the Gutter Section	V =	5.4	5.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.5	2.5	

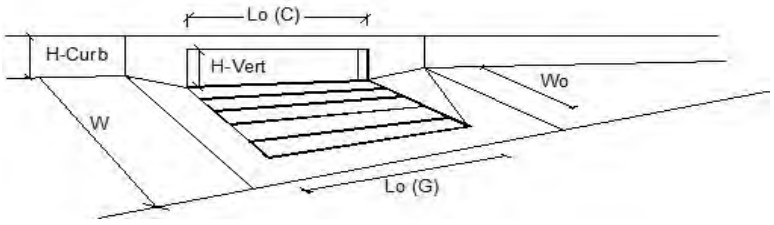
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.6	19.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.6	18.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.1	6.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.8	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.7	31.2	cfs
Average Flow Velocity Within the Gutter Section	V =	4.1	6.5	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.4	3.8	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.7**	**31.2**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.7**	**31.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.20 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 9.26 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

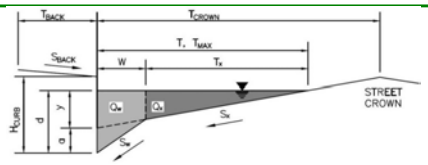


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.2	9.3	cfs
Water Spread Width	T =	5.8	15.1	ft
Water Depth at Flowline (outside of local depression)	d =	2.9	5.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.833	0.393	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.2	5.4	cfs
Discharge within the Gutter Section W	Q_w =	1.0	3.5	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.4	cfs
Flow Area within the Gutter Section W	A_W =	0.32	0.69	sq ft
Velocity within the Gutter Section W	V_W =	3.1	5.0	fps
Water Depth for Design Condition	d_{LOCAL} =	7.9	10.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.246	0.127	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.95	14.88	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.95	10.00	ft
Interception Capacity	Q_i =	1.2	7.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.95	9.61	ft
Actual Interception Capacity	**Q_a =**	**1.2**	**7.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**1.4**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.2**	**7.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.8**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**81**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **14-A**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	7.7	7.7	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	4.1	4.1	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.0	1.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**12.8**	**12.8**	**cfs**
Flow Velocity within the Gutter Section	V =	5.4	5.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.5	2.5	

Maximum Capacity for 1/2 Street based on Allowable Depth

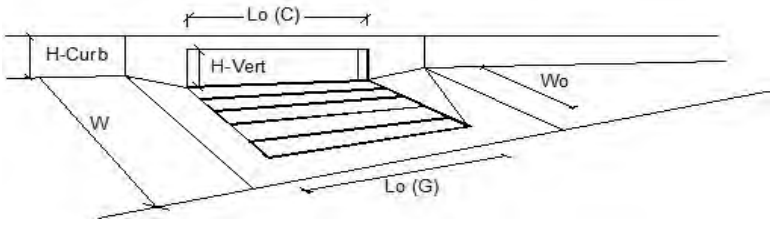
		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.6	19.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.6	18.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.1	6.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.8	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.7	31.2	cfs
Average Flow Velocity Within the Gutter Section	V =	4.1	6.5	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.4	3.8	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.7**	**31.2**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.7**	**31.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.90 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.83 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

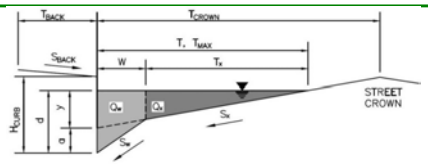


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	0.9	3.8	cfs
Water Spread Width	T =	4.8	10.6	ft
Water Depth at Flowline (outside of local depression)	d =	2.7	4.0	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.901	0.550	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.1	1.7	cfs
Discharge within the Gutter Section W	Q_w =	0.8	2.1	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.28	0.51	sq ft
Velocity within the Gutter Section W	V_W =	2.9	4.1	fps
Water Depth for Design Condition	d_{LOCAL} =	7.7	9.0	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.264	0.169	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.30	8.49	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.30	8.49	ft
Interception Capacity	Q_i =	0.9	3.8	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.30	8.49	ft
Actual Interception Capacity	**Q_a =**	**0.9**	**3.8**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.9**	**3.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**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: SPRING HILL
Inlet ID: 9-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.018	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	8.4	8.4	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	4.5	4.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.1	1.1	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**14.0**	**14.0**	**cfs**
Flow Velocity within the Gutter Section	V =	5.9	5.9	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.8	2.8	

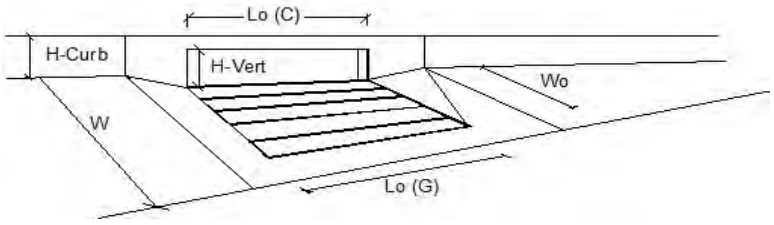
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.8	21.4	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.8	20.6	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.3	7.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	6.4	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	4.0	34.2	cfs
Average Flow Velocity Within the Gutter Section	V =	4.5	7.1	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.5	4.2	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	0.91	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**4.0**	**31.0**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	6.91	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.32	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.0**	**31.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.02 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.47 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

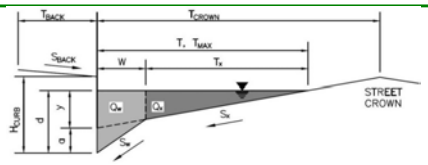


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.0	4.5	cfs
Water Spread Width	T =	4.9	10.9	ft
Water Depth at Flowline (outside of local depression)	d =	2.7	4.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.893	0.537	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.1	2.1	cfs
Discharge within the Gutter Section W	Q_w =	0.9	2.4	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.28	0.52	sq ft
Velocity within the Gutter Section W	V_W =	3.2	4.6	fps
Water Depth for Design Condition	d_{LOCAL} =	7.7	9.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.262	0.166	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.57	9.37	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.57	9.37	ft
Interception Capacity	Q_i =	1.0	4.5	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.57	9.37	ft
Actual Interception Capacity	**Q_a =**	**1.0**	**4.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.0**	**4.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**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: SPRING HILL
Inlet ID: 7a-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

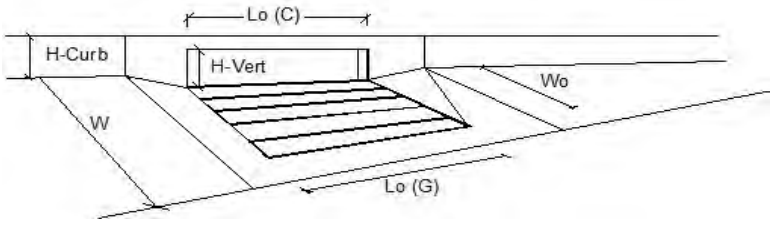
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.58 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 12.50 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

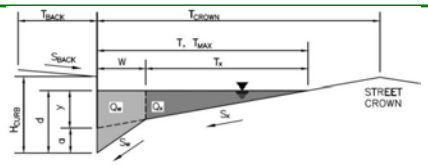


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit 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	
Warning 2 Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.04	0.04	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	2.6	12.5	cfs
Water Spread Width		T =	9.7	17.0	ft
Water Depth at Flowline (outside of local depression)		d =	3.8	5.9	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.3	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.593	0.328	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	1.0	7.6	cfs
Discharge within the Gutter Section W		Q_w =	1.5	3.7	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	1.2	cfs
Flow Area within the Gutter Section W		A_W =	0.47	0.81	sq ft
Velocity within the Gutter Section W		V_W =	3.2	4.6	fps
Water Depth for Design Condition		d_{LOCAL} =	8.8	10.9	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.181	0.109	ft/ft
Required Length L_T to Have 100% Interception		L_T =	6.57	17.61	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	6.57	15.00	ft
Interception Capacity		Q_i =	2.6	10.9	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.02	0.02	
Effective (Unclogged) Length		L_e =	6.57	14.71	ft
Actual Interception Capacity		**Q_a =**	**2.6**	**10.8**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.4**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**2.6**	**10.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**1.7**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**87**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 7-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.013	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	7.2	7.2	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.9	3.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.9	0.9	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.9**	**11.9**	**cfs**
Flow Velocity within the Gutter Section	V =	5.0	5.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.3	2.3	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.5	18.2	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.5	17.5	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.9	6.2	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.4	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.4	29.0	cfs
Average Flow Velocity Within the Gutter Section	V =	3.8	6.1	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.3	3.6	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.4**	**29.0**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

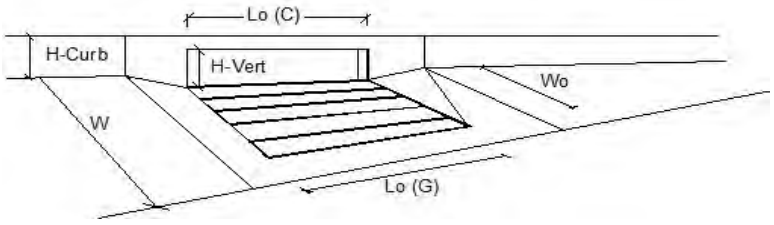
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**3.4**	**29.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.93 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 11.04 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

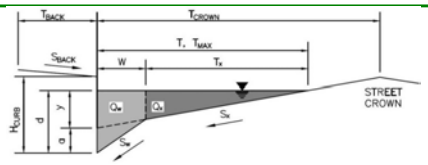


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.9	11.0	cfs
Water Spread Width	T =	7.9	16.5	ft
Water Depth at Flowline (outside of local depression)	d =	3.4	5.5	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.695	0.360	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.6	6.6	cfs
Discharge within the Gutter Section W	Q_w =	1.3	3.7	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.8	cfs
Flow Area within the Gutter Section W	A_W =	0.40	0.75	sq ft
Velocity within the Gutter Section W	V_W =	3.3	5.0	fps
Water Depth for Design Condition	d_{LOCAL} =	8.4	10.5	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.209	0.118	ft/ft
Required Length L_T to Have 100% Interception	L_T =	5.39	16.47	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	5.39	10.00	ft
Interception Capacity	Q_i =	1.9	8.4	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	5.39	9.61	ft
Actual Interception Capacity	**Q_a =**	**1.9**	**8.2**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**2.1**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.9**	**8.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.9**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**74**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 6-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.9	6.9	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.7	3.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.9	0.9	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.5**	**11.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.8	4.8	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.3	2.3	

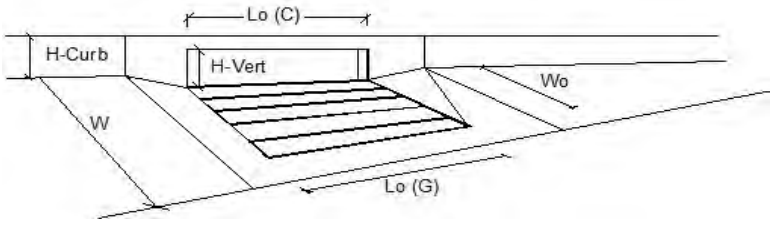
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	17.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.2	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.3	27.9	cfs
Average Flow Velocity Within the Gutter Section	V =	3.7	5.8	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.4	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.3**	**27.9**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.3**	**27.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.02 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.03 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

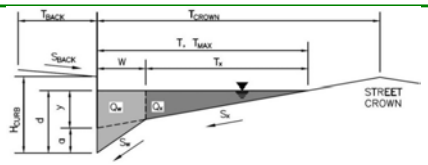


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.0	10.0	cfs
Water Spread Width	T =	5.6	16.2	ft
Water Depth at Flowline (outside of local depression)	d =	2.9	5.4	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.846	0.367	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.2	5.9	cfs
Discharge within the Gutter Section W	Q_w =	0.9	3.5	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.6	cfs
Flow Area within the Gutter Section W	A_W =	0.31	0.73	sq ft
Velocity within the Gutter Section W	V_W =	2.8	4.7	fps
Water Depth for Design Condition	d_{LOCAL} =	7.9	10.4	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.249	0.120	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.57	15.54	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.57	10.00	ft
Interception Capacity	Q_i =	1.0	7.9	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.57	9.61	ft
Actual Interception Capacity	**Q_a =**	**1.0**	**7.7**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**1.7**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.0**	**7.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.3**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**77**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 4-A



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.9	6.9	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.7	3.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.9	0.9	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.5**	**11.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.8	4.8	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.3	2.3	

Maximum Capacity for 1/2 Street based on Allowable Depth

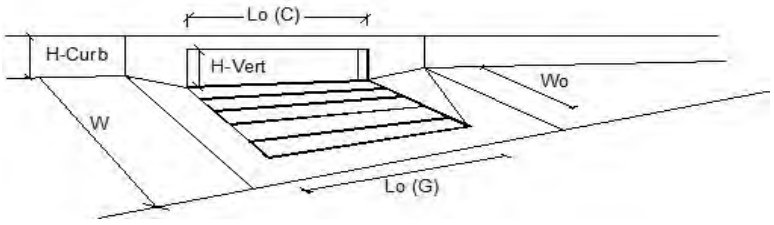
		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	17.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.2	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.3	27.9	cfs
Average Flow Velocity Within the Gutter Section	V =	3.7	5.8	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.4	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.3**	**27.9**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.3**	**27.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.40 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.68 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

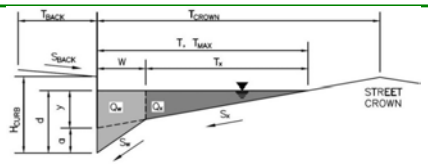


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit 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	
Warning 2 Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.04	0.04	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.4	5.7	cfs
Water Spread Width		T =	6.8	13.1	ft
Water Depth at Flowline (outside of local depression)		d =	3.1	4.7	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.766	0.453	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.3	3.1	cfs
Discharge within the Gutter Section W		Q_w =	1.1	2.5	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W		A_W =	0.36	0.61	sq ft
Velocity within the Gutter Section W		V_W =	3.0	4.2	fps
Water Depth for Design Condition		d_{LOCAL} =	8.1	9.7	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.228	0.143	ft/ft
Required Length L_T to Have 100% Interception		L_T =	4.37	11.00	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	4.37	11.00	ft
Interception Capacity		Q_i =	1.4	5.6	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.02	0.02	
Effective (Unclogged) Length		L_e =	4.37	11.00	ft
Actual Interception Capacity		**Q_a =**	**1.4**	**5.6**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.0**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.4**	**5.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**99**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 3a-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.6	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.5	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.0**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	4.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.2	2.2	

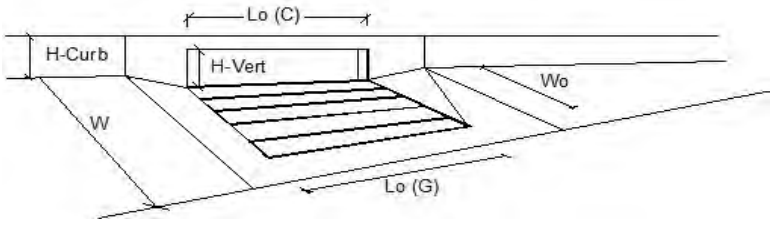
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.30 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.93 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

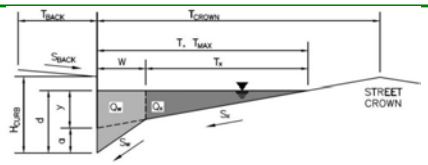


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.3	7.9	cfs
Water Spread Width	T =	6.7	15.1	ft
Water Depth at Flowline (outside of local depression)	d =	3.1	5.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.773	0.393	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.3	4.6	cfs
Discharge within the Gutter Section W	Q_w =	1.0	3.0	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.3	cfs
Flow Area within the Gutter Section W	A_W =	0.35	0.69	sq ft
Velocity within the Gutter Section W	V_W =	2.8	4.3	fps
Water Depth for Design Condition	d_{LOCAL} =	8.1	10.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.230	0.127	ft/ft
Required Length L_T to Have 100% Interception	L_T =	4.17	13.50	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	4.17	10.00	ft
Interception Capacity	Q_i =	1.3	6.9	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	4.17	9.61	ft
Actual Interception Capacity	**Q_a =**	**1.3**	**6.8**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.8**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.3**	**6.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.2**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**85**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 3-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.6	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.5	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.0**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	4.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.2	2.2	

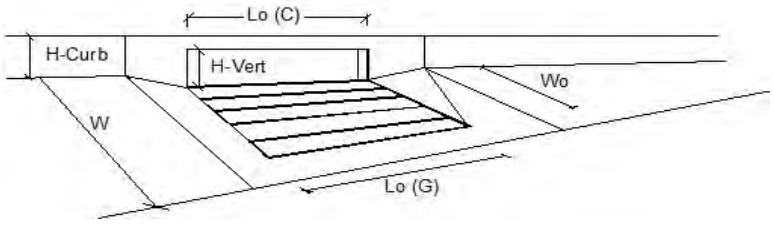
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.62 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 8.96 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

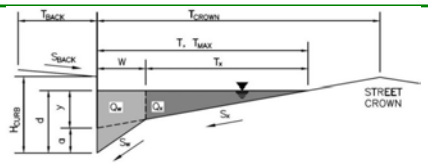


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit 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	
Warning 2 Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.04	0.04	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.6	9.0	cfs
Water Spread Width		T =	7.5	15.8	ft
Water Depth at Flowline (outside of local depression)		d =	3.3	5.3	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.718	0.376	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.5	5.3	cfs
Discharge within the Gutter Section W		Q_w =	1.2	3.2	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.5	cfs
Flow Area within the Gutter Section W		A_W =	0.39	0.72	sq ft
Velocity within the Gutter Section W		V_W =	3.0	4.4	fps
Water Depth for Design Condition		d_{LOCAL} =	8.3	10.3	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.215	0.122	ft/ft
Required Length L_T to Have 100% Interception		L_T =	4.82	14.52	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	4.82	14.52	ft
Interception Capacity		Q_i =	1.6	8.5	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.02	0.02	
Effective (Unclogged) Length		L_e =	4.82	14.52	ft
Actual Interception Capacity		**Q_a =**	**1.6**	**8.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.0**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.6**	**8.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.5**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**94**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL
Inlet ID: 2-A



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.6	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.5	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.0**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	4.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.2	2.2	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

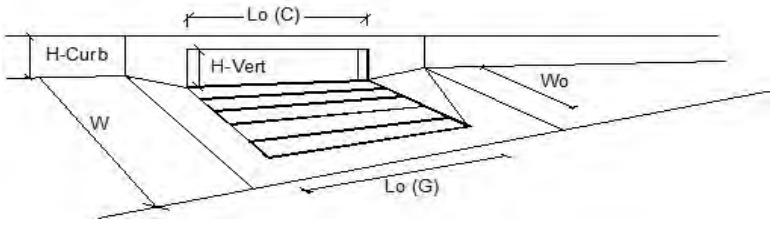
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.78 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.51 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

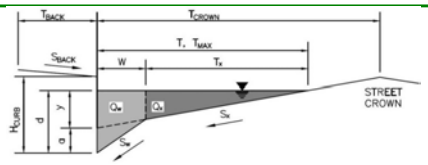


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	0.8	3.5	cfs
Water Spread Width	T =	4.9	10.9	ft
Water Depth at Flowline (outside of local depression)	d =	2.7	4.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.898	0.537	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.1	1.6	cfs
Discharge within the Gutter Section W	Q_w =	0.7	1.9	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.28	0.52	sq ft
Velocity within the Gutter Section W	V_W =	2.5	3.6	fps
Water Depth for Design Condition	d_{LOCAL} =	7.7	9.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.264	0.166	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.02	8.05	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.02	8.05	ft
Interception Capacity	Q_i =	0.8	3.5	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.02	8.05	ft
Actual Interception Capacity	**Q_a =**	**0.8**	**3.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.8**	**3.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**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: **SPRING HILL**
Inlet ID: **1a-A**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.6	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.5	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.0**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	4.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.2	2.2	

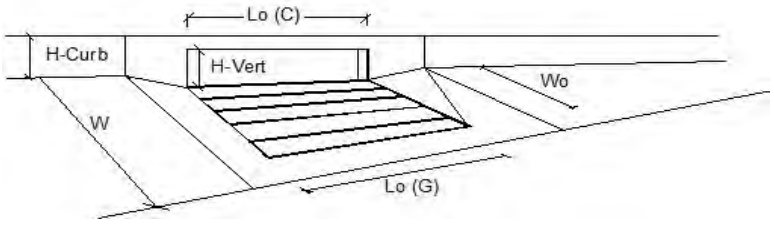
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.01 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 6.41 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	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 =	5.00	5.00	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'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.0	6.4	cfs
Water Spread Width	T =	5.8	13.9	ft
Water Depth at Flowline (outside of local depression)	d =	2.9	4.9	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.837	0.426	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.2	3.6	cfs
Discharge within the Gutter Section W	Q_w =	0.8	2.7	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.2	cfs
Flow Area within the Gutter Section W	A_W =	0.32	0.64	sq ft
Velocity within the Gutter Section W	V_W =	2.7	4.1	fps
Water Depth for Design Condition	d_{LOCAL} =	7.9	9.9	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.247	0.135	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.55	11.86	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.55	5.00	ft
Interception Capacity	Q_i =	1.0	3.9	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.00	1.00	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.10	0.10	
Effective (Unclogged) Length	L_e =	3.55	4.50	ft
Actual Interception Capacity	**Q_a =**	**1.0**	**3.6**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**2.6**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.0**	**3.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.8**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**56**	**%**

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	31-B	30-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.1	1.3
Major Q_{Known} (cfs)	6.6	5.6

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.1**	**1.3**
Major Total Design Peak Flow, Q (cfs)	**6.6**	**5.6**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.6	2.2

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	29-B	28-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.1	1.2
Major Q_{Known} (cfs)	5.2	5.6

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.1**	**1.2**
Major Total Design Peak Flow, Q (cfs)	**5.2**	**5.6**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.1	0.2

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	27-B	26-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.8	1.1
Major Q_{Known} (cfs)	8.4	5.6

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.8**	**1.1**
Major Total Design Peak Flow, Q (cfs)	**8.4**	**5.6**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	1.4	0.2

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	25-B	24-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.4	1.5
Major Q_{Known} (cfs)	6.8	8.7

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.4**	**1.5**
Major Total Design Peak Flow, Q (cfs)	**6.8**	**8.7**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.5	1.3

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	23-B	22-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.7	1.1
Major Q_{Known} (cfs)	10.6	5.0

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.7**	**1.1**
Major Total Design Peak Flow, Q (cfs)	**10.6**	**5.0**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.7	0.0

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	21-B	20-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.5	2.1
Major Q_{Known} (cfs)	3.3	9.9

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**0.5**	**2.1**
Major Total Design Peak Flow, Q (cfs)	**3.3**	**9.9**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	2.2

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	19-B	18-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.3	0.6
Major Q_{Known} (cfs)	5.6	4.8

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.3**	**0.6**
Major Total Design Peak Flow, Q (cfs)	**5.6**	**4.8**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.2	0.0

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	17-B	16-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.0	1.4
Major Q_{Known} (cfs)	4.3	6.0

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.0**	**1.4**
Major Total Design Peak Flow, Q (cfs)	**4.3**	**6.0**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	0.3

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	15-B	14-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.6	1.2
Major Q_{Known} (cfs)	8.5	5.8

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.6**	**1.2**
Major Total Design Peak Flow, Q (cfs)	**8.5**	**5.8**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	1.2	0.3

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	13-B	12-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.4	0.4
Major Q_{Known} (cfs)	3.6	3.5

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**0.4**	**0.4**
Major Total Design Peak Flow, Q (cfs)	**3.6**	**3.5**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	11-B	10-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.4	1.2
Major Q_{Known} (cfs)	12.4	5.5

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**2.4**	**1.2**
Major Total Design Peak Flow, Q (cfs)	**12.4**	**5.5**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	1.5	0.2

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	9-B	8-B
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.2	2.0
Major Q_{Known} (cfs)	10.5	9.4

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**2.2**	**2.0**
Major Total Design Peak Flow, Q (cfs)	**10.5**	**9.4**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	2.5	2.0

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	7-B	6-B
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)	1.1	0.9
Major Q_{Known} (cfs)	5.8	4.2

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.1**	**0.9**
Major Total Design Peak Flow, Q (cfs)	**5.8**	**4.2**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.3	N/A

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	5-B	4-B
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)	1.5	1.0
Major Q_{Known} (cfs)	7.1	6.9

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.5**	**1.0**
Major Total Design Peak Flow, Q (cfs)	**7.1**	**6.9**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.7	N/A

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	3-B	2-B
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)	1.9	1.7
Major Q_{Known} (cfs)	9.4	8.0

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.9**	**1.7**
Major Total Design Peak Flow, Q (cfs)	**9.4**	**8.0**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	1.8	N/A

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	1-B
Site Type (Urban or Rural)	
Inlet Application (Street or Area)	STREET
Hydraulic Condition	In Sump
Inlet Type	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.7
Major Q_{Known} (cfs)	3.2

CALCULATED OUTPUT

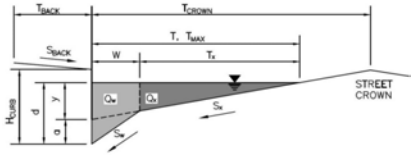
Minor Total Design Peak Flow, Q (cfs)	**0.7**
Major Total Design Peak Flow, Q (cfs)	**3.2**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **31-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

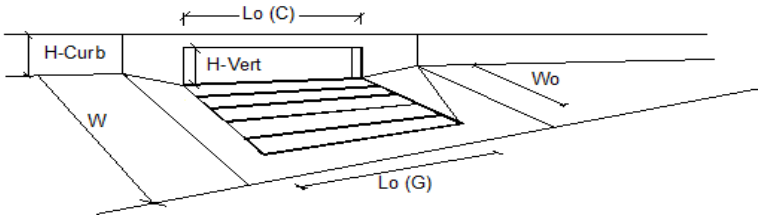
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.13 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 6.56 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

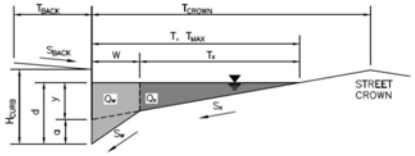


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.1	6.6	cfs
Water Spread Width		T =	6.3	14.3	ft
Water Depth at Flowline (outside of local depression)		d =	3.0	5.0	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.797	0.415	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.2	3.7	cfs
Discharge within the Gutter Section W		Q_w =	0.9	2.6	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.2	cfs
Flow Area within the Gutter Section W		A_W =	0.34	0.66	sq ft
Velocity within the Gutter Section W		V_W =	2.7	4.0	fps
Water Depth for Design Condition		d_{LOCAL} =	8.0	10.0	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.236	0.133	ft/ft
Required Length L_T to Have 100% Interception		L_T =	3.82	12.01	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	3.82	10.00	ft
Interception Capacity		Q_i =	1.1	6.1	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	3.82	9.63	ft
Actual Interception Capacity		**Q_a =**	**1.1**	**6.0**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.3**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.1**	**6.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.6**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**92**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **30-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

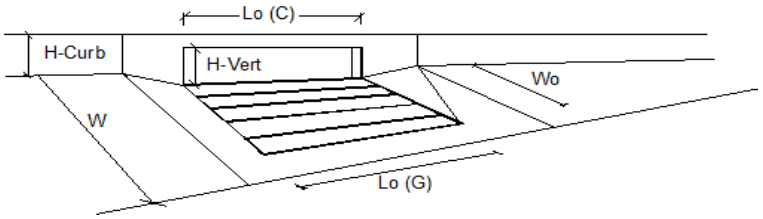
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\ TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.26 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.61 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



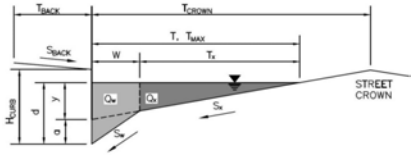
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	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'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.3	5.6	cfs
Water Spread Width	T =	6.7	13.5	ft
Water Depth at Flowline (outside of local depression)	d =	3.1	4.7	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.769	0.440	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.3	3.1	cfs
Discharge within the Gutter Section W	Q_w =	1.0	2.4	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.36	0.63	sq ft
Velocity within the Gutter Section W	V_W =	2.7	3.9	fps
Water Depth for Design Condition	d_{LOCAL} =	8.1	9.7	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.229	0.139	ft/ft
Required Length L_T to Have 100% Interception	L_T =	4.09	10.91	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	4.09	5.00	ft
Interception Capacity	Q_i =	1.3	3.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.00	1.00	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.10	0.10	
Effective (Unclogged) Length	L_e =	4.09	4.50	ft
Actual Interception Capacity	**Q_a =**	**1.3**	**3.4**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**2.1**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.3**	**3.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.2**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**60**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **29-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\ TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

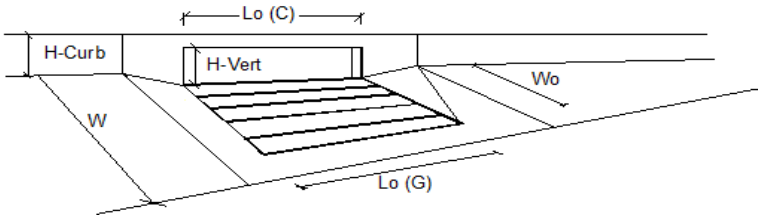
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.08 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.15 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

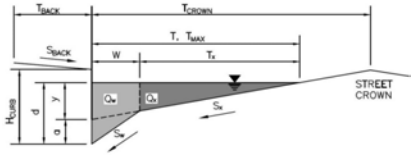


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.1	5.2	cfs
Water Spread Width	T =	6.2	13.0	ft
Water Depth at Flowline (outside of local depression)	d =	3.0	4.6	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.809	0.455	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.2	2.8	cfs
Discharge within the Gutter Section W	Q_w =	0.9	2.3	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.33	0.61	sq ft
Velocity within the Gutter Section W	V_W =	2.6	3.8	fps
Water Depth for Design Condition	d_{LOCAL} =	8.0	9.6	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.239	0.143	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.71	10.34	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.71	10.00	ft
Interception Capacity	Q_i =	1.1	5.1	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.71	9.63	ft
Actual Interception Capacity	**Q_a =**	**1.1**	**5.0**	**cfs**
Carry-Over Flow = $Q_{o(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.1**	**5.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**98**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **28-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.9	6.9	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.7	3.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.9	0.9	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.5**	**11.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.8	4.8	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.3	2.3	

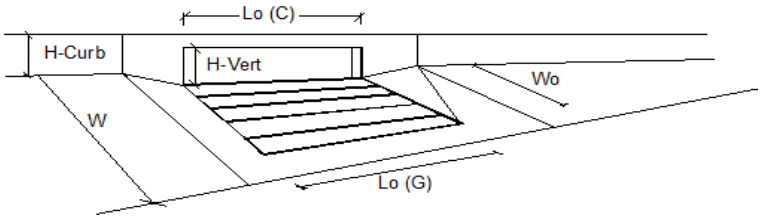
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	17.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.2	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.3	27.9	cfs
Average Flow Velocity Within the Gutter Section	V =	3.7	5.8	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.4	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.3**	**27.9**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.3**	**27.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.19 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.60 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



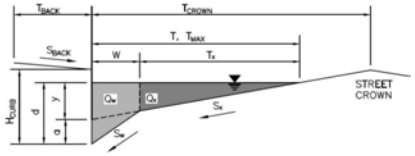
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.2	5.6	cfs
Water Spread Width	T =	6.2	13.0	ft
Water Depth at Flowline (outside of local depression)	d =	3.0	4.6	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.807	0.455	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.2	3.0	cfs
Discharge within the Gutter Section W	Q_w =	1.0	2.5	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.33	0.61	sq ft
Velocity within the Gutter Section W	V_W =	2.9	4.1	fps
Water Depth for Design Condition	d_{LOCAL} =	8.0	9.6	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.239	0.143	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.94	10.90	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.94	10.00	ft
Interception Capacity	Q_i =	1.2	5.5	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.94	9.63	ft
Actual Interception Capacity	**Q_a =**	**1.2**	**5.4**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.1**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.2**	**5.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.2**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**97**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **27-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.9	6.9	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.7	3.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.9	0.9	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.5**	**11.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.8	4.8	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.3	2.3	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\ TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	1.4	17.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.2	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.3	27.9	cfs
Average Flow Velocity Within the Gutter Section	V =	3.7	5.8	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.4	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.3**	**27.9**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

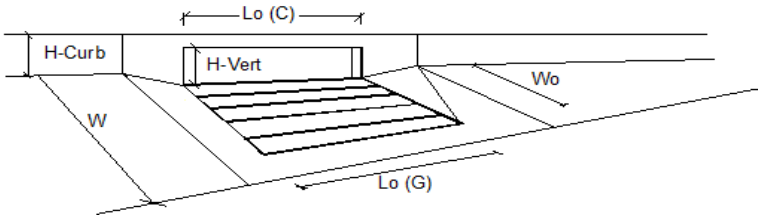
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.3**	**27.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.77 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 8.40 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

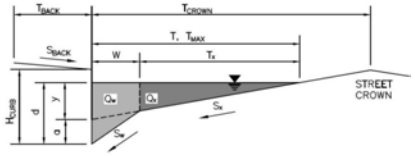


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.8	8.4	cfs
Water Spread Width		T =	7.7	15.2	ft
Water Depth at Flowline (outside of local depression)		d =	3.4	5.2	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.706	0.391	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.5	4.9	cfs
Discharge within the Gutter Section W		Q_w =	1.2	3.1	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.4	cfs
Flow Area within the Gutter Section W		A_W =	0.39	0.69	sq ft
Velocity within the Gutter Section W		V_W =	3.2	4.5	fps
Water Depth for Design Condition		d_{LOCAL} =	8.4	10.2	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.212	0.126	ft/ft
Required Length L_T to Have 100% Interception		L_T =	5.10	13.99	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	5.10	10.00	ft
Interception Capacity		Q_i =	1.8	7.2	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	5.10	9.63	ft
Actual Interception Capacity		**Q_a =**	**1.8**	**7.0**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**1.0**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.8**	**7.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**1.4**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**84**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **26-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

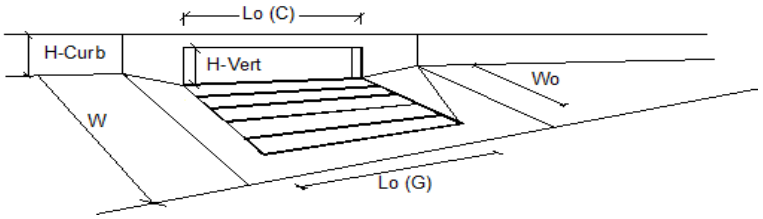
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.09 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.61 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



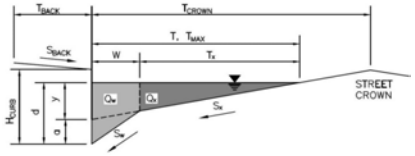
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.1	5.6	cfs
Water Spread Width	T =	6.2	13.5	ft
Water Depth at Flowline (outside of local depression)	d =	3.0	4.7	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.806	0.440	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.2	3.1	cfs
Discharge within the Gutter Section W	Q_w =	0.9	2.4	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.33	0.63	sq ft
Velocity within the Gutter Section W	V_W =	2.6	3.9	fps
Water Depth for Design Condition	d_{LOCAL} =	8.0	9.7	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.239	0.139	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.73	10.91	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.73	10.00	ft
Interception Capacity	Q_i =	1.1	5.4	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.73	9.63	ft
Actual Interception Capacity	**Q_a =**	**1.1**	**5.4**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.1**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.1**	**5.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.2**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**96**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **25-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.022	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	9.3	9.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	5.0	5.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.2	1.2	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**15.5**	**15.5**	**cfs**
Flow Velocity within the Gutter Section	V =	6.5	6.5	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	3.1	3.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	2.0	23.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	2.0	22.7	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.5	8.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	7.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	4.5	37.8	cfs
Average Flow Velocity Within the Gutter Section	V =	5.0	7.9	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.7	4.7	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	0.77	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**4.5**	**29.2**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	6.61	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.02	inches

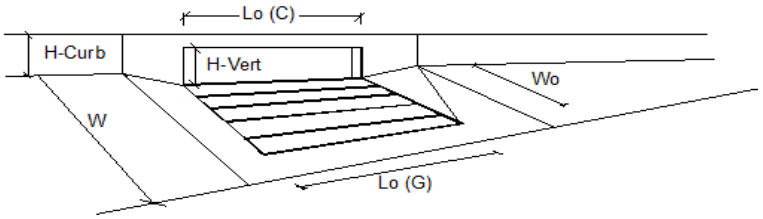
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.5**	**29.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.43 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 6.83 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

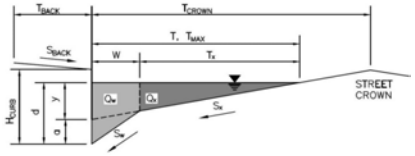


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.4	6.8	cfs
Water Spread Width		T =	5.8	12.5	ft
Water Depth at Flowline (outside of local depression)		d =	2.9	4.5	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.836	0.473	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.2	3.6	cfs
Discharge within the Gutter Section W		Q_w =	1.2	3.2	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W		A_W =	0.32	0.58	sq ft
Velocity within the Gutter Section W		V_W =	3.8	5.5	fps
Water Depth for Design Condition		d_{LOCAL} =	7.9	9.5	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.247	0.148	ft/ft
Required Length L_T to Have 100% Interception		L_T =	4.41	12.33	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	4.41	10.00	ft
Interception Capacity		Q_i =	1.4	6.4	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	4.41	9.63	ft
Actual Interception Capacity		**Q_a =**	**1.4**	**6.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.4**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.4**	**6.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.5**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**93**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **24-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.022	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	9.3	9.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	5.0	5.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.2	1.2	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**15.5**	**15.5**	**cfs**
Flow Velocity within the Gutter Section	V =	6.5	6.5	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	3.1	3.1	

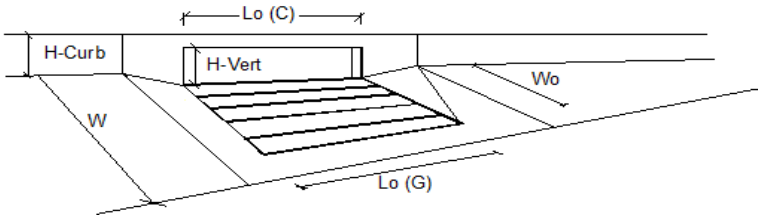
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	2.0	23.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	2.0	22.7	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.5	8.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	7.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	4.5	37.8	cfs
Average Flow Velocity Within the Gutter Section	V =	5.0	7.9	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.7	4.7	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	0.77	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**4.5**	**29.2**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	6.61	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.02	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.5**	**29.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.45 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 8.70 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

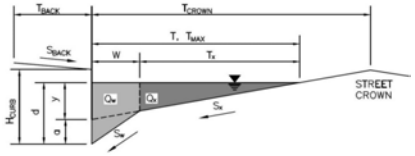


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.5	8.7	cfs
Water Spread Width		T =	5.8	13.7	ft
Water Depth at Flowline (outside of local depression)		d =	2.9	4.8	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.833	0.432	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.2	4.8	cfs
Discharge within the Gutter Section W		Q_w =	1.2	3.7	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.2	cfs
Flow Area within the Gutter Section W		A_W =	0.32	0.64	sq ft
Velocity within the Gutter Section W		V_W =	3.8	5.8	fps
Water Depth for Design Condition		d_{LOCAL} =	7.9	9.8	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.246	0.137	ft/ft
Required Length L_T to Have 100% Interception		L_T =	4.45	14.36	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	4.45	10.00	ft
Interception Capacity		Q_i =	1.5	7.5	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	4.45	9.63	ft
Actual Interception Capacity		**Q_a =**	**1.5**	**7.4**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**1.2**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.5**	**7.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**1.3**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**85**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **23-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	7.7	7.7	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	4.1	4.1	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.0	1.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**12.8**	**12.8**	**cfs**
Flow Velocity within the Gutter Section	V =	5.4	5.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.5	2.5	

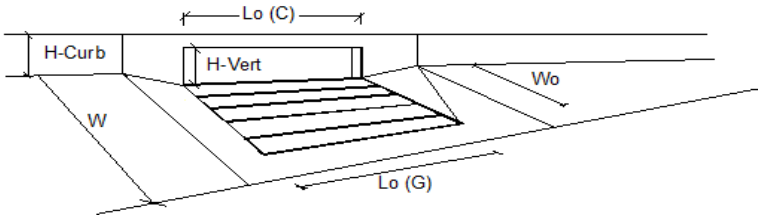
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.6	19.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.6	18.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.1	6.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.8	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.7	31.2	cfs
Average Flow Velocity Within the Gutter Section	V =	4.1	6.5	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.4	3.8	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.7**	**31.2**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.7**	**31.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.68 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.55 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

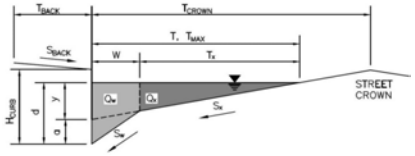


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit 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	
Warning 2 Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.04	0.04	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.7	10.6	cfs
Water Spread Width		T =	7.1	15.9	ft
Water Depth at Flowline (outside of local depression)		d =	3.2	5.3	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.748	0.375	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.4	6.2	cfs
Discharge within the Gutter Section W		Q_w =	1.3	3.7	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.6	cfs
Flow Area within the Gutter Section W		A_W =	0.37	0.72	sq ft
Velocity within the Gutter Section W		V_W =	3.4	5.2	fps
Water Depth for Design Condition		d_{LOCAL} =	8.2	10.3	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.223	0.122	ft/ft
Required Length L_T to Have 100% Interception		L_T =	4.91	16.08	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	4.91	15.00	ft
Interception Capacity		Q_i =	1.7	9.9	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.02	0.02	
Effective (Unclogged) Length		L_e =	4.91	14.74	ft
Actual Interception Capacity		**Q_a =**	**1.7**	**9.8**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.1**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.7**	**9.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.7**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**93**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **22-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	7.7	7.7	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	4.1	4.1	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.0	1.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**12.8**	**12.8**	**cfs**
Flow Velocity within the Gutter Section	V =	5.4	5.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.5	2.5	

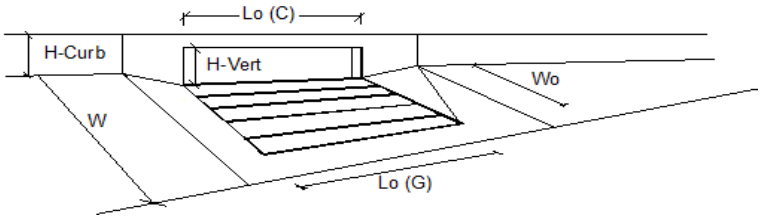
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.6	19.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.6	18.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.1	6.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.8	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.7	31.2	cfs
Average Flow Velocity Within the Gutter Section	V =	4.1	6.5	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.4	3.8	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.7**	**31.2**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.7**	**31.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.13 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.97 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

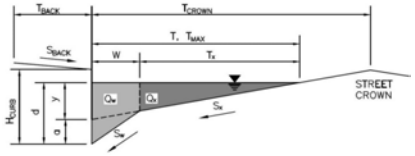


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.1	5.0	cfs
Water Spread Width		T =	5.6	11.8	ft
Water Depth at Flowline (outside of local depression)		d =	2.9	4.4	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.848	0.497	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.2	2.5	cfs
Discharge within the Gutter Section W		Q_w =	1.0	2.5	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.31	0.56	sq ft
Velocity within the Gutter Section W		V_W =	3.1	4.4	fps
Water Depth for Design Condition		d_{LOCAL} =	7.9	9.4	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.250	0.155	ft/ft
Required Length L_T to Have 100% Interception		L_T =	3.81	10.08	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	3.81	10.00	ft
Interception Capacity		Q_i =	1.1	5.0	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	3.81	9.63	ft
Actual Interception Capacity		**Q_a =**	**1.1**	**4.9**	**cfs**
Carry-Over Flow = $Q_{o(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.0**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.1**	**4.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**99**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **21-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.018	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	8.4	8.4	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	4.5	4.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.1	1.1	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**14.0**	**14.0**	**cfs**
Flow Velocity within the Gutter Section	V =	5.9	5.9	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.8	2.8	

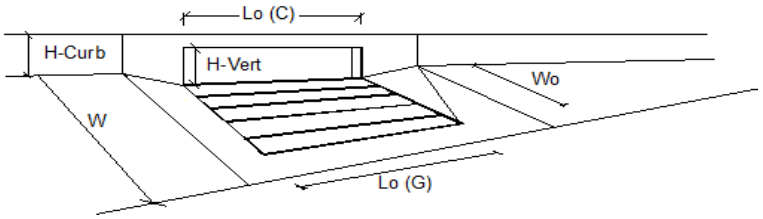
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.8	21.4	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.8	20.6	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.3	7.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	6.4	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	4.0	34.2	cfs
Average Flow Velocity Within the Gutter Section	V =	4.5	7.1	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.5	4.2	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	0.91	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**4.0**	**31.0**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	6.91	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.32	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.0**	**31.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.53 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.31 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

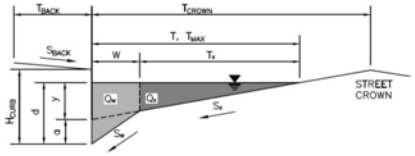


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	0.5	3.3	cfs
Water Spread Width		T =	2.2	9.5	ft
Water Depth at Flowline (outside of local depression)		d =	2.0	3.8	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	1.000	0.604	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.0	1.3	cfs
Discharge within the Gutter Section W		Q_w =	0.5	2.0	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.17	0.46	sq ft
Velocity within the Gutter Section W		V_W =	3.1	4.3	fps
Water Depth for Design Condition		d_{LOCAL} =	7.0	8.8	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.291	0.184	ft/ft
Required Length L_T to Have 100% Interception		L_T =	2.44	7.67	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	2.44	7.67	ft
Interception Capacity		Q_i =	0.5	3.3	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	2.44	7.67	ft
Actual Interception Capacity		**Q_a =**	**0.5**	**3.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.0**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.5**	**3.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o		**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: **SPRING HILL**
Inlet ID: **20-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.6	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.5	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.0**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	4.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.2	2.2	

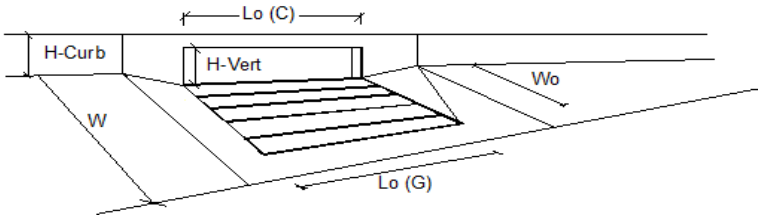
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.13 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 9.87 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

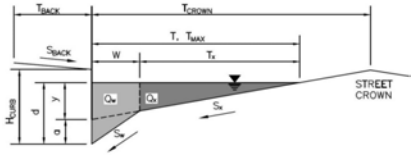


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	2.1	9.9	cfs
Water Spread Width		T =	8.6	16.4	ft
Water Depth at Flowline (outside of local depression)		d =	3.6	5.4	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.650	0.363	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.7	5.9	cfs
Discharge within the Gutter Section W		Q_w =	1.4	3.3	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.6	cfs
Flow Area within the Gutter Section W		A_W =	0.43	0.74	sq ft
Velocity within the Gutter Section W		V_W =	3.2	4.5	fps
Water Depth for Design Condition		d_{LOCAL} =	8.6	10.4	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.196	0.118	ft/ft
Required Length L_T to Have 100% Interception		L_T =	5.77	15.39	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	5.77	10.00	ft
Interception Capacity		Q_i =	2.1	7.8	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	5.77	9.63	ft
Actual Interception Capacity		**Q_a =**	**2.1**	**7.6**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**1.6**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**2.1**	**7.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**2.2**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**77**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **19-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.6	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.5	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.0**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	4.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.2	2.2	

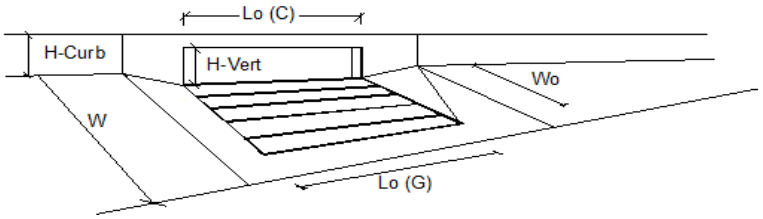
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.28 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.63 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

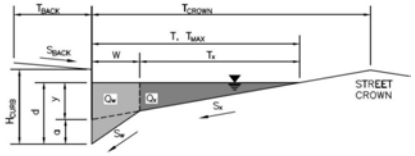


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.3	5.6	cfs
Water Spread Width	T =	6.6	13.3	ft
Water Depth at Flowline (outside of local depression)	d =	3.1	4.7	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.778	0.447	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.3	3.1	cfs
Discharge within the Gutter Section W	Q_w =	1.0	2.5	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.35	0.62	sq ft
Velocity within the Gutter Section W	V_W =	2.8	4.0	fps
Water Depth for Design Condition	d_{LOCAL} =	8.1	9.7	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.231	0.141	ft/ft
Required Length L_T to Have 100% Interception	L_T =	4.13	10.94	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	4.13	10.00	ft
Interception Capacity	Q_i =	1.3	5.5	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	4.13	9.63	ft
Actual Interception Capacity	**Q_a =**	**1.3**	**5.4**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.1**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.3**	**5.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.2**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**96**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **18-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.018	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	8.4	8.4	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	4.5	4.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.1	1.1	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**14.0**	**14.0**	**cfs**
Flow Velocity within the Gutter Section	V =	5.9	5.9	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.8	2.8	

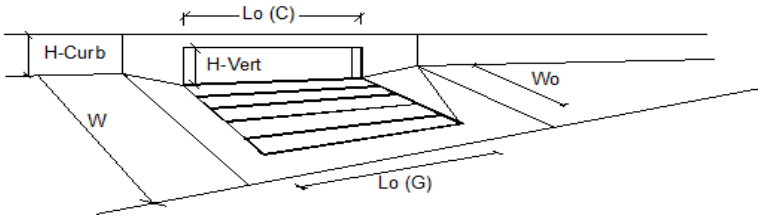
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.8	21.4	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.8	20.6	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.3	7.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	6.4	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	4.0	34.2	cfs
Average Flow Velocity Within the Gutter Section	V =	4.5	7.1	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.5	4.2	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	0.91	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**4.0**	**31.0**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	6.91	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.32	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.0**	**31.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.59 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.77 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

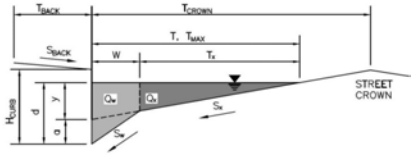


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	0.6	4.8	cfs
Water Spread Width		T =	2.3	11.2	ft
Water Depth at Flowline (outside of local depression)		d =	2.1	4.2	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	1.000	0.523	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.0	2.3	cfs
Discharge within the Gutter Section W		Q_w =	0.6	2.5	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.18	0.53	sq ft
Velocity within the Gutter Section W		V_W =	3.3	4.7	fps
Water Depth for Design Condition		d_{LOCAL} =	7.1	9.2	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.291	0.162	ft/ft
Required Length L_T to Have 100% Interception		L_T =	2.57	9.79	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	2.57	9.79	ft
Interception Capacity		Q_i =	0.6	4.8	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	2.57	9.63	ft
Actual Interception Capacity		**Q_a =**	**0.6**	**4.8**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.0**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.6**	**4.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o		**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: **SPRING HILL**
Inlet ID: **17-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.018	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	8.4	8.4	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	4.5	4.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.1	1.1	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**14.0**	**14.0**	**cfs**
Flow Velocity within the Gutter Section	V =	5.9	5.9	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.8	2.8	

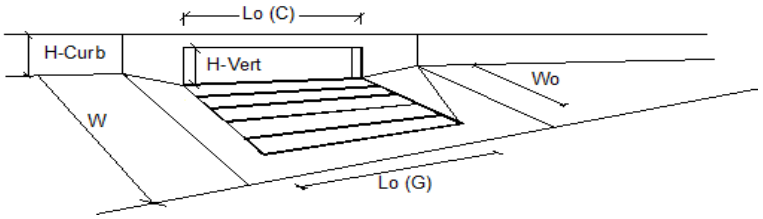
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.8	21.4	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.8	20.6	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.3	7.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	6.4	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	4.0	34.2	cfs
Average Flow Velocity Within the Gutter Section	V =	4.5	7.1	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.5	4.2	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	0.91	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**4.0**	**31.0**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	6.91	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.32	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.0**	**31.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.98 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.25 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

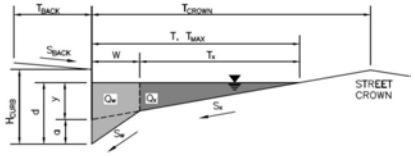


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.0	4.3	cfs
Water Spread Width	T =	4.8	10.6	ft
Water Depth at Flowline (outside of local depression)	d =	2.7	4.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.902	0.548	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.1	1.9	cfs
Discharge within the Gutter Section W	Q_w =	0.9	2.3	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.28	0.51	sq ft
Velocity within the Gutter Section W	V_W =	3.2	4.6	fps
Water Depth for Design Condition	d_{LOCAL} =	7.7	9.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.265	0.169	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.48	9.06	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.48	9.06	ft
Interception Capacity	Q_i =	1.0	4.2	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.48	9.06	ft
Actual Interception Capacity	**Q_a =**	**1.0**	**4.2**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.0**	**4.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**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: **SPRING HILL**
Inlet ID: **16-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

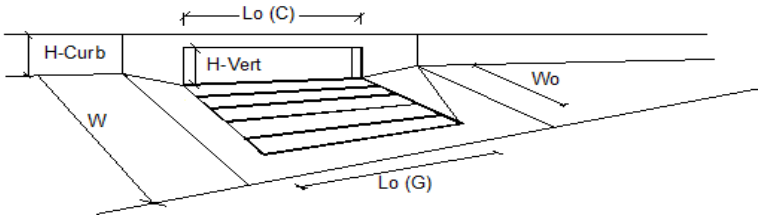
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\ TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.38 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.97 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



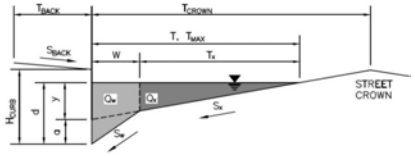
Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.4	6.0	cfs
Water Spread Width	T =	7.1	13.8	ft
Water Depth at Flowline (outside of local depression)	d =	3.2	4.8	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.747	0.430	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.3	3.3	cfs
Discharge within the Gutter Section W	Q_w =	1.0	2.5	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.37	0.64	sq ft
Velocity within the Gutter Section W	V_W =	2.8	3.9	fps
Water Depth for Design Condition	d_{LOCAL} =	8.2	9.8	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.223	0.137	ft/ft
Required Length L_T to Have 100% Interception	L_T =	4.34	11.34	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	4.34	10.00	ft
Interception Capacity	Q_i =	1.4	5.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	4.34	9.63	ft
Actual Interception Capacity	**Q_a =**	**1.4**	**5.6**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.2**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.4**	**5.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.3**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**94**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **15-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.022	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	9.3	9.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	5.0	5.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.2	1.2	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**15.5**	**15.5**	**cfs**
Flow Velocity within the Gutter Section	V =	6.5	6.5	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	3.1	3.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	2.0	23.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	2.0	22.7	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.5	8.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	7.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	4.5	37.8	cfs
Average Flow Velocity Within the Gutter Section	V =	5.0	7.9	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.7	4.7	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	0.77	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**4.5**	**29.2**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	6.61	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.02	inches

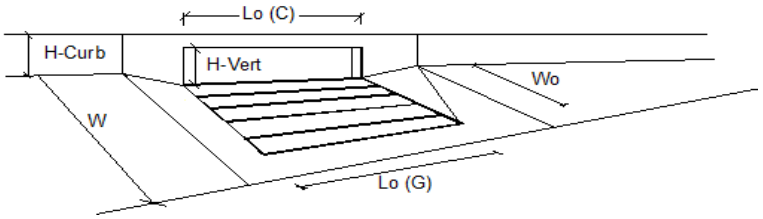
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.5**	**29.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.56 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 8.50 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



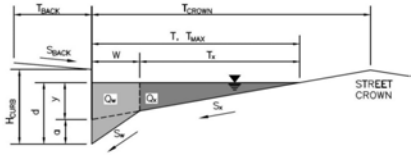
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.6	8.5	cfs
Water Spread Width		T =	6.1	13.6	ft
Water Depth at Flowline (outside of local depression)		d =	3.0	4.8	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.815	0.435	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.3	4.7	cfs
Discharge within the Gutter Section W		Q_w =	1.3	3.6	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.2	cfs
Flow Area within the Gutter Section W		A_W =	0.33	0.63	sq ft
Velocity within the Gutter Section W		V_W =	3.9	5.7	fps
Water Depth for Design Condition		d_{LOCAL} =	8.0	9.8	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.241	0.138	ft/ft
Required Length L_T to Have 100% Interception		L_T =	4.67	14.16	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	4.67	10.00	ft
Interception Capacity		Q_i =	1.6	7.4	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	4.67	9.63	ft
Actual Interception Capacity		**Q_a =**	**1.6**	**7.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**1.1**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.6**	**7.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**1.2**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**85**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL

Inlet ID: 14-B



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

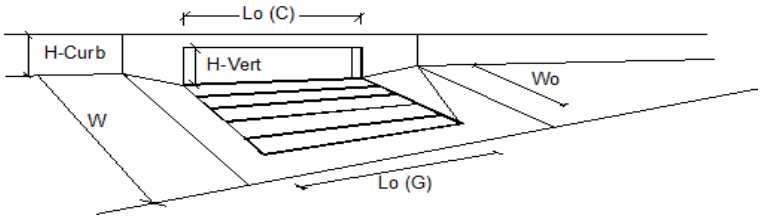
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.23 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.84 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



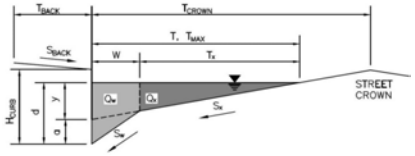
Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.2	5.8	cfs
Water Spread Width	T =	6.6	13.7	ft
Water Depth at Flowline (outside of local depression)	d =	3.1	4.8	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.775	0.432	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.3	3.2	cfs
Discharge within the Gutter Section W	Q_w =	1.0	2.5	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.35	0.63	sq ft
Velocity within the Gutter Section W	V_W =	2.7	3.9	fps
Water Depth for Design Condition	d_{LOCAL} =	8.1	9.8	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.230	0.137	ft/ft
Required Length L_T to Have 100% Interception	L_T =	4.03	11.19	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	4.03	10.00	ft
Interception Capacity	Q_i =	1.2	5.6	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	4.03	9.63	ft
Actual Interception Capacity	**Q_a =**	**1.2**	**5.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.2**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.2**	**5.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.3**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**95**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **13-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.013	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	7.2	7.2	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.9	3.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.9	0.9	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.9**	**11.9**	**cfs**
Flow Velocity within the Gutter Section	V =	5.0	5.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.3	2.3	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.5	18.2	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.5	17.5	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.9	6.2	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.4	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.4	29.0	cfs
Average Flow Velocity Within the Gutter Section	V =	3.8	6.1	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.3	3.6	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.4**	**29.0**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

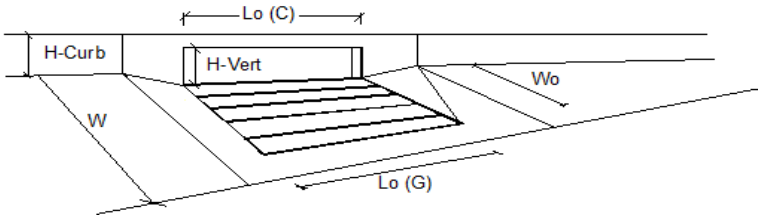
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.4**	**29.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.41 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.56 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	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 =	10.00	10.00	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) =	0.06	0.06	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	0.4	3.6	cfs
Water Spread Width	T =	2.1	10.5	ft
Water Depth at Flowline (outside of local depression)	d =	2.0	4.0	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	1.000	0.551	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.0	1.6	cfs
Discharge within the Gutter Section W	Q_w =	0.4	2.0	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.17	0.51	sq ft
Velocity within the Gutter Section W	V_W =	2.4	3.9	fps
Water Depth for Design Condition	d_{LOCAL} =	7.0	9.0	inches

Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**

Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.291	0.170	ft/ft
Required Length L_T to Have 100% Interception	L_T =	2.10	8.10	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	2.10	8.10	ft
Interception Capacity	Q_i =	0.4	3.6	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	2.10	8.10	ft
Actual Interception Capacity	**Q_a =**	**0.4**	**3.6**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	**cfs**

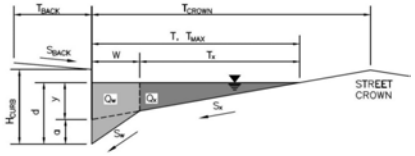
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.4**	**3.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL

Inlet ID: 12-B



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.9	6.9	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.7	3.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.9	0.9	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.5**	**11.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.8	4.8	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.3	2.3	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	17.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.2	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.3	27.9	cfs
Average Flow Velocity Within the Gutter Section	V =	3.7	5.8	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.4	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.3**	**27.9**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

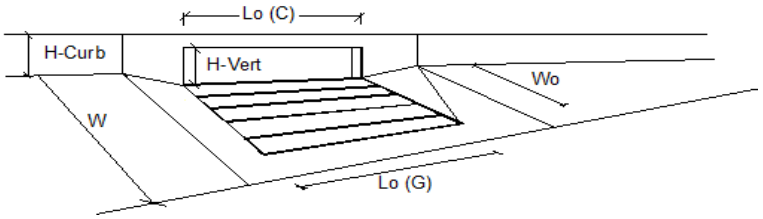
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.3**	**27.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.39 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.50 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



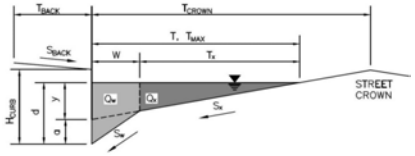
Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	0.4	3.5	cfs
Water Spread Width	T =	2.1	10.7	ft
Water Depth at Flowline (outside of local depression)	d =	2.0	4.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	1.000	0.546	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.0	1.6	cfs
Discharge within the Gutter Section W	Q_w =	0.4	1.9	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.17	0.51	sq ft
Velocity within the Gutter Section W	V_W =	2.3	3.7	fps
Water Depth for Design Condition	d_{LOCAL} =	7.0	9.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.291	0.168	ft/ft
Required Length L_T to Have 100% Interception	L_T =	2.04	8.03	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	2.04	8.03	ft
Interception Capacity	Q_i =	0.4	3.5	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	2.04	8.03	ft
Actual Interception Capacity	**Q_a =**	**0.4**	**3.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.4**	**3.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**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: SPRING HILL

Inlet ID: 11-B



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.9	6.9	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.7	3.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.9	0.9	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.5**	**11.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.8	4.8	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.3	2.3	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\ TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	1.4	17.5	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.8	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.2	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.3	27.9	cfs
Average Flow Velocity Within the Gutter Section	V =	3.7	5.8	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.4	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.3**	**27.9**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

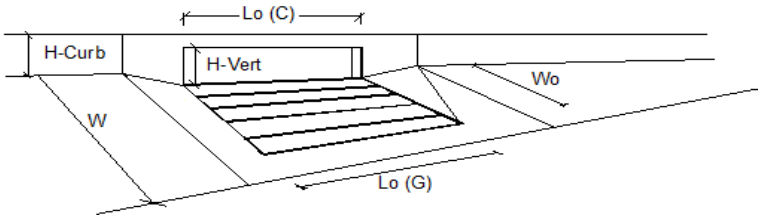
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.3**	**27.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.42 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 12.44 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



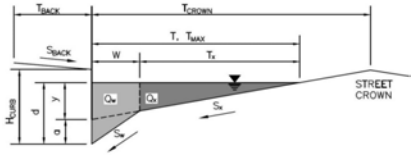
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit 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	
Warning 2 Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.04	0.04	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	2.4	12.4	cfs
Water Spread Width		T =	9.0	17.0	ft
Water Depth at Flowline (outside of local depression)		d =	3.7	5.7	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.1	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.629	0.339	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.9	7.5	cfs
Discharge within the Gutter Section W		Q_w =	1.5	3.9	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	1.1	cfs
Flow Area within the Gutter Section W		A_W =	0.45	0.79	sq ft
Velocity within the Gutter Section W		V_W =	3.4	4.9	fps
Water Depth for Design Condition		d_{LOCAL} =	8.7	10.7	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.191	0.112	ft/ft
Required Length L_T to Have 100% Interception		L_T =	6.28	17.65	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	6.28	15.00	ft
Interception Capacity		Q_i =	2.4	11.0	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.02	0.02	
Effective (Unclogged) Length		L_e =	6.28	14.74	ft
Actual Interception Capacity		**Q_a =**	**2.4**	**10.9**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.4**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**2.4**	**10.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**1.5**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**88**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **10-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.6	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.5	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.0**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	4.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.2	2.2	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

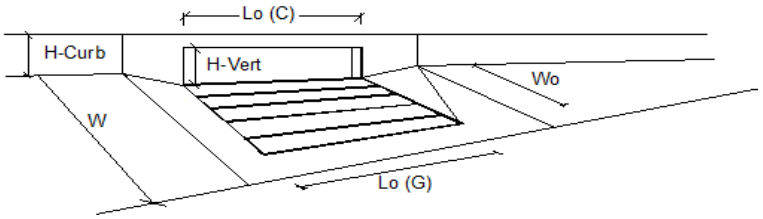
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.22 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.52 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	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 =	10.00	10.00	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) =	0.06	0.06	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.2	5.5	cfs
Water Spread Width	T =	6.4	13.2	ft
Water Depth at Flowline (outside of local depression)	d =	3.1	4.7	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.790	0.450	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.3	3.0	cfs
Discharge within the Gutter Section W	Q_w =	1.0	2.4	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.34	0.61	sq ft
Velocity within the Gutter Section W	V_W =	2.8	4.0	fps
Water Depth for Design Condition	d_{LOCAL} =	8.1	9.7	inches

Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**

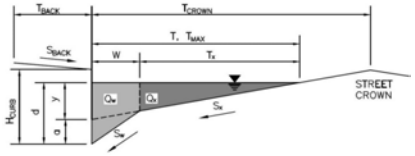
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.234	0.142	ft/ft
Required Length L_T to Have 100% Interception	L_T =	4.01	10.80	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	4.01	10.00	ft
Interception Capacity	Q_i =	1.2	5.4	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	4.01	9.63	ft
Actual Interception Capacity	**Q_a =**	**1.2**	**5.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.1**	**cfs**

Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.2**	**5.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.2**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**97**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **9-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.6	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.5	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.0**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	4.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.2	2.2	

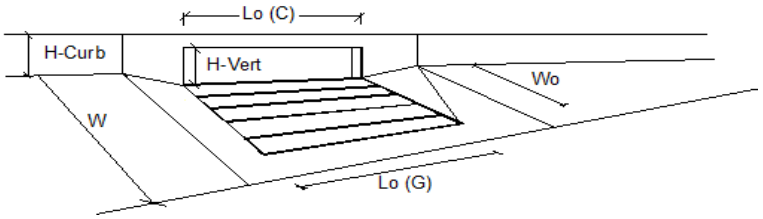
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.20 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 10.48 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

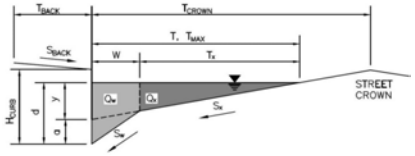


	Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
	Type of Inlet		Type =	CDOT Type R Curb Opening		
	Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
	Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
	Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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	
Warning 2	Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.04	0.04	
	Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
	Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	2.2	10.5	cfs
	Water Spread Width		T =	8.8	16.7	ft
	Water Depth at Flowline (outside of local depression)		d =	3.6	5.5	inches
	Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
	Ratio of Gutter Flow to Design Flow		E_o =	0.642	0.356	
	Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.8	6.3	cfs
	Discharge within the Gutter Section W		Q_w =	1.4	3.5	cfs
	Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.8	cfs
	Flow Area within the Gutter Section W		A_W =	0.44	0.76	sq ft
	Velocity within the Gutter Section W		V_W =	3.2	4.6	fps
	Water Depth for Design Condition		d_{LOCAL} =	8.6	10.5	inches
	Grate Analysis (Calculated)			MINOR	MAJOR	
	Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
	Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
	Under No-Clogging Condition			MINOR	MAJOR	
	Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
	Interception Rate of Frontal Flow		R_f =	N/A	N/A	
	Interception Rate of Side Flow		R_x =	N/A	N/A	
	Interception Capacity		Q_i =	N/A	N/A	cfs
	Under Clogging Condition			MINOR	MAJOR	
	Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
	Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
	Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
	Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
	Interception Rate of Frontal Flow		R_f =	N/A	N/A	
	Interception Rate of Side Flow		R_x =	N/A	N/A	
	Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
	Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
	Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
	Equivalent Slope S_e		S_e =	0.194	0.116	ft/ft
	Required Length L_T to Have 100% Interception		L_T =	5.90	15.93	ft
	Under No-Clogging Condition			MINOR	MAJOR	
	Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	5.90	10.00	ft
	Interception Capacity		Q_i =	2.2	8.1	cfs
	Under Clogging Condition			MINOR	MAJOR	
	Clogging Coefficient		CurbCoeff =	1.25	1.25	
	Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.03	0.03	
	Effective (Unclogged) Length		L_e =	5.90	9.75	ft
	Actual Interception Capacity		**Q_a =**	**2.2**	**8.0**	**cfs**
	Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**1.8**	**cfs**
	Summary			MINOR	MAJOR	
	Total Inlet Interception Capacity		**Q =**	**2.2**	**8.0**	**cfs**
	Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**2.5**	**cfs**
	Capture Percentage = Q_a/Q_o		**C% =**	**100**	**76**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **8-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.6	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.5	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.0**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	4.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.2	2.2	

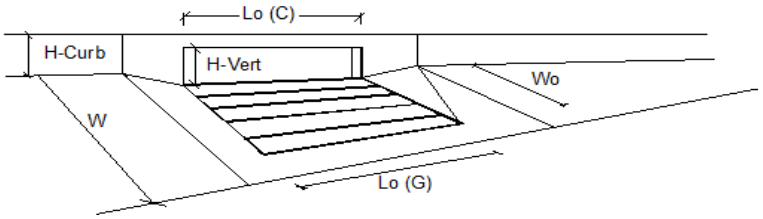
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.04 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 9.42 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

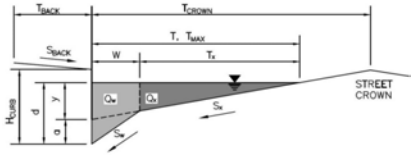


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	2.0	9.4	cfs
Water Spread Width		T =	8.4	16.1	ft
Water Depth at Flowline (outside of local depression)		d =	3.5	5.4	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.660	0.370	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.7	5.6	cfs
Discharge within the Gutter Section W		Q_w =	1.3	3.3	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.6	cfs
Flow Area within the Gutter Section W		A_W =	0.42	0.73	sq ft
Velocity within the Gutter Section W		V_W =	3.2	4.5	fps
Water Depth for Design Condition		d_{LOCAL} =	8.5	10.4	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.199	0.120	ft/ft
Required Length L_T to Have 100% Interception		L_T =	5.61	14.96	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	5.61	10.00	ft
Interception Capacity		Q_i =	2.0	7.6	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	5.61	9.63	ft
Actual Interception Capacity		**Q_a =**	**2.0**	**7.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**1.4**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**2.0**	**7.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**2.0**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**79**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **7-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.6	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.5	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.0**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	4.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.2	2.2	

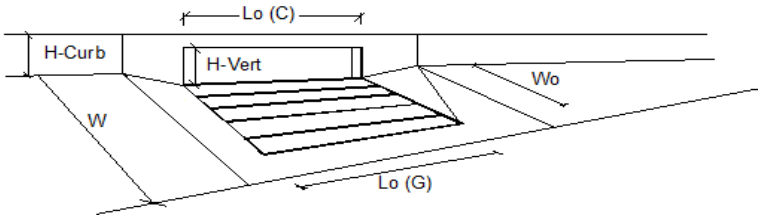
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.09 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.81 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



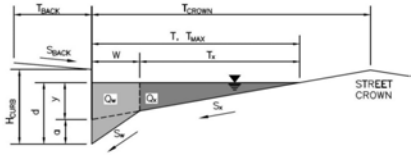
Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.1	5.8	cfs
Water Spread Width	T =	6.0	13.4	ft
Water Depth at Flowline (outside of local depression)	d =	3.0	4.7	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.819	0.441	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.2	3.2	cfs
Discharge within the Gutter Section W	Q_w =	0.9	2.5	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.33	0.62	sq ft
Velocity within the Gutter Section W	V_W =	2.7	4.0	fps
Water Depth for Design Condition	d_{LOCAL} =	8.0	9.7	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.242	0.140	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.73	11.16	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.73	10.00	ft
Interception Capacity	Q_i =	1.1	5.6	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.73	9.63	ft
Actual Interception Capacity	**Q_a =**	**1.1**	**5.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.2**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.1**	**5.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.3**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**95**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **6-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	5.6	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

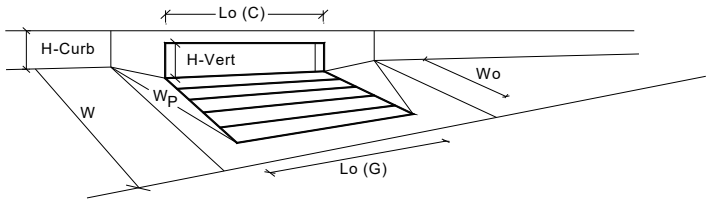
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	17.0	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.349	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

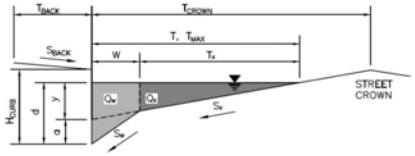


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	5.6	inches
Grate Information		MINOR	MAJOR	Override Depths
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) =	10.00	10.00	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	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) =	0.06	0.06	
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	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.6	7.3	cfs
Interception with Clogging	Q_{wa} =	2.5	7.0	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	19.5	21.8	cfs
Interception with Clogging	Q_{oa} =	18.8	21.0	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	6.7	11.8	cfs
Interception with Clogging	Q_{ma} =	6.4	11.3	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**2.5**	**7.0**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.4	17.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
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} =	0.17	0.30	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} =	0.79	0.91	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.5**	**7.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.9	4.2	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **5-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.6	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.5	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**11.0**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	4.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.2	2.2	

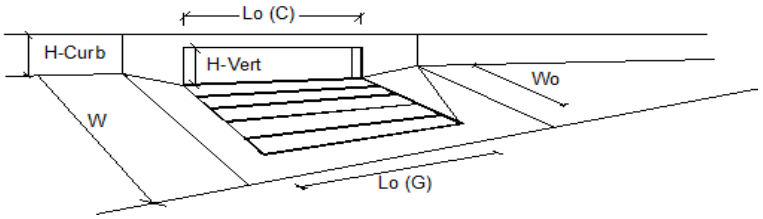
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\ TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.51 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.05 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



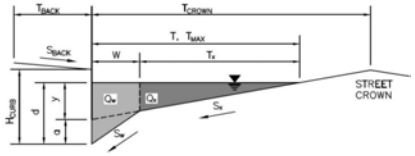
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.5	7.1	cfs
Water Spread Width		T =	7.2	14.5	ft
Water Depth at Flowline (outside of local depression)		d =	3.3	5.0	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.735	0.410	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.4	4.0	cfs
Discharge within the Gutter Section W		Q_w =	1.1	2.8	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.2	cfs
Flow Area within the Gutter Section W		A_W =	0.38	0.66	sq ft
Velocity within the Gutter Section W		V_W =	3.0	4.2	fps
Water Depth for Design Condition		d_{LOCAL} =	8.3	10.0	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.219	0.131	ft/ft
Required Length L_T to Have 100% Interception		L_T =	4.60	12.57	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	4.60	10.00	ft
Interception Capacity		Q_i =	1.5	6.4	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	4.60	9.63	ft
Actual Interception Capacity		**Q_a =**	**1.5**	**6.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.5**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.5**	**6.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.7**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**90**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SPRING HILL

Inlet ID: 4-B



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	5.6	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

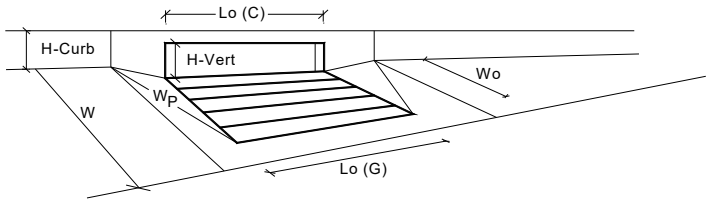
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	17.0	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.349	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

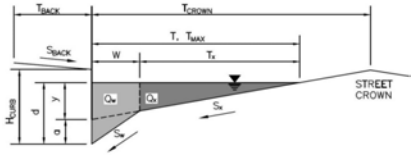


Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	5.6	inches
Grate Information		MINOR	MAJOR	Override Depths
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) =	10.00	10.00	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	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) =	0.06	0.06	
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	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.6	7.3	cfs
Interception with Clogging	Q_{wa} =	2.5	7.0	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	19.5	21.8	cfs
Interception with Clogging	Q_{oa} =	18.8	21.0	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	6.7	11.8	cfs
Interception with Clogging	Q_{ma} =	6.4	11.3	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**2.5**	**7.0**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.4	17.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
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} =	0.17	0.30	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} =	0.79	0.91	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.5**	**7.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.0	6.9	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **3-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	8.9	8.9	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	4.8	4.8	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	1.1	1.1	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**14.8**	**14.8**	**cfs**
Flow Velocity within the Gutter Section	V =	6.2	6.2	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.9	2.9	

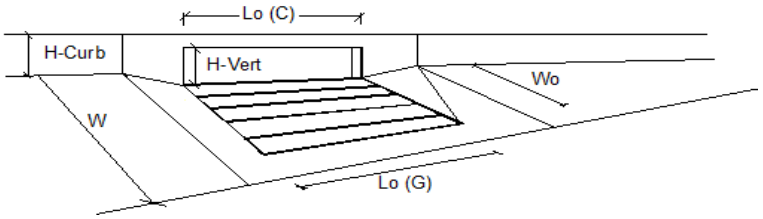
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.9	22.6	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.9	21.7	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	2.4	7.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	6.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	4.3	36.0	cfs
Average Flow Velocity Within the Gutter Section	V =	4.8	7.5	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.6	4.4	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	0.83	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**4.3**	**30.1**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	6.75	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.16	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.3**	**30.1**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.92 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 9.42 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

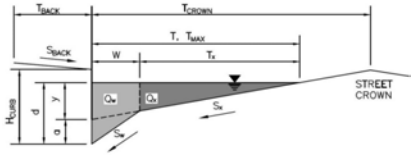


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.9	9.4	cfs
Water Spread Width		T =	7.0	14.4	ft
Water Depth at Flowline (outside of local depression)		d =	3.2	5.0	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.751	0.412	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.5	5.4	cfs
Discharge within the Gutter Section W		Q_w =	1.4	3.8	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.3	cfs
Flow Area within the Gutter Section W		A_W =	0.37	0.66	sq ft
Velocity within the Gutter Section W		V_W =	3.9	5.7	fps
Water Depth for Design Condition		d_{LOCAL} =	8.2	10.0	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.224	0.132	ft/ft
Required Length L_T to Have 100% Interception		L_T =	5.34	15.08	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	5.34	10.00	ft
Interception Capacity		Q_i =	1.9	7.8	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	5.34	9.63	ft
Actual Interception Capacity		**Q_a =**	**1.9**	**7.7**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**1.5**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.9**	**7.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**1.8**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**81**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **2-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	5.6	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

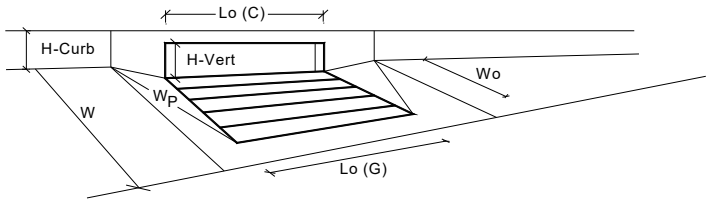
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	17.0	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.349	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



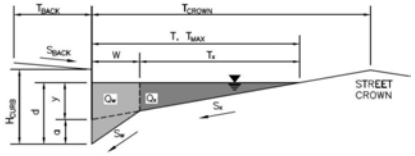
			MINOR	MAJOR	
Design Information (Input)					
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	5.6	inches
Grate Information			MINOR	MAJOR	Override Depths
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) =	15.00	15.00	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		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)	Warning 3	C_f (C) =	0.04	0.04	
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	
Grate Flow Analysis (Calculated)			MINOR	MAJOR	
Clogging Coefficient for Multiple Units		Coef =	N/A	N/A	
Clogging Factor for Multiple Units		Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{wi} =	N/A	N/A	cfs
Interception with Clogging		Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{oi} =	N/A	N/A	cfs
Interception with Clogging		Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow			MINOR	MAJOR	
Interception without Clogging		Q_{mi} =	N/A	N/A	cfs
Interception with Clogging		Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)		**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)			MINOR	MAJOR	
Clogging Coefficient for Multiple Units		Coef =	1.31	1.31	
Clogging Factor for Multiple Units		Clog =	0.02	0.02	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{wi} =	2.9	8.4	cfs
Interception with Clogging		Q_{wa} =	2.9	8.2	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{oi} =	29.3	32.7	cfs
Interception with Clogging		Q_{oa} =	28.7	32.2	cfs
Curb Opening Capacity as Mixed Flow			MINOR	MAJOR	
Interception without Clogging		Q_{mi} =	8.6	15.4	cfs
Interception with Clogging		Q_{ma} =	8.4	15.1	cfs
Resulting Curb Opening Capacity (assumes clogged condition)		**Q_{Curb} =**	**2.9**	**8.2**	**cfs**
Resultant Street Conditions			MINOR	MAJOR	
Total Inlet Length		L =	15.00	15.00	feet
Resultant Street Flow Spread (based on street geometry from above)		T =	10.4	17.0	ft
Resultant Flow Depth at Street Crown		d_{CROWN} =	0.0	0.0	inches
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} =	0.17	0.30	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} =	0.64	0.76	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**2.9**	**8.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK\ REQUIRED}$ =	1.7	8.0	cfs

Warning 3: Clogging Factor is not the recommended value for inlet type specified..

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **1-B**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	5.6	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

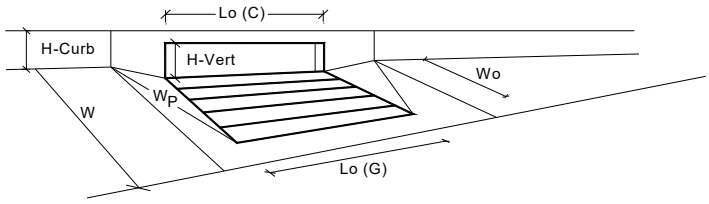
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	17.0	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.349	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	5.6	inches
Grate Information		MINOR	MAJOR	Override Depths
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) =	10.00	10.00	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	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) =	0.06	0.06	
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	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.6	7.3	cfs
Interception with Clogging	Q_{wa} =	2.5	7.0	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	19.5	21.8	cfs
Interception with Clogging	Q_{oa} =	18.8	21.0	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	6.7	11.8	cfs
Interception with Clogging	Q_{ma} =	6.4	11.3	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**2.5**	**7.0**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.4	17.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
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} =	0.17	0.30	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} =	0.79	0.91	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.5**	**7.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.7	3.2	cfs

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	6-C	5-C
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	In Sump	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)	0.9	0.4
Major Q_{Known} (cfs)	4.7	1.5

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**0.9**	**0.4**
Major Total Design Peak Flow, Q (cfs)	**4.7**	**1.5**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	4-C	3-C
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	3.2	0.5
Major Q_{Known} (cfs)	20.6	4.4

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**3.2**	**0.5**
Major Total Design Peak Flow, Q (cfs)	**20.6**	**4.4**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	3.2	0.0

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	2-C	1-C
Site Type (Urban or Rural)		
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	In Sump	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)	1.7	1.2
Major Q_{Known} (cfs)	13.3	4.2

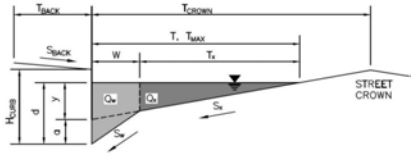
CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.7**	**1.2**
Major Total Design Peak Flow, Q (cfs)	**13.3**	**4.2**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **1-C**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

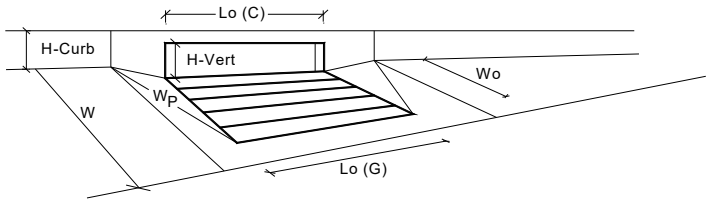
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

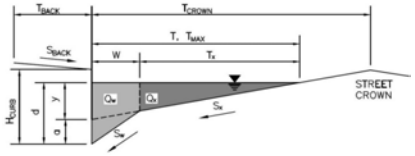


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	5.6	inches
Grate Information		MINOR	MAJOR	Override Depths
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	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	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.1	5.1	cfs
Interception with Clogging	Q_{wa} =	1.9	4.6	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.8	10.9	cfs
Interception with Clogging	Q_{oa} =	8.8	9.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	4.2	6.9	cfs
Interception with Clogging	Q_{ma} =	3.8	6.2	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**1.9**	**4.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.4	17.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
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} =	0.17	0.30	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.9**	**4.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.2	4.2	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**
Inlet ID: **2-C**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

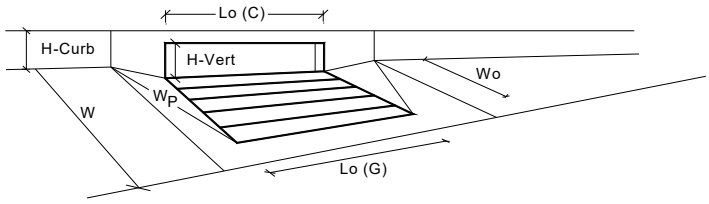
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



			MINOR	MAJOR	
Design Information (Input)					
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	5.6	inches
Grate Information			MINOR	MAJOR	Override Depths
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) =	15.00	15.00	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		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)	Warning 3	C_f (C) =	0.04	0.04	
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	
Grate Flow Analysis (Calculated)			MINOR	MAJOR	
Clogging Coefficient for Multiple Units		Coef =	N/A	N/A	
Clogging Factor for Multiple Units		Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{wi} =	N/A	N/A	cfs
Interception with Clogging		Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{oi} =	N/A	N/A	cfs
Interception with Clogging		Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow			MINOR	MAJOR	
Interception without Clogging		Q_{mi} =	N/A	N/A	cfs
Interception with Clogging		Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)		**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)			MINOR	MAJOR	
Clogging Coefficient for Multiple Units		Coef =	1.33	1.33	
Clogging Factor for Multiple Units		Clog =	0.01	0.01	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{wi} =	5.3	15.1	cfs
Interception with Clogging		Q_{wa} =	5.2	15.0	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{oi} =	58.5	65.5	cfs
Interception with Clogging		Q_{oa} =	58.0	64.9	cfs
Curb Opening Capacity as Mixed Flow			MINOR	MAJOR	
Interception without Clogging		Q_{mi} =	16.3	29.3	cfs
Interception with Clogging		Q_{ma} =	16.2	29.0	cfs
Resulting Curb Opening Capacity (assumes clogged condition)		**Q_{Curb} =**	**5.2**	**15.0**	**cfs**
Resultant Street Conditions			MINOR	MAJOR	
Total Inlet Length		L =	30.00	30.00	feet
Resultant Street Flow Spread (based on street geometry from above)		T =	10.4	17.0	ft
Resultant Flow Depth at Street Crown		d_{CROWN} =	0.0	0.0	inches
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} =	0.17	0.30	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} =	0.64	0.76	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**5.2**	**15.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK\ REQUIRED}$ =	1.7	13.3	cfs

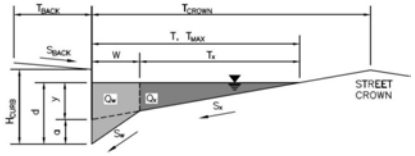
Warning 3: Clogging Factor is not the recommended value for inlet type specified..

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **3-C**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\ TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

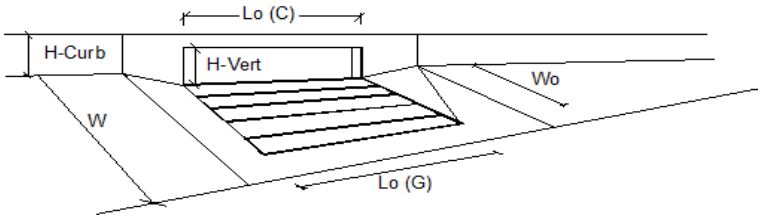
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.49 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.38 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



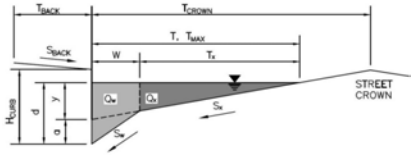
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit 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	
Warning 2 Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.04	0.04	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	0.5	4.4	cfs
Water Spread Width		T =	3.5	12.2	ft
Water Depth at Flowline (outside of local depression)		d =	2.3	4.4	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.974	0.483	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.0	2.2	cfs
Discharge within the Gutter Section W		Q_w =	0.5	2.1	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.22	0.57	sq ft
Velocity within the Gutter Section W		V_W =	2.1	3.7	fps
Water Depth for Design Condition		d_{LOCAL} =	7.3	9.4	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.284	0.151	ft/ft
Required Length L_T to Have 100% Interception		L_T =	2.29	9.32	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	2.29	9.32	ft
Interception Capacity		Q_i =	0.5	4.4	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.02	0.02	
Effective (Unclogged) Length		L_e =	2.29	9.32	ft
Actual Interception Capacity		**Q_a =**	**0.5**	**4.4**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.0**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.5**	**4.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**99**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **4-C**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

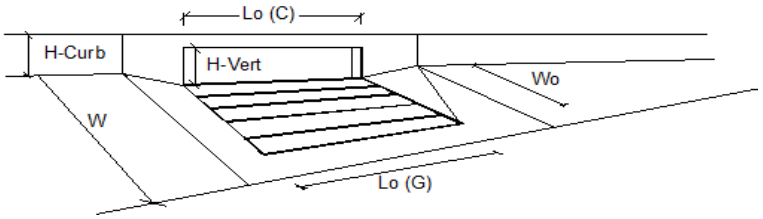
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.0**	**25.5**	**cfs**

WARNING: MINOR STORM max. allowable capacity is less than the design peak flow of 3.17 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 20.56 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



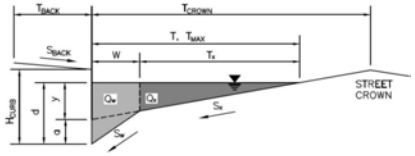
			MINOR	MAJOR	
Design Information (Input)	CDOT Type R Curb Opening				
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	2	2	
Length of a Single 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	
Warning 2	Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.04	0.04	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR & MAJOR STORM			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	3.2	20.6	cfs
Water Spread Width		T =	10.6	17.0	ft
Water Depth at Flowline (outside of local depression)		d =	4.1	6.7	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	1.1	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.548	0.278	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	1.4	12.5	cfs
Discharge within the Gutter Section W		Q_w =	1.7	4.8	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	3.2	cfs
Flow Area within the Gutter Section W		A_W =	0.51	0.95	sq ft
Velocity within the Gutter Section W		V_W =	3.4	5.1	fps
Water Depth for Design Condition		d_{LOCAL} =	9.1	11.7	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.169	0.095	ft/ft
Required Length L_T to Have 100% Interception		L_T =	7.54	23.30	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	7.54	23.30	ft
Interception Capacity		Q_i =	3.2	17.3	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.33	1.33	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.01	0.01	
Effective (Unclogged) Length		L_e =	7.54	23.30	ft
Actual Interception Capacity		**Q_a =**	**3.2**	**17.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.0**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**3.2**	**17.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**3.2**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**84**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **5-C**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

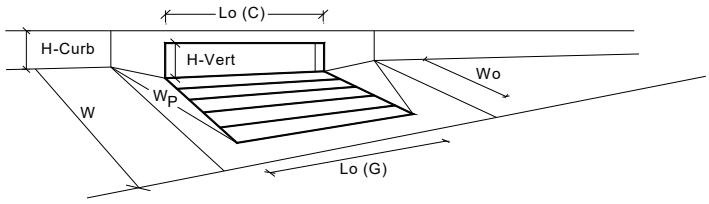
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



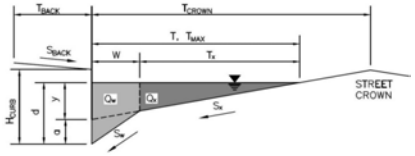
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	5.6	inches
Grate Information		MINOR	MAJOR	Override Depths
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	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	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.1	5.1	cfs
Interception with Clogging	Q_{wa} =	1.9	4.6	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.8	10.9	cfs
Interception with Clogging	Q_{oa} =	8.8	9.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	4.2	6.9	cfs
Interception with Clogging	Q_{ma} =	3.8	6.2	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**1.9**	**4.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.4	17.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
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} =	0.17	0.30	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.9**	**4.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.4	1.5	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **SPRING HILL**

Inlet ID: **6-C**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

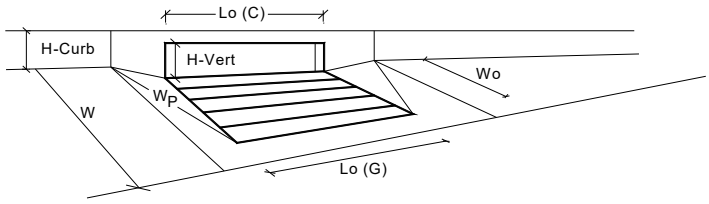
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	5.6	inches
Grate Information		MINOR	MAJOR	Override Depths
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) =	10.00	10.00	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	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) =	0.06	0.06	
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	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.6	7.3	cfs
Interception with Clogging	Q_{wa} =	2.5	7.0	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	19.5	21.8	cfs
Interception with Clogging	Q_{oa} =	18.8	21.0	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	6.7	11.8	cfs
Interception with Clogging	Q_{ma} =	6.4	11.3	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**2.5**	**7.0**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.4	17.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
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} =	0.17	0.30	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} =	0.79	0.91	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.5**	**7.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.9	4.7	cfs

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	7D	6D	5D
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	In Sump	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.3	0.7	0.7
Major Q_{Known} (cfs)	6.1	10.0	6.0

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	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)	**1.3**	**0.7**	**0.7**
Major Total Design Peak Flow, Q (cfs)	**6.1**	**10.0**	**6.0**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.4	N/A	0.4

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	4D	3D	2D
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.7	0.1	2.5
Major Q_{Known} (cfs)	7.2	0.9	14.9

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	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)	**1.7**	**0.1**	**2.5**
Major Total Design Peak Flow, Q (cfs)	**7.2**	**0.9**	**14.9**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.9	0.0	N/A

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	1D
Site Type (Urban or Rural)	URBAN
Inlet Application (Street or Area)	STREET
Hydraulic Condition	In Sump
Inlet Type	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	3.1
Major Q_{Known} (cfs)	15.4

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	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)	

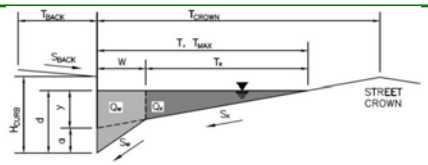
CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**3.1**
Major Total Design Peak Flow, Q (cfs)	**15.4**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SpringHill E5X
Inlet ID: 7D



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	2.64	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	4.15	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	9.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.532	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	1.7	6.6	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	1.9	3.5	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**3.6**	**11.0**	**cfs**
Flow Velocity within the Gutter Section	V =	3.6	4.6	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	1.3	2.2	

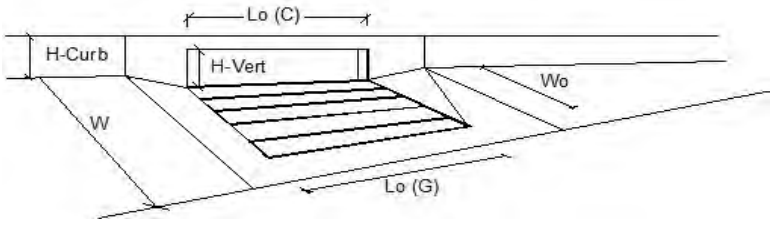
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.1	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.7	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.34 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 6.05 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

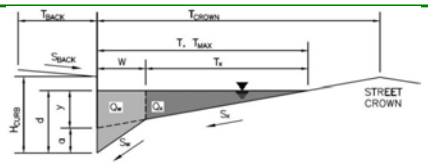


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.3	6.1	cfs
Water Spread Width	T =	6.8	13.6	ft
Water Depth at Flowline (outside of local depression)	d =	3.1	4.8	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.766	0.435	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.3	3.3	cfs
Discharge within the Gutter Section W	Q_w =	1.0	2.6	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.36	0.63	sq ft
Velocity within the Gutter Section W	V_W =	2.9	4.1	fps
Water Depth for Design Condition	d_{LOCAL} =	8.1	9.8	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.228	0.138	ft/ft
Required Length L_T to Have 100% Interception	L_T =	4.26	11.44	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	4.26	10.00	ft
Interception Capacity	Q_i =	1.3	5.8	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	4.26	9.38	ft
Actual Interception Capacity	**Q_a =**	**1.3**	**5.7**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.3**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.3**	**5.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.4**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**93**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SpringHill E5X
Inlet ID: 6D



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	5.6	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	2.64	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	4.15	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	9.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.532	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

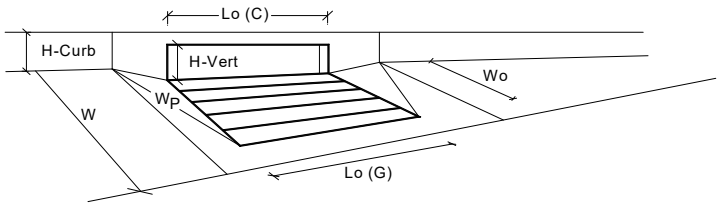
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	17.0	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.349	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			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 5.03 (August 2023)

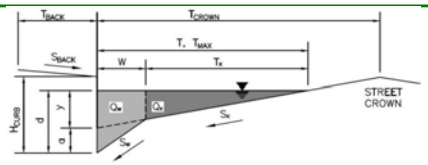


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	5.6	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
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) =	10.00	10.00	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	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	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.6	7.3	cfs
Interception with Clogging	Q_{wa} =	2.5	6.9	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	19.5	21.8	cfs
Interception with Clogging	Q_{oa} =	18.3	20.5	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	6.7	11.8	cfs
Interception with Clogging	Q_{ma} =	6.3	11.0	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**2.5**	**6.9**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.4	17.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
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} =	0.17	0.30	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} =	0.79	0.91	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.5**	**6.9**	**cfs**
WARNING: Inlet Capacity < Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	0.7	10.0	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SpringHill E5X
Inlet ID: 5D



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	2.64	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	4.15	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	9.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.532	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	1.6	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	1.8	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**3.4**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	3.5	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	1.2	2.1	

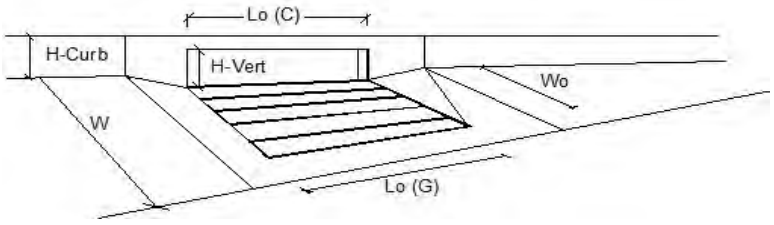
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.68 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 6.03 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

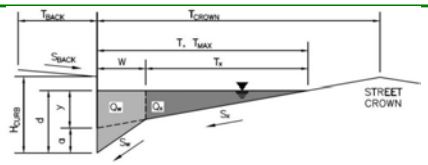


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	0.7	6.0	cfs
Water Spread Width	T =	4.6	13.9	ft
Water Depth at Flowline (outside of local depression)	d =	2.6	4.8	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.917	0.427	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.1	3.4	cfs
Discharge within the Gutter Section W	Q_w =	0.6	2.5	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.1	cfs
Flow Area within the Gutter Section W	A_W =	0.27	0.64	sq ft
Velocity within the Gutter Section W	V_W =	2.3	3.9	fps
Water Depth for Design Condition	d_{LOCAL} =	7.6	9.8	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.269	0.136	ft/ft
Required Length L_T to Have 100% Interception	L_T =	2.78	11.42	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	2.78	10.00	ft
Interception Capacity	Q_i =	0.7	5.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	2.78	9.38	ft
Actual Interception Capacity	**Q_a =**	**0.7**	**5.6**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.3**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.7**	**5.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.4**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**93**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SpringHill E5X
Inlet ID: 4D



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	2.64	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	4.15	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	9.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.532	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	1.6	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	1.8	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**3.4**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	3.5	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	1.2	2.1	

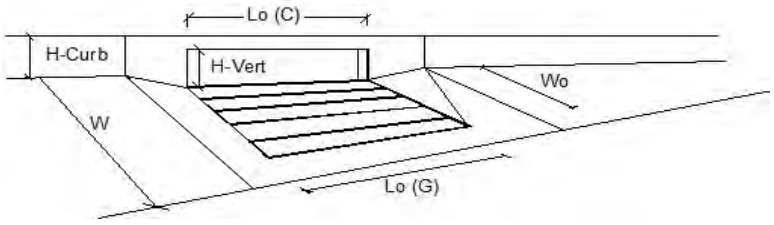
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.0**	**25.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.71 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.15 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

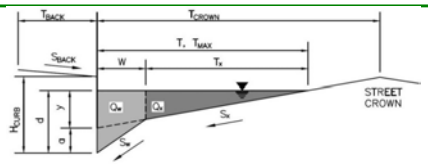


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.7	7.2	cfs
Water Spread Width	T =	7.9	14.8	ft
Water Depth at Flowline (outside of local depression)	d =	3.4	5.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.693	0.401	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.5	4.1	cfs
Discharge within the Gutter Section W	Q_w =	1.2	2.8	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.3	cfs
Flow Area within the Gutter Section W	A_W =	0.40	0.68	sq ft
Velocity within the Gutter Section W	V_W =	2.9	4.1	fps
Water Depth for Design Condition	d_{LOCAL} =	8.4	10.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.208	0.129	ft/ft
Required Length L_T to Have 100% Interception	L_T =	5.00	12.67	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	5.00	10.00	ft
Interception Capacity	Q_i =	1.7	6.5	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	5.00	9.38	ft
Actual Interception Capacity	**Q_a =**	**1.7**	**6.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.6**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.7**	**6.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.9**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**88**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SpringHill E5X
Inlet ID: 3D



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.5	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	17.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	2.64	4.20	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	4.15	5.71	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	9.0	15.5	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.532	0.340	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	1.7	7.2	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	1.9	3.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	1.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**3.6**	**11.9**	**cfs**
Flow Velocity within the Gutter Section	V =	3.6	4.7	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	1.3	2.2	

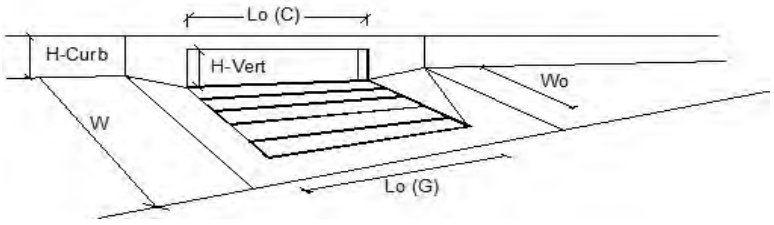
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.4	16.7	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.4	16.2	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.8	5.7	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	5.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.2	26.8	cfs
Average Flow Velocity Within the Gutter Section	V =	3.5	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.2	3.3	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.2**	**26.8**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.39	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.2**	**26.8**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.09 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 0.94 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

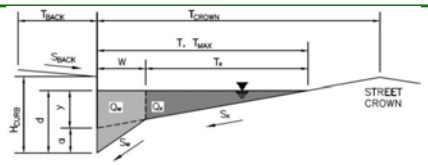


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	0.1	0.9	cfs
Water Spread Width	T =	1.2	5.5	ft
Water Depth at Flowline (outside of local depression)	d =	1.8	2.8	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	1.000	0.854	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.0	0.1	cfs
Discharge within the Gutter Section W	Q_w =	0.1	0.8	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.00	0.31	sq ft
Velocity within the Gutter Section W	V_W =	0.0	2.6	fps
Water Depth for Design Condition	d_{LOCAL} =	6.8	7.8	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.291	0.252	ft/ft
Required Length L_T to Have 100% Interception	L_T =	0.96	3.39	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	0.96	3.39	ft
Interception Capacity	Q_i =	0.1	0.9	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	0.96	3.39	ft
Actual Interception Capacity	**Q_a =**	**0.1**	**0.9**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.1**	**0.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**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: SpringHill E5X
Inlet ID: 2D



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	2.64	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	4.15	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	9.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.532	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

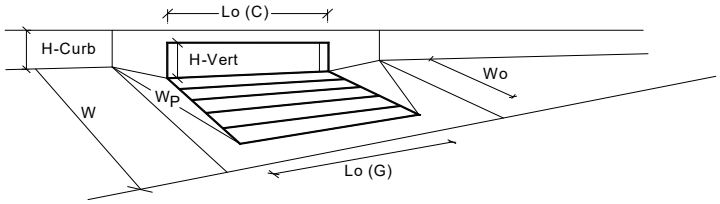
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			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 5.03 (August 2023)



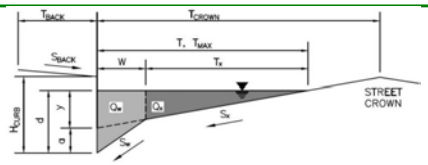
			MINOR	MAJOR	
Design Information (Input)	CDOT Type R Curb Opening				
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	7.1	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
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) =	15.00	15.00	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		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
Warning 3	Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.04	0.04	
	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	
Grate Flow Analysis (Calculated)			MINOR	MAJOR	
Clogging Coefficient for Multiple Units		Coef =	N/A	N/A	
Clogging Factor for Multiple Units		Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{wi} =	N/A	N/A	cfs
Interception with Clogging		Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{oi} =	N/A	N/A	cfs
Interception with Clogging		Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow			MINOR	MAJOR	
Interception without Clogging		Q_{mi} =	N/A	N/A	cfs
Interception with Clogging		Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)		**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)			MINOR	MAJOR	
Clogging Coefficient for Multiple Units		Coef =	1.31	1.31	
Clogging Factor for Multiple Units		Clog =	0.02	0.02	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{wi} =	2.9	15.8	cfs
Interception with Clogging		Q_{wa} =	2.9	15.5	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{oi} =	29.3	35.7	cfs
Interception with Clogging		Q_{oa} =	28.7	35.0	cfs
Curb Opening Capacity as Mixed Flow			MINOR	MAJOR	
Interception without Clogging		Q_{mi} =	8.6	22.1	cfs
Interception with Clogging		Q_{ma} =	8.4	21.7	cfs
Resulting Curb Opening Capacity (assumes clogged condition)		**Q_{Curb} =**	**2.9**	**15.5**	**cfs**
Resultant Street Conditions			MINOR	MAJOR	
Total Inlet Length		L =	15.00	15.00	feet
Resultant Street Flow Spread (based on street geometry from above)		T =	10.4	23.3	**ft. >T-Crown**
Resultant Flow Depth at Street Crown		d_{CROWN} =	0.0	1.5	inches
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} =	0.17	0.43	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} =	0.64	0.85	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**2.9**	**15.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK\ REQUIRED}$ =	2.5	14.9	cfs

Warning 3: Clogging Factor is not the recommended value for inlet type specified..

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: SpringHill E5X
Inlet ID: 1D



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	2.64	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	4.15	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	9.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.532	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

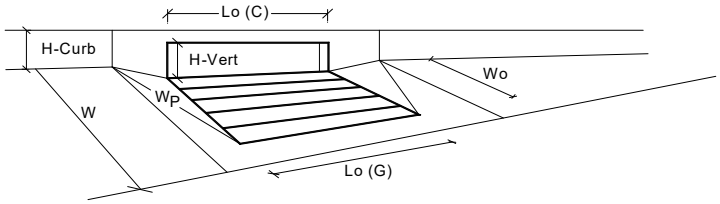
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			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 5.03 (August 2023)



			MINOR	MAJOR	
Design Information (Input)	CDOT Type R Curb Opening				
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.1	7.1	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
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) =	15.00	15.00	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		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
Warning 3	Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.04	0.04	
	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	
Grate Flow Analysis (Calculated)			MINOR	MAJOR	
Clogging Coefficient for Multiple Units		Coef =	N/A	N/A	
Clogging Factor for Multiple Units		Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{wi} =	N/A	N/A	cfs
Interception with Clogging		Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{oi} =	N/A	N/A	cfs
Interception with Clogging		Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow			MINOR	MAJOR	
Interception without Clogging		Q_{mi} =	N/A	N/A	cfs
Interception with Clogging		Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)		**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)			MINOR	MAJOR	
Clogging Coefficient for Multiple Units		Coef =	1.31	1.31	
Clogging Factor for Multiple Units		Clog =	0.02	0.02	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{wi} =	3.2	15.8	cfs
Interception with Clogging		Q_{wa} =	3.1	15.5	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)			MINOR	MAJOR	
Interception without Clogging		Q_{oi} =	29.5	35.7	cfs
Interception with Clogging		Q_{oa} =	28.9	35.0	cfs
Curb Opening Capacity as Mixed Flow			MINOR	MAJOR	
Interception without Clogging		Q_{mi} =	9.0	22.1	cfs
Interception with Clogging		Q_{ma} =	8.8	21.7	cfs
Resulting Curb Opening Capacity (assumes clogged condition)		**Q_{Curb} =**	**3.1**	**15.5**	**cfs**
Resultant Street Conditions			MINOR	MAJOR	
Total Inlet Length		L =	15.00	15.00	feet
Resultant Street Flow Spread (based on street geometry from above)		T =	10.8	23.3	**ft. >T-Crown**
Resultant Flow Depth at Street Crown		d_{CROWN} =	0.0	1.5	inches
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} =	0.18	0.43	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} =	0.65	0.85	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**3.1**	**15.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK\ REQUIRED}$ =	3.1	15.4	cfs

Warning 3: Clogging Factor is not the recommended value for inlet type specified..

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	8-E	7-E	6-E
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.67	1.52	2.24
Major Q_{Known} (cfs)	11.56	7.00	9.86

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	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)	**2.67**	**1.52**	**2.24**
Major Total Design Peak Flow, Q (cfs)	**11.56**	**7.00**	**9.86**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	1.27	0.74	2.25

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	5-E	4-E	3-E
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.69	2.06	1.02
Major Q_{Known} (cfs)	6.87	9.67	7.49

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	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)	**1.69**	**2.06**	**1.02**
Major Total Design Peak Flow, Q (cfs)	**6.87**	**9.67**	**7.49**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	0.69	2.14	0.96

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	E3-OS	2-E	1-E
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	AREA	STREET	STREET
Hydraulic Condition	Swale	In Sump	In Sump
Inlet Type	CDOT Type C (Depressed)	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.68	2.00	1.99
Major Q_{Known} (cfs)	8.90	8.03	8.03

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	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)			

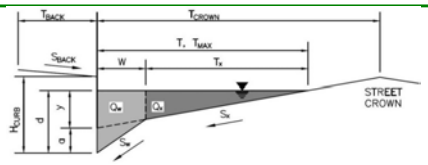
CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**0.68**	**2.00**	**1.99**
Major Total Design Peak Flow, Q (cfs)	**8.90**	**8.03**	**8.03**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.00	N/A	N/A

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Spring Hill Pond E
Inlet ID: 8-E



Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016		
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018		

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

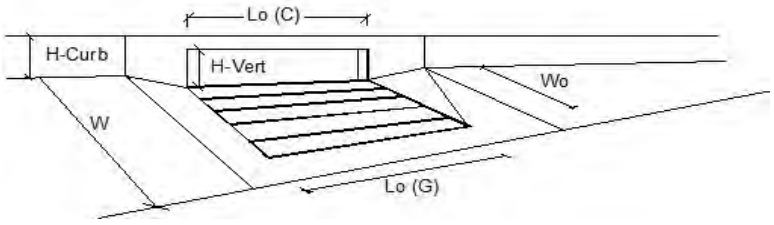
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**3.0**	**10.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.67 cfs on sheet 'Inlet Management'
WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 11.56 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

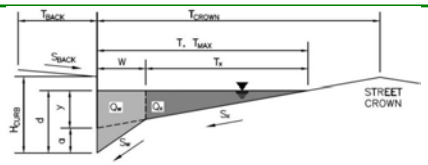


			MINOR	MAJOR	
Design Information (Input)	CDOT Type R Curb Opening				
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single 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	
Warning 2	Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.04	0.04	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	2.7	11.6	cfs
Water Spread Width		T =	9.8	17.0	ft
Water Depth at Flowline (outside of local depression)		d =	3.9	5.7	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.1	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.586	0.337	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	1.1	7.0	cfs
Discharge within the Gutter Section W		Q_w =	1.6	3.6	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	1.0	cfs
Flow Area within the Gutter Section W		A_W =	0.48	0.79	sq ft
Velocity within the Gutter Section W		V_W =	3.3	4.5	fps
Water Depth for Design Condition		d_{LOCAL} =	8.9	10.7	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.179	0.111	ft/ft
Required Length L_T to Have 100% Interception		L_T =	6.72	16.84	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	6.72	15.00	ft
Interception Capacity		Q_i =	2.7	10.3	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.02	0.02	
Effective (Unclogged) Length		L_e =	6.72	14.71	ft
Actual Interception Capacity		**Q_a =**	**2.7**	**10.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.3**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**2.7**	**10.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**1.3**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**89**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Spring Hill Pond E
Inlet ID: 7-E



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

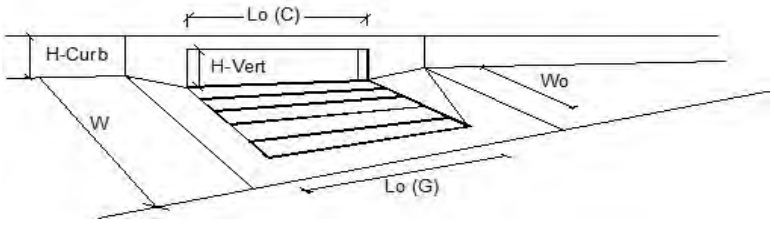
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**3.0**	**10.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.52 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.00 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

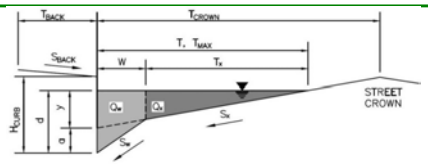


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	1.5	7.0	cfs
Water Spread Width		T =	7.5	14.7	ft
Water Depth at Flowline (outside of local depression)		d =	3.3	5.0	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.721	0.404	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.4	4.0	cfs
Discharge within the Gutter Section W		Q_w =	1.1	2.7	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.3	cfs
Flow Area within the Gutter Section W		A_W =	0.38	0.67	sq ft
Velocity within the Gutter Section W		V_W =	2.9	4.0	fps
Water Depth for Design Condition		d_{LOCAL} =	8.3	10.0	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e		S_e =	0.216	0.130	ft/ft
Required Length L_T to Have 100% Interception		L_T =	4.63	12.51	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	4.63	10.00	ft
Interception Capacity		Q_i =	1.5	6.4	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	4.63	9.61	ft
Actual Interception Capacity		**Q_a =**	**1.5**	**6.3**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.0**	**0.5**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.5**	**6.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.7**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**100**	**89**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Spring Hill Pond E
Inlet ID: 6-E



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

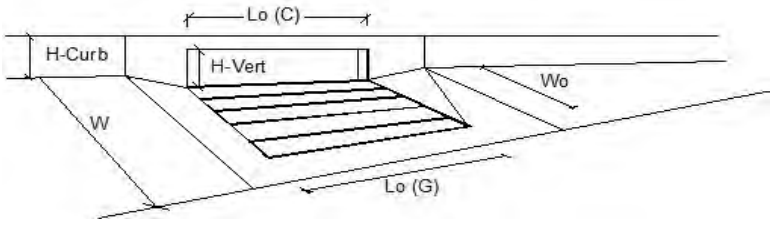
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**3.0**	**10.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.24 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 9.86 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

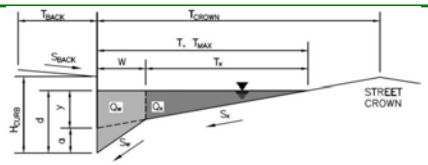


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	2.2	9.9	cfs
Water Spread Width	T =	9.0	16.6	ft
Water Depth at Flowline (outside of local depression)	d =	3.7	5.5	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.626	0.357	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.8	5.9	cfs
Discharge within the Gutter Section W	Q_w =	1.4	3.3	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.7	cfs
Flow Area within the Gutter Section W	A_W =	0.45	0.75	sq ft
Velocity within the Gutter Section W	V_W =	3.1	4.4	fps
Water Depth for Design Condition	d_{LOCAL} =	8.7	10.5	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.190	0.117	ft/ft
Required Length L_T to Have 100% Interception	L_T =	5.98	15.34	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	5.98	10.00	ft
Interception Capacity	Q_i =	2.2	7.8	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	5.98	9.61	ft
Actual Interception Capacity	**Q_a =**	**2.2**	**7.6**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**1.6**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.2**	**7.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.3**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**77**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Spring Hill Pond E
Inlet ID: 5-E



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

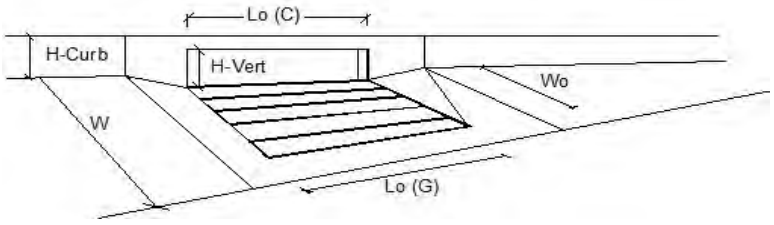
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**3.0**	**10.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.69 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 6.87 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

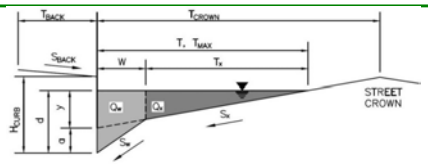


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.7	6.9	cfs
Water Spread Width	T =	7.9	14.6	ft
Water Depth at Flowline (outside of local depression)	d =	3.4	5.0	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.694	0.407	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.5	3.9	cfs
Discharge within the Gutter Section W	Q_w =	1.2	2.7	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.2	cfs
Flow Area within the Gutter Section W	A_W =	0.40	0.67	sq ft
Velocity within the Gutter Section W	V_W =	2.9	4.0	fps
Water Depth for Design Condition	d_{LOCAL} =	8.4	10.0	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.208	0.130	ft/ft
Required Length L_T to Have 100% Interception	L_T =	4.96	12.37	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	4.96	10.00	ft
Interception Capacity	Q_i =	1.7	6.3	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	4.96	9.61	ft
Actual Interception Capacity	**Q_a =**	**1.7**	**6.2**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.4**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.7**	**6.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.7**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**90**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Spring Hill Pond E**
Inlet ID: **4-E**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	5.5	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	2.40	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	3.91	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	8.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.577	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	1.2	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	1.6	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**2.8**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	3.3	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	1.1	2.1	

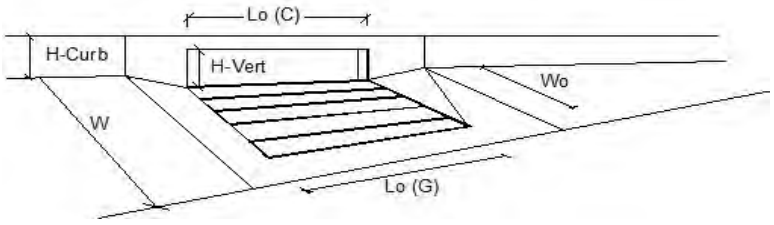
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	16.6	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	14.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.358	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	5.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	5.9	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	3.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	9.8	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	4.4	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	2.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**9.8**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	5.50	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	0.00	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**2.8**	**9.8**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.06 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 9.67 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

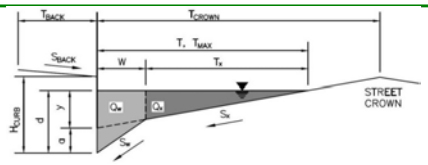


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	2.1	9.7	cfs
Water Spread Width	T =	8.7	16.5	ft
Water Depth at Flowline (outside of local depression)	d =	3.6	5.5	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.646	0.359	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.7	5.8	cfs
Discharge within the Gutter Section W	Q_w =	1.3	3.2	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.7	cfs
Flow Area within the Gutter Section W	A_W =	0.43	0.75	sq ft
Velocity within the Gutter Section W	V_W =	3.1	4.3	fps
Water Depth for Design Condition	d_{LOCAL} =	8.6	10.5	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.195	0.117	ft/ft
Required Length L_T to Have 100% Interception	L_T =	5.66	15.18	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	5.66	10.00	ft
Interception Capacity	Q_i =	2.1	7.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	5.66	9.61	ft
Actual Interception Capacity	**Q_a =**	**2.1**	**7.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**1.5**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.1**	**7.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.1**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**78**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Spring Hill Pond E
Inlet ID: 3-E



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	6.3	6.3	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	3.4	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.8	0.8	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	4.4	4.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	2.1	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	23.3	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	21.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.253	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	1.3	15.9	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	1.3	15.3	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	1.7	5.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	4.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	3.0	25.5	cfs
Average Flow Velocity Within the Gutter Section	V =	3.4	5.3	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	1.1	3.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	1.00	1.00	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**3.0**	**25.5**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.00	7.10	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.51	inches

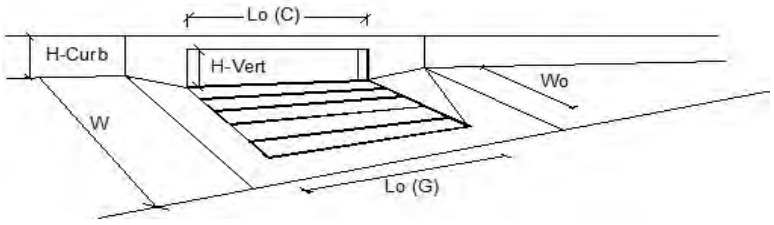
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**3.0**	**10.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.02 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.49 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

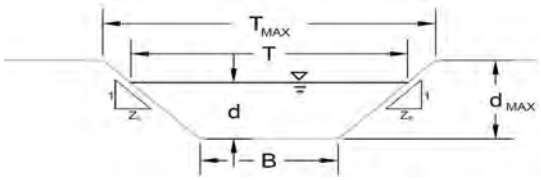
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	5.0	5.0	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 =	10.00	10.00	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) =	0.06	0.06	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.0	7.5	cfs
Water Spread Width	T =	6.0	15.1	ft
Water Depth at Flowline (outside of local depression)	d =	2.9	5.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.822	0.395	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.2	4.3	cfs
Discharge within the Gutter Section W	Q_w =	0.8	2.8	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.3	cfs
Flow Area within the Gutter Section W	A_W =	0.32	0.69	sq ft
Velocity within the Gutter Section W	V_W =	2.6	4.1	fps
Water Depth for Design Condition	d_{LOCAL} =	7.9	10.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.243	0.127	ft/ft
Required Length L_T to Have 100% Interception	L_T =	3.57	13.02	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	3.57	10.00	ft
Interception Capacity	Q_i =	1.0	6.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	3.57	9.61	ft
Actual Interception Capacity	**Q_a =**	**1.0**	**6.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.6**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.0**	**6.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**87**	**%**

AREA INLET IN A SWALE

Spring Hill Pond E
E3-OS



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.035	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	4.00	ft
Left Side Slope	Z1 =	5.00	ft/ft
Right Side Sloe	Z2 =	5.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- ○ Non-Cohesive
- ◉ Cohesive
- ○ Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**25.00**	**25.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.75**	**1.75**	**ft**

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Maximum Allowable Top Width	T_{MAX} =	**25.00**	**25.00**	**ft**
Water Depth	d =	2.10	2.10	ft
Flow Area	A =	30.45	30.45	sq ft
Wetted Perimeter	P =	25.42	25.42	ft
Hydraulic Radius	R =	1.20	1.20	ft
Manning's n	n =	0.035	0.035	
Flow Velocity	V =	6.79	6.79	fps
Velocity-Depth Product	VR =	8.14	8.14	ft^2/s
Hydraulic Depth	D =	1.22	1.22	ft
Froude Number	Fr =	1.08	1.08	
Maximum Flow Based on Allowable Water Depth	Q_T =	**206.8**	**206.8**	**cfs**

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Maximum Allowable Water Depth	d_{MAX} =	**1.75**	**1.75**	**ft**
Top Width	T =	21.50	21.50	ft
Flow Area	A =	22.31	22.31	sq ft
Wetted Perimeter	P =	21.85	21.85	ft
Hydraulic Radius	R =	1.02	1.02	ft
Manning's n	n =	0.035	0.035	
Flow Velocity	V =	6.11	6.11	fps
Velocity-Depth Product	VR =	6.24	6.24	ft^2/s
Hydraulic Depth	D =	1.04	1.04	ft
Froude Number	Fr =	1.06	1.06	
Maximum Flow Based On Allowable Water Depth	Q_d =	**136.2**	**136.2**	**cfs**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**136.2**	**136.2**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**1.75**	**1.75**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**0.7**	**8.9**	**cfs**
Water Depth	d =	**0.11**	**0.47**	**ft**
Top Width	T =	5.14	8.74	ft
Flow Area	A =	0.52	3.02	sq ft
Wetted Perimeter	P =	5.16	8.84	ft
Hydraulic Radius	R =	0.10	0.34	ft
Manning's n	n =	0.035	0.035	
Flow Velocity	V =	1.31	2.94	fps
Velocity-Depth Product	VR =	0.13	1.01	ft^2/s
Hydraulic Depth	D =	0.10	0.35	ft
Warning 04 Froude Number	Fr =	0.72	0.88	

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

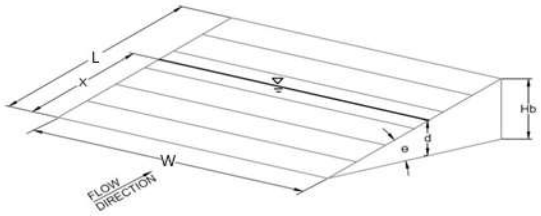
AREA INLET IN A SWALE

Spring Hill Pond E

E3-OS

Inlet Design Information (Input)

Type of Inlet	CDOT Type C (Depressed)	Inlet Type =	CDOT Type C (Depressed)	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	0.84	
Orifice Coefficient		C_o =	0.56	
Weir Coefficient		C_w =	1.81	



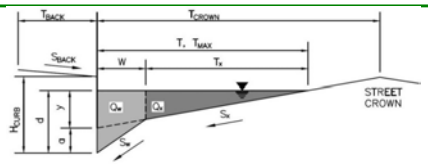
		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.11	1.47	
Grate Capacity as a Weir				
Submerged Side Weir Length	X =	3.00	3.00	ft
Inclined Side Weir Flow	Q_{ws} =	11.2	17.0	cfs
Base Weir Flow	Q_{wb} =	15.9	24.3	cfs
Interception Without Cloggging	Q_{wi} =	38.2	58.2	cfs
Interception With Clogging	Q_{wa} =	19.1	29.1	cfs
Grate Capacity as an Orifice				
Interception Without Clogging	Q_{oi} =	30.0	34.5	cfs
Interception With Clogging	Q_{oa} =	15.0	17.3	cfs
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**15.0**	**17.3**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Spring Hill Pond E
Inlet ID: 2-E



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	16.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.6	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	3.84	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.35	5.35	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	14.0	14.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.372	0.372	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

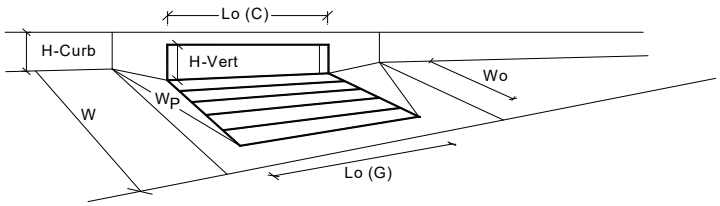
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	25.4	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	23.4	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.231	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			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 5.03 (August 2023)

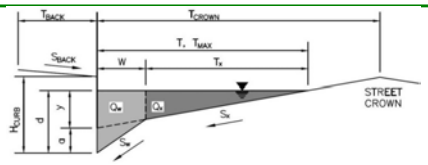


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	5.4	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
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) =	10.00	10.00	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	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) =	0.06	0.06	
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	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	
Clogging Factor for Multiple Units	Clog =	0.02	0.02	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	3.7	9.4	cfs
Interception with Clogging	Q_{wa} =	3.6	9.2	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	39.0	43.0	cfs
Interception with Clogging	Q_{oa} =	38.2	42.1	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	11.2	18.7	cfs
Interception with Clogging	Q_{ma} =	10.9	18.3	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**3.6**	**9.2**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	20.00	20.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.4	16.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
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} =	0.17	0.28	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} =	0.64	0.74	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.6**	**9.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.0	8.0	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Spring Hill Pond E**
Inlet ID: **1-E**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	16.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.018	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	7.6	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	3.84	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.35	5.35	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	14.0	14.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.372	0.372	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth

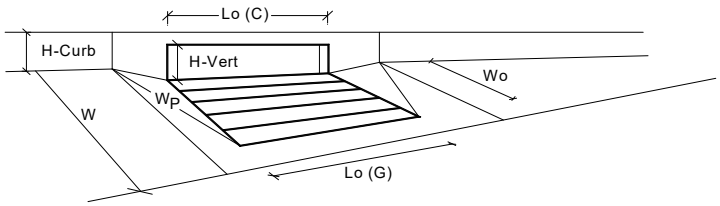
		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	25.4	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	8.4	23.4	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.560	0.231	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			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 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	5.4	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
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) =	10.00	10.00	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	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) =	0.06	0.06	
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	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	
Clogging Factor for Multiple Units	Clog =	0.02	0.02	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	3.7	9.4	cfs
Interception with Clogging	Q_{wa} =	3.6	9.2	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	39.0	43.0	cfs
Interception with Clogging	Q_{oa} =	38.2	42.1	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	11.2	18.7	cfs
Interception with Clogging	Q_{ma} =	10.9	18.3	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**3.6**	**9.2**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	20.00	20.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.4	16.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
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} =	0.17	0.28	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} =	0.64	0.74	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.6**	**9.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.0	8.0	cfs

Appendix B – Hydraulic Computations

Swale Calculations

Worksheet for Offsite Swale 1 - 2 Year

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.032
Channel Slope	0.005 ft/ft
Left Side Slope	5.000 H:V
Right Side Slope	5.000 H:V
Discharge	2.61 cfs

Results	
Normal Depth	7.2 in
Flow Area	1.8 ft²
Wetted Perimeter	6.1 ft
Hydraulic Radius	3.5 in
Top Width	6.00 ft
Critical Depth	5.3 in
Critical Slope	0.025 ft/ft
Velocity	1.45 ft/s
Velocity Head	0.03 ft
Specific Energy	0.63 ft
Froude Number	0.468
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	7.2 in
Critical Depth	5.3 in
Channel Slope	0.005 ft/ft
Critical Slope	0.025 ft/ft

Worksheet for Offsite Swale 1 - 100 Year

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.032
Channel Slope	0.005 ft/ft
Left Side Slope	5.000 H:V
Right Side Slope	5.000 H:V
Discharge	13.29 cfs

Results	
Normal Depth	13.2 in
Flow Area	6.1 ft²
Wetted Perimeter	11.3 ft
Hydraulic Radius	6.5 in
Top Width	11.04 ft
Critical Depth	10.2 in
Critical Slope	0.020 ft/ft
Velocity	2.18 ft/s
Velocity Head	0.07 ft
Specific Energy	1.18 ft
Froude Number	0.517
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	13.2 in
Critical Depth	10.2 in
Channel Slope	0.005 ft/ft
Critical Slope	0.020 ft/ft

Worksheet for Offsite Swale 2 - 2 Year

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.032
Channel Slope	0.005 ft/ft
Left Side Slope	5.000 H:V
Right Side Slope	5.000 H:V
Bottom Width	4.00 ft
Discharge	0.68 cfs

Results	
Normal Depth	1.9 in
Flow Area	0.8 ft²
Wetted Perimeter	5.6 ft
Hydraulic Radius	1.7 in
Top Width	5.62 ft
Critical Depth	1.1 in
Critical Slope	0.034 ft/ft
Velocity	0.88 ft/s
Velocity Head	0.01 ft
Specific Energy	0.17 ft
Froude Number	0.415
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.9 in
Critical Depth	1.1 in
Channel Slope	0.005 ft/ft
Critical Slope	0.034 ft/ft

Worksheet for Offsite Swale 2 - 100 Yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.032
Channel Slope	0.005 ft/ft
Left Side Slope	5.000 H:V
Right Side Slope	5.000 H:V
Bottom Width	4.00 ft
Discharge	8.90 cfs

Results	
Normal Depth	7.8 in
Flow Area	4.7 ft²
Wetted Perimeter	10.6 ft
Hydraulic Radius	5.3 in
Top Width	10.46 ft
Critical Depth	5.3 in
Critical Slope	0.022 ft/ft
Velocity	1.90 ft/s
Velocity Head	0.06 ft
Specific Energy	0.70 ft
Froude Number	0.502
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	7.8 in
Critical Depth	5.3 in
Channel Slope	0.005 ft/ft
Critical Slope	0.022 ft/ft

Appendix B – Hydraulic Computations

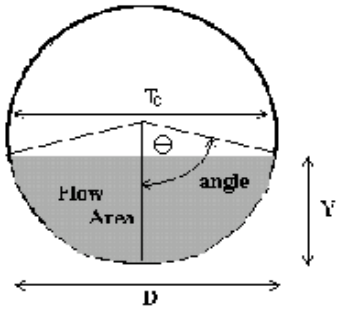
Culvert Calculations

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: SPRING HILL

Pipe ID: POND B-C OUTFALL Q2 = 0.8 CFS



Design Information (Input)			
Pipe Invert Slope	So =	0.0140	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	48.00	inches
Design discharge	Q =	0.80	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	12.57	sq ft
Full-flow wetted perimeter	Pf =	12.57	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	170.42	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	0.45	radians
Flow area	An =	0.23	sq ft
Top width	Tn =	1.73	ft
Wetted perimeter	Pn =	1.79	ft
Flow depth	Yn =	0.20	ft
Flow velocity	Vn =	3.46	fps
Discharge	Qn =	0.80	cfs
Percent of Full Flow	Flow =	0.5%	of full flow
Normal Depth Froude Number	Fr_n =	1.67	supercritical

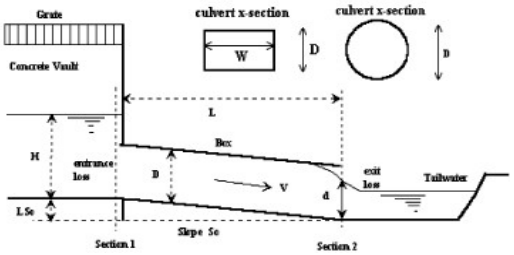
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	0.51	radians
Critical flow area	Ac =	0.34	sq ft
Critical top width	Tc =	1.96	ft
Critical flow depth	Yc =	0.26	ft
Critical flow velocity	Vc =	2.36	fps
Critical Depth Froude Number	Fr_c =	1.00	

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: SPRING HILL

ID: POND B-C OUTFALL Q100 = 55.6 CFS



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	48	inches
	Inlet Edge Type (Choose from pull-down list)		Grooved Edge Projecting	
	OR:			
Box Culvert:	Barrel Height (Rise) in Feet	H (Rise) =		ft
	Barrel Width (Span) in Feet	W (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	# Barrels =	1	
	Inlet Elevation at Culvert Invert	Elev IN =	4971.8	ft
	Outlet Elevation **OR** Slope	Elev OUT =	4967.3	ft
	Culvert Length	L =	322	ft
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	1.58
Sum of All Loss Coefficients	K_s =	2.78
Minimum Energy Condition Coefficient	KE_{low} =	-0.0290
Orifice Inlet Condition Coefficient	C_d =	0.67

Calculations of Culvert Capacity (output):

Backwater calculations required to obtain Outlet Control Flowrate when HWo < 0.75 * Culvert Rise

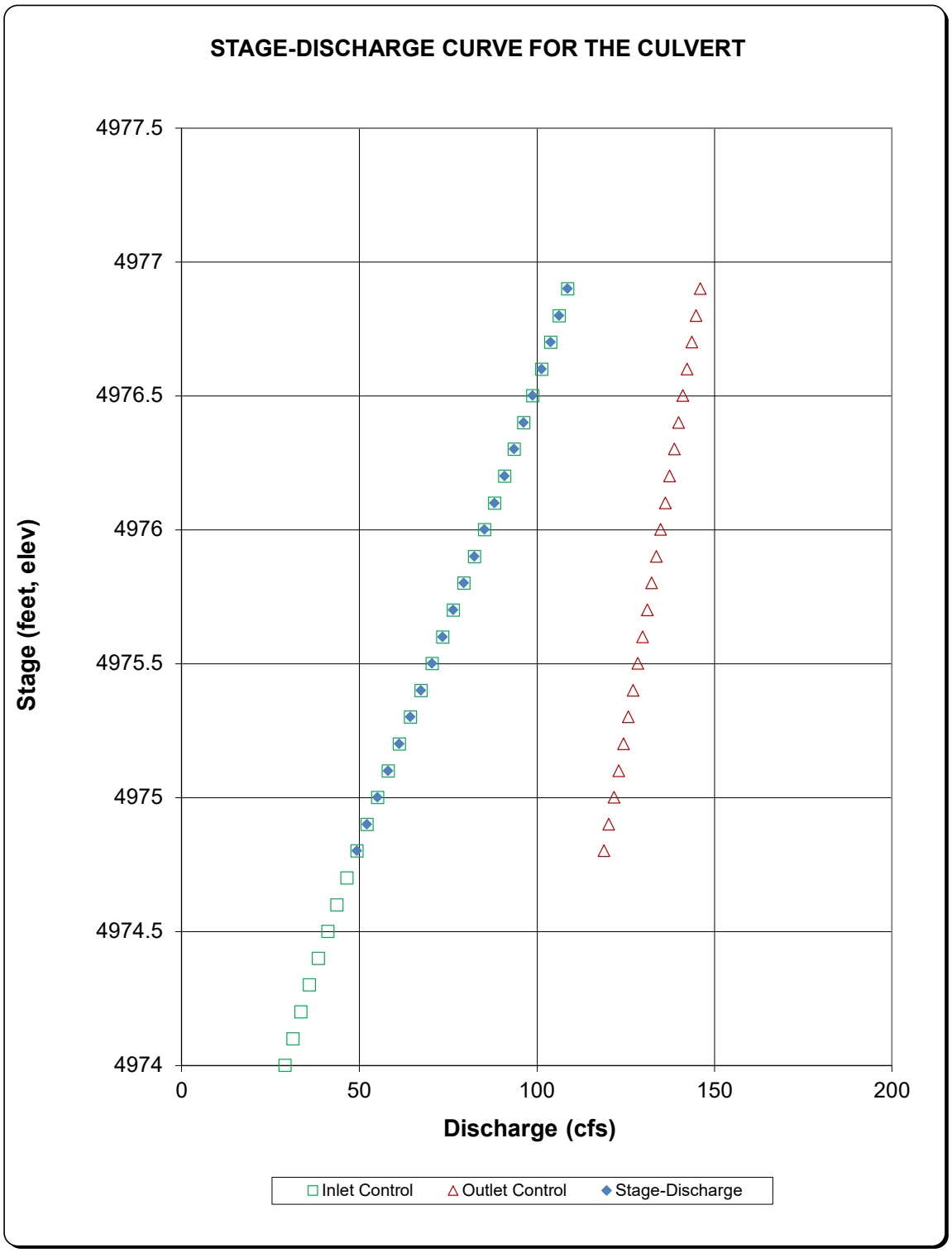
Headwater Surface Elevation (ft)	Tailwater Surface Elevation (ft)	Inlet Control Equation Used	Inlet Control Flowrate (cfs)	Outlet Control Flowrate (cfs)	Controlling Culvert Flowrate (cfs)	Flow Control Used
4974.00		Regression Eqn.	29.04	#N/A	#N/A	#N/A
4974.10		Regression Eqn.	31.31	#N/A	#N/A	#N/A
4974.20		Regression Eqn.	33.61	#N/A	#N/A	#N/A
4974.30		Regression Eqn.	36.01	#N/A	#N/A	#N/A
4974.40		Regression Eqn.	38.51	#N/A	#N/A	#N/A
4974.50		Regression Eqn.	41.11	#N/A	#N/A	#N/A
4974.60		Regression Eqn.	43.76	#N/A	#N/A	#N/A
4974.70		Regression Eqn.	46.51	#N/A	#N/A	#N/A
4974.80		Regression Eqn.	49.35	118.94	**49.35**	INLET
4974.90		Regression Eqn.	52.25	120.34	**52.25**	INLET
4975.00		Regression Eqn.	55.21	121.73	**55.21**	INLET
4975.10		Regression Eqn.	58.22	123.11	**58.22**	INLET
4975.20		Regression Eqn.	61.31	124.47	**61.31**	INLET
4975.30		Regression Eqn.	64.34	125.81	**64.34**	INLET
4975.40		Regression Eqn.	67.41	127.15	**67.41**	INLET
4975.50		Regression Eqn.	70.47	128.49	**70.47**	INLET
4975.60		Regression Eqn.	73.52	129.80	**73.52**	INLET
4975.70		Regression Eqn.	76.53	131.12	**76.53**	INLET
4975.80		Regression Eqn.	79.51	132.39	**79.51**	INLET
4975.90		Regression Eqn.	82.44	133.68	**82.44**	INLET
4976.00		Regression Eqn.	85.32	134.97	**85.32**	INLET
4976.10		Regression Eqn.	88.14	136.24	**88.14**	INLET
4976.20		Regression Eqn.	90.91	137.49	**90.91**	INLET
4976.30		Regression Eqn.	93.62	138.74	**93.62**	INLET
4976.40		Regression Eqn.	96.31	139.97	**96.31**	INLET
4976.50		Regression Eqn.	98.85	141.20	**98.85**	INLET
4976.60		Regression Eqn.	101.41	142.41	**101.41**	INLET
4976.70		Regression Eqn.	103.85	143.64	**103.85**	INLET
4976.80		Regression Eqn.	106.31	144.83	**106.31**	INLET
4976.90		Regression Eqn.	108.64	146.04	**108.64**	INLET
				Processing Time:	**00.30 Seconds**	

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: SPRING HILL

ID: POND B-C OUTFALL Q100 = 55.6 CFS

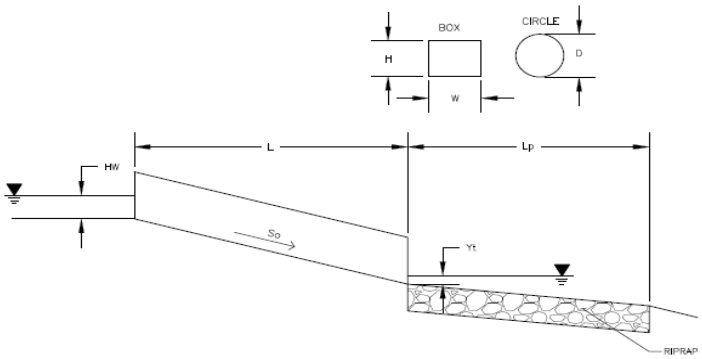


DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: **SPRING HILL**

ID: **POND B-C OUTFALL Q100 = 55.6 CFS**



Soil Type:
Choose One:
○ Sandy
◉ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:				
	Design Discharge	Q =	55.6	cfs
Circular Culvert:				
	Barrel Diameter in Inches	D =	48	inches
	Inlet Edge Type (Choose from pull-down list)		Grooved Edge Projecting	
OR:				
Box Culvert:			**OR**	
	Barrel Height (Rise) in Feet	H (Rise) =		ft
	Barrel Width (Span) in Feet	W (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	# Barrels =	1	
	Inlet Elevation	Elev IN =	4971.8	ft
	Outlet Elevation **OR** Slope	Elev OUT =	4967.3	ft
	Culvert Length	L =	322	ft
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	k_b =	0	
	Exit Loss Coefficient	k_x =	1	
	Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
	Max Allowable Channel Velocity	V =	7	ft/s
Calculated Results:				
	Culvert Cross Sectional Area Available	A =	12.57	ft^2
	Culvert Normal Depth	Y_n =	1.57	ft
	Culvert Critical Depth	Y_c =	2.24	ft
	Froude Number	Fr =	1.97	**Supercritical!**
	Entrance Loss Coefficient	k_e =	0.20	
	Friction Loss Coefficient	k_f =	1.58	
	Sum of All Loss Coefficients	k_s =	2.78	ft
Headwater:				
	Inlet Control Headwater	HW_I =	3.21	ft
	Outlet Control Headwater	HW_O =	N/A	ft
	Design Headwater Elevation	**HW =**	**4975.01**	**ft**
	Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**0.80**	
	Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required			
Outlet Protection:				
	Flow/(Diameter^2.5)	Q/D^2.5 =	1.74	$ft^{0.5}/s$
	Tailwater Surface Height	Y_t =	1.60	ft
	Tailwater/Diameter	Yt/D =	0.40	
	Expansion Factor	1/(2*tan(Θ)) =	5.99	
	Flow Area at Max Channel Velocity	A_t =	7.94	ft^2
	Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
	Length of Riprap Protection	**L_p =**	**12**	**ft**
	Width of Riprap Protection at Downstream End	**T =**	**7**	**ft**
	Adjusted Diameter for Supercritical Flow	Da =	2.79	ft
	Minimum Theoretical Riprap Size	d_{50} min=	6	in
	Nominal Riprap Size	d_{50} nominal=	9	in
	MHFD Riprap Type	**Type =**	**L**	

BASIN E ROADWAY CULVERT

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 893.16 cfs

Maximum Flow: 893.16 cfs

Table 1 - Summary of Culvert Flows at Crossing: Crossing 1 - Basin E Roadway

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
4967.39	0.00	0.00	0.00	1
4968.59	89.32	89.32	0.00	1
4969.30	178.63	178.63	0.00	1
4969.90	267.95	267.95	0.00	1
4970.43	357.26	357.26	0.00	1
4970.91	446.58	446.58	0.00	1
4971.37	535.90	535.90	0.00	1
4971.80	625.21	625.21	0.00	1
4972.21	714.53	714.53	0.00	1
4972.60	803.84	803.84	0.00	1
4972.98	893.16	893.16	0.00	1
4982.23	3085.60	3085.60	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	4967.39	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
89.32	89.32	4968.59	1.148	1.204	3-M1t	0.797	0.755	0.881	0.881	4.226	2.855
178.63	178.63	4969.30	1.822	1.911	3-M1t	1.242	1.198	1.317	1.317	5.649	3.638
267.95	267.95	4969.90	2.388	2.506	3-M1t	1.617	1.570	1.662	1.662	6.716	4.170
357.26	357.26	4970.43	2.893	3.036	3-M1t	1.956	1.902	1.957	1.957	7.605	4.582
446.58	446.58	4970.91	3.357	3.523	3-M2t	2.273	2.207	2.219	2.219	8.385	4.923
535.90	535.90	4971.37	3.791	3.977	2-M2c	2.573	2.492	2.492	2.457	8.959	5.215
625.21	625.21	4971.80	4.209	4.407	2-M2c	2.861	2.762	2.762	2.676	9.431	5.472
714.53	714.53	4972.21	4.617	4.817	2-M2c	3.138	3.019	3.019	2.879	9.860	5.702
803.84	803.84	4972.60	5.012	5.209	2-M2c	3.408	3.266	3.266	3.071	10.255	5.910
893.16	893.16	4972.98	5.395	5.587	2-M2c	3.672	3.504	3.504	3.252	10.622	6.102

****

Straight Culvert

Inlet Elevation (invert): 4967.39 ft, Outlet Elevation (invert): 4967.16 ft

Culvert Length: 111.20 ft, Culvert Slope: 0.0021

****

Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 4967.39 ft

Outlet Station: 111.20 ft

Outlet Elevation: 4967.16 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 8.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel (45º flare) Wingwall

Inlet Depression: None

Water Surface Profile Plot for Culvert: Culvert 1

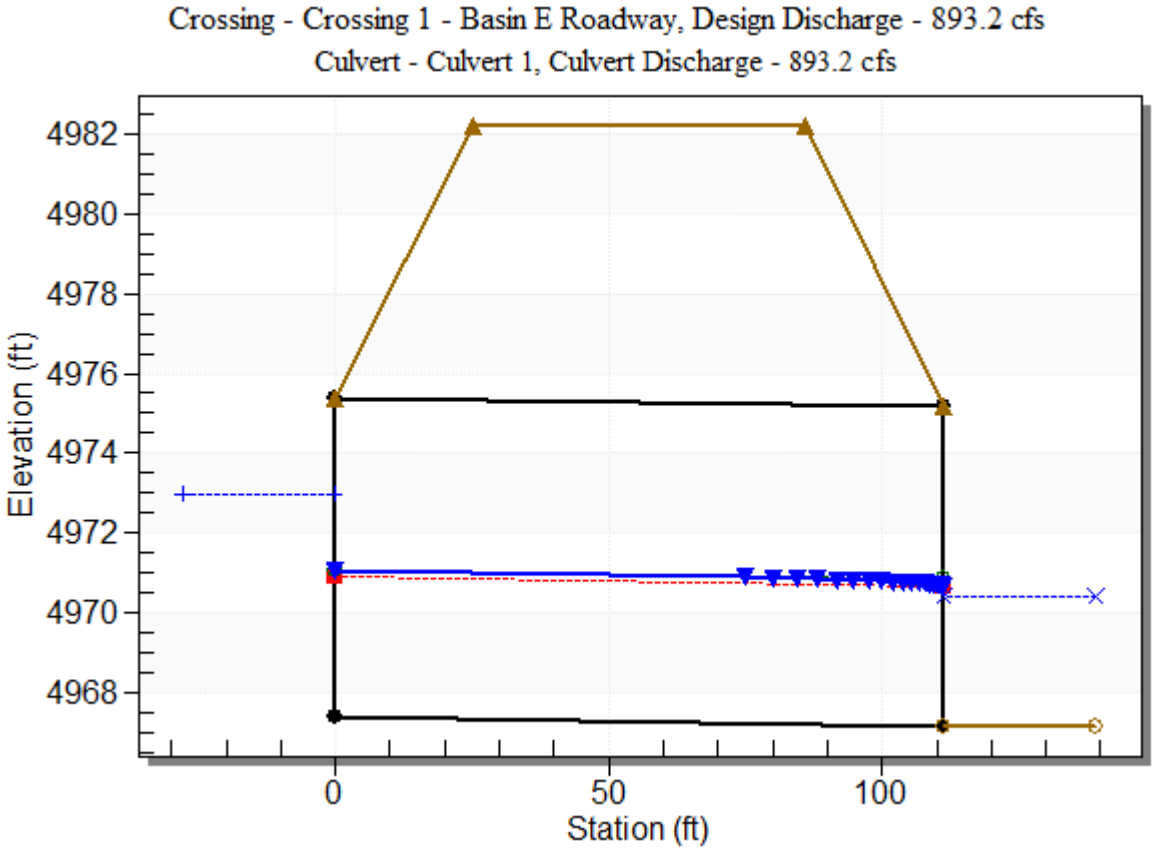


Table 3 - Downstream Channel Rating Curve (Crossing: Crossing 1 - Basin E

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	4967.16	0.00	0.00	0.00	0.00
89.32	4968.04	0.88	2.86	0.11	0.56
178.63	4968.48	1.32	3.64	0.16	0.60
267.95	4968.82	1.66	4.17	0.21	0.62
357.26	4969.12	1.96	4.58	0.24	0.63
446.58	4969.38	2.22	4.92	0.28	0.64
535.90	4969.62	2.46	5.22	0.31	0.65
625.21	4969.84	2.68	5.47	0.33	0.66
714.53	4970.04	2.88	5.70	0.36	0.67
803.84	4970.23	3.07	5.91	0.38	0.67
893.16	4970.41	3.25	6.10	0.41	0.68

Tailwater Channel Data - Crossing 1 - Basin E Roadway

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 32.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0020

Channel Manning's n: 0.0200

Channel Invert Elevation: 4967.16 ft

Roadway Data for Crossing: Crossing 1 - Basin E Roadway

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 4982.23 ft

Roadway Surface: Paved

Roadway Top Width: 61.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 889.25 cfs

Maximum Flow: 889.25 cfs

Table 1 - Summary of Culvert Flows at Crossing: Crossing 2 - Basin D Roadway

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
4983.77	0.00	0.00	0.00	1
4985.87	88.92	88.92	0.00	1
4987.11	177.85	177.85	0.00	1
4988.15	266.77	266.77	0.00	1
4989.08	355.70	355.70	0.00	1
4989.59	444.63	444.63	0.00	1
4989.84	533.55	533.55	0.00	1
4990.14	622.48	622.48	0.00	1
4990.48	711.40	711.40	0.00	1
4990.88	800.32	800.32	0.00	1
4991.42	889.25	889.25	0.00	1
4997.59	1283.75	1283.75	0.00	Overtopping

Crossing

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	4983.77	0.000	2.760	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
88.92	88.92	4985.87	2.085	4.858	7-A2c	-1.000	1.349	1.349	0.849	6.591	2.802
177.85	177.85	4987.11	3.310	6.096	7-A2c	-1.000	2.142	2.142	1.272	8.304	3.578
266.77	266.77	4988.15	4.344	7.138	7-A2c	-1.000	2.806	2.806	1.607	9.506	4.108
355.70	355.70	4989.08	5.293	8.071	7-A2c	-1.000	3.400	3.400	1.893	10.463	4.519
444.63	444.63	4989.59	6.180	8.576	7-A2c	-1.000	3.945	3.945	2.148	11.271	4.860
533.55	533.55	4989.84	7.028	8.830	7-A2c	-1.000	4.455	4.455	2.379	11.977	5.153
622.48	622.48	4990.14	7.859	9.129	7-A2c	-1.000	4.937	4.937	2.593	12.608	5.410
711.40	711.40	4990.48	8.688	9.475	7-A2c	-1.000	5.397	5.397	2.792	13.182	5.641
800.32	800.32	4990.88	9.534	9.866	7-A2c	-1.000	5.837	5.837	2.979	13.710	5.850
889.25	889.25	4991.42	10.407	10.304	7-A2t	-1.000	6.262	6.262	3.157	14.200	6.042

****

Straight Culvert

Inlet Elevation (invert): 4981.01 ft, Outlet Elevation (invert): 4983.77 ft

Culvert Length: 192.62 ft, Culvert Slope: -0.0143

****

Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 4981.01 ft

Outlet Station: 192.60 ft

Outlet Elevation: 4983.77 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 8.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel (45º flare) Wingwall

Inlet Depression: None

Water Surface Profile Plot for Culvert: Culvert 1

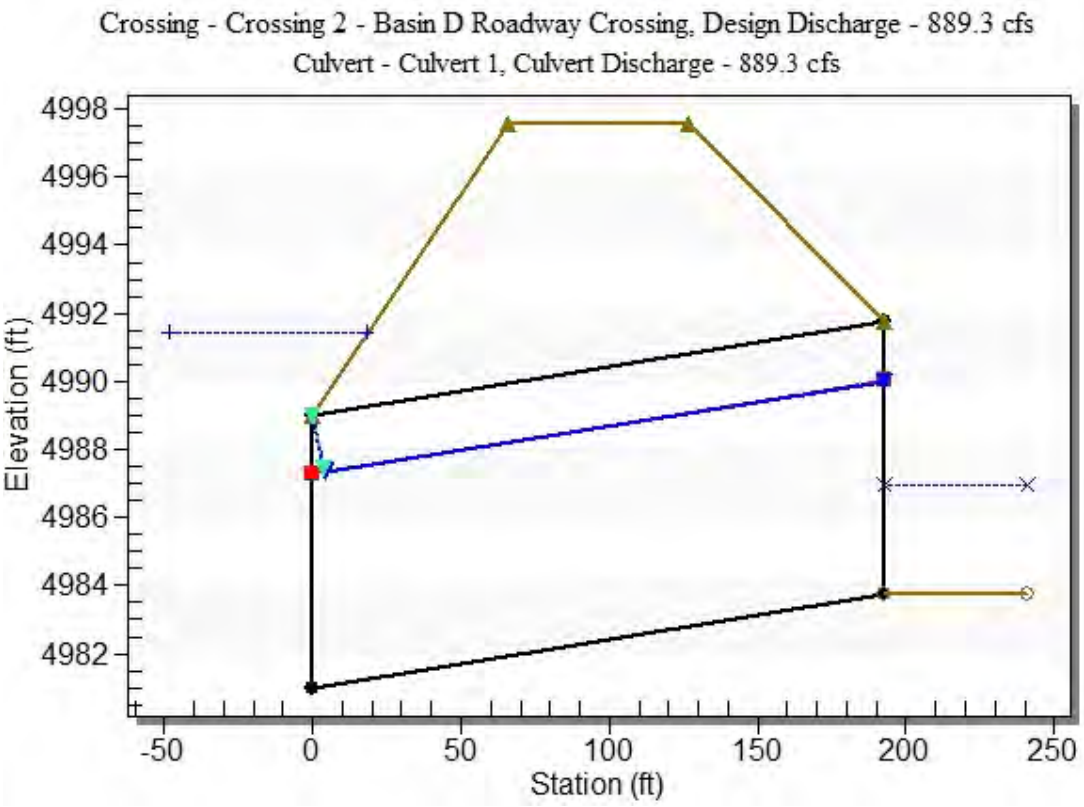


Table 3 - Downstream Channel Rating Curve (Crossing: Crossing 2 - Basin D Roadway Crossing)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	4983.77	0.00	0.00	0.00	0.00
88.92	4984.62	0.85	2.80	0.11	0.56
177.85	4985.04	1.27	3.58	0.16	0.59
266.77	4985.38	1.61	4.11	0.20	0.61
355.70	4985.66	1.89	4.52	0.24	0.63
444.63	4985.92	2.15	4.86	0.27	0.64
533.55	4986.15	2.38	5.15	0.30	0.65
622.48	4986.36	2.59	5.41	0.32	0.66
711.40	4986.56	2.79	5.64	0.35	0.66
800.32	4986.75	2.98	5.85	0.37	0.67
889.25	4986.93	3.16	6.04	0.39	0.68

Tailwater Channel Data - Crossing 2 - Basin D Roadway Crossing

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 34.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0020

Channel Manning's n: 0.0200

Channel Invert Elevation: 4983.77 ft

Roadway Data for Crossing: Crossing 2 - Basin D Roadway Crossing

Roadway Profile Shape: Constant Roadway Elevation

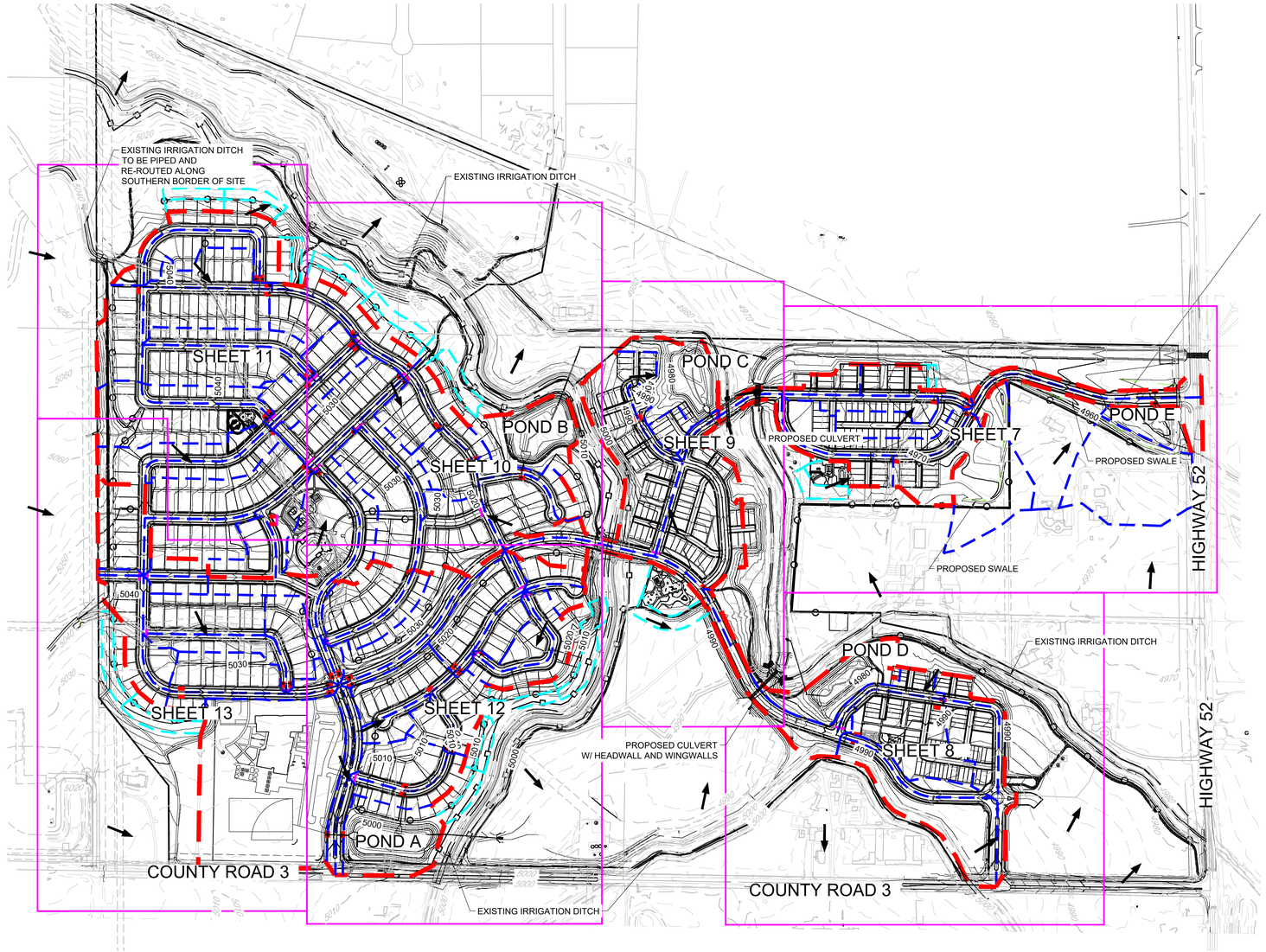
Crest Length: 100.00 ft

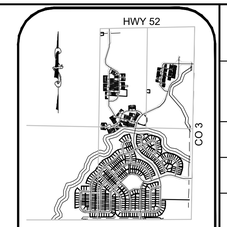
Crest Elevation: 4997.59 ft

Roadway Surface: Paved

Roadway Top Width: 60.30 ft

Appendix C – Drainage Maps





KEYMAP
SCALE 1" = 2000'

300 150 0 300 600

SCALE: 1" = 300

LEGEND

- XX = BASIN ID
- DESIGN POINT
- EXISTING DRAINAGE BOUNDARY
- MINOR BASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- RUNOFF BASIN BOUNDARY
- LAYOUT MATCHLINE
- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- PROPOSED MAJOR CONTOURS
- PROPOSED MINOR CONTOURS
- EMERGENCY OVERFLOW PATH
- PROPOSED STORM
- EXISTING STORM
- PROPOSED FLOW ARROW
- 100-YEAR FLOOD PLAIN
- LOT TYPES
- PAGE BOUNDARIES
- AREAS OUTSIDE OF POND DELINEATION

MAJOR BASIN SUMMARY	
BASIN A AREA (ac)	56.48
BASIN A IMPERVIOUSNESS (%)	55.00%
BASIN B AREA (ac)	62.70
BASIN B IMPERVIOUSNESS (%)	55.00%
BASIN C AREA (ac)	15.85
BASIN C IMPERVIOUSNESS (%)	50.00%
BASIN D AREA (ac)	16.73
BASIN D IMPERVIOUSNESS (%)	50.00%
BASIN E AREA (ac)	14.50
BASIN E IMPERVIOUSNESS (%)	60.00%

NOTES:

1. ALL PONDS ARE PRIVATE AND ARE MAINTAINED BY METRO DISTRICT.
2. ALL STORM INLETS PIPES HAVE BEEN DESIGNED FOR THE 100-YEAR STORM.
3. ALL STORM INLETS AND PIPES SHOWN ARE PUBLIC AND WILL BE MAINTAINED BY THE METRO DISTRICT UNLESS OTHERWISE NOTED.
4. OUTLET STRUCTURE AND OVERFLOW WEIR DETAILS WILL BE PROVIDED WITH FINAL DRAINAGE REPORT.
5. ALL ROADS ARE CLASSIFIED AS PUBLIC WITH THE EXCEPTION OF THE PRIVATE ALLEYWAYS.
6. SEE FIRM MAP, APPENDIX A FOR MORE INFORMATION REGARDING THE FLOODPLAIN.
7. DIRECT RUNOFF BASINS SHOWN IN CYAN ARE NOT INCLUDED IN STORM PIPE AND INLET SIZING. DIRECT RUNOFF BASINS ARE TREATED THROUGH THE RUNOFF REDUCTION METHOD SHOWN IN THE DRAINAGE REPORT.

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SPRING HILL
PRELIMINARY DRAINAGE MAPS
OVERALL DRAINAGE MAP

SCALE: AS SHOWN
FILE NO: 8130307501
DRAWN BY: EWA
CHECKED BY: MS
DATE: JUNE 2025
SHEET NUMBER 1

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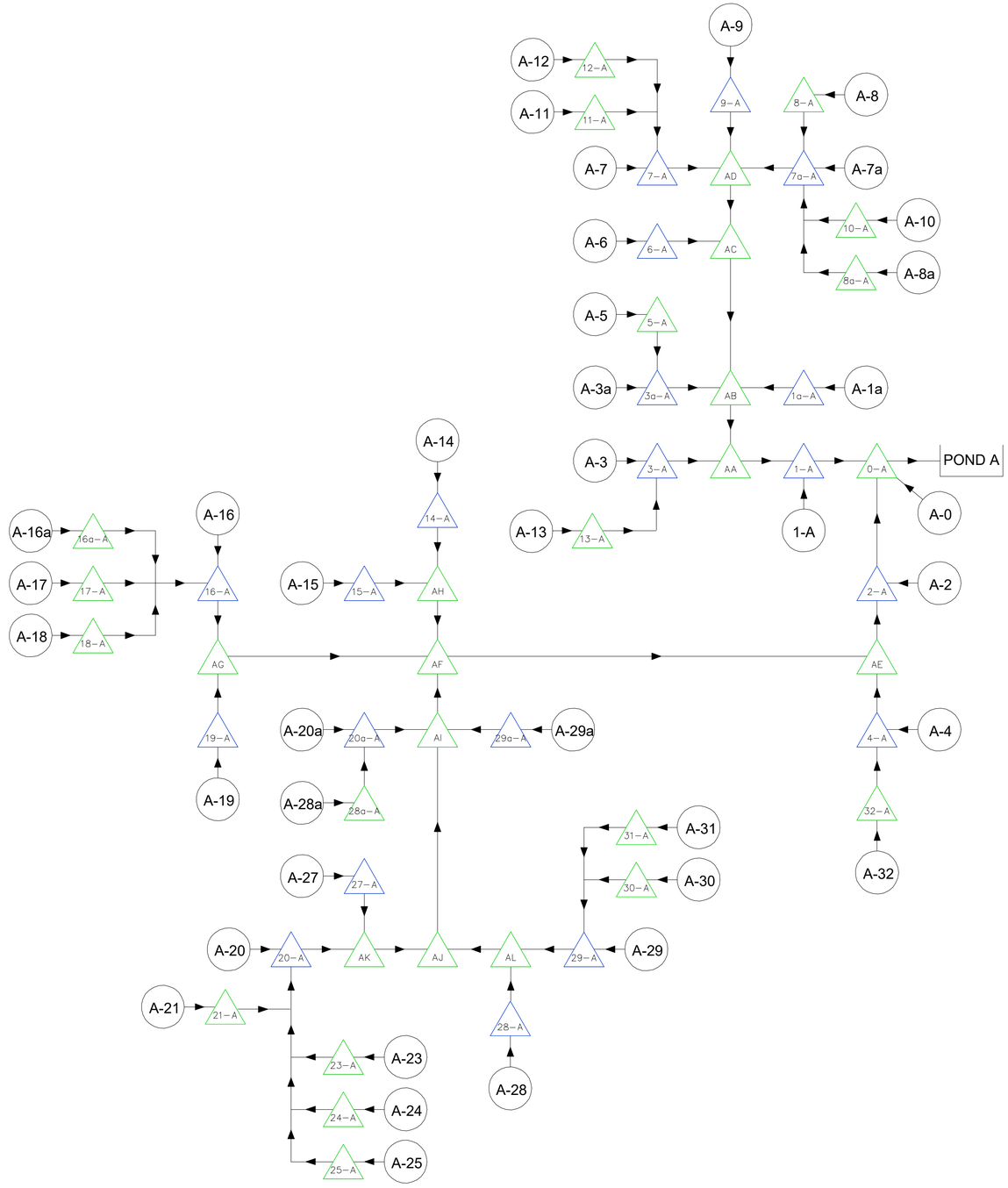
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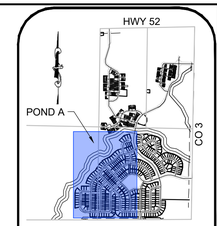
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KEYMAP
SCALE 1" = 2000'

LEGEND

- DESIGN POINT — 1–A
- DESIGN POINT W/ INLET — 1–A
- AREA BASIN LABEL — A-1
- FLOW PATH W/ ARROW
- OUTFALL TO POND — POND X

POND A ROUTING

BENCHMARK
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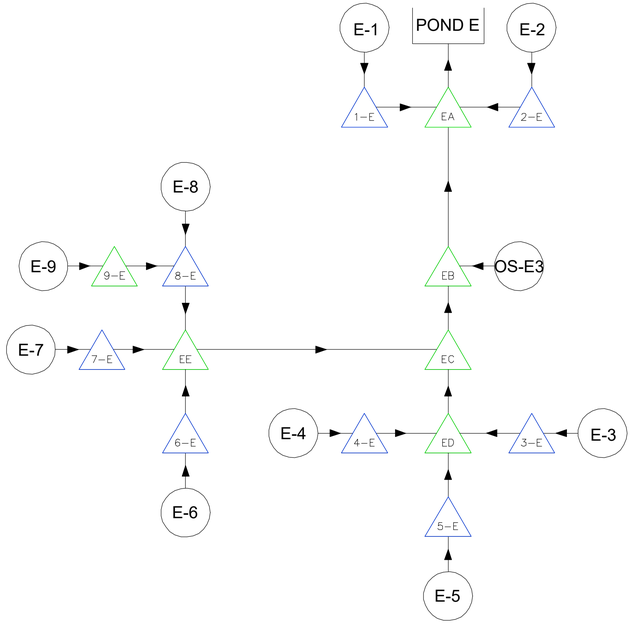
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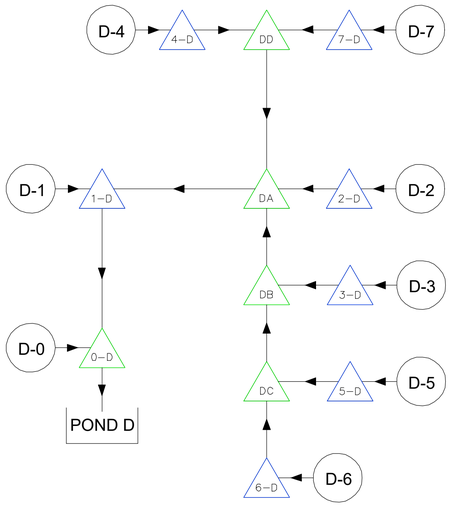
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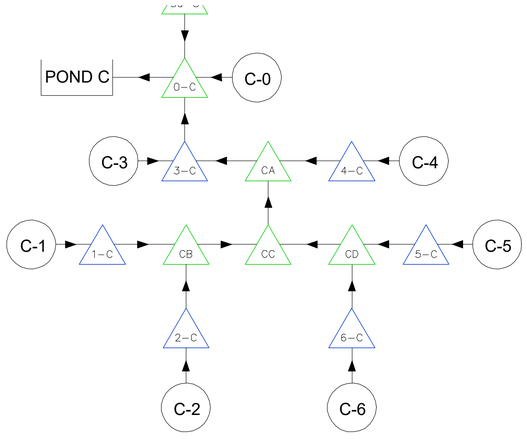
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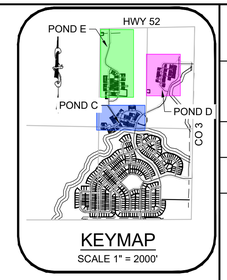
POND E ROUTING



POND D ROUTING



POND C ROUTING



KEYMAP
SCALE 1" = 2000'

LEGEND

DESIGN POINT	1– A
DESIGN POINT W/ INLET	1– A
AREA BASIN LABEL	A-1
FLOW PATH W/ ARROW	
OUTFALL TO POND	POND X

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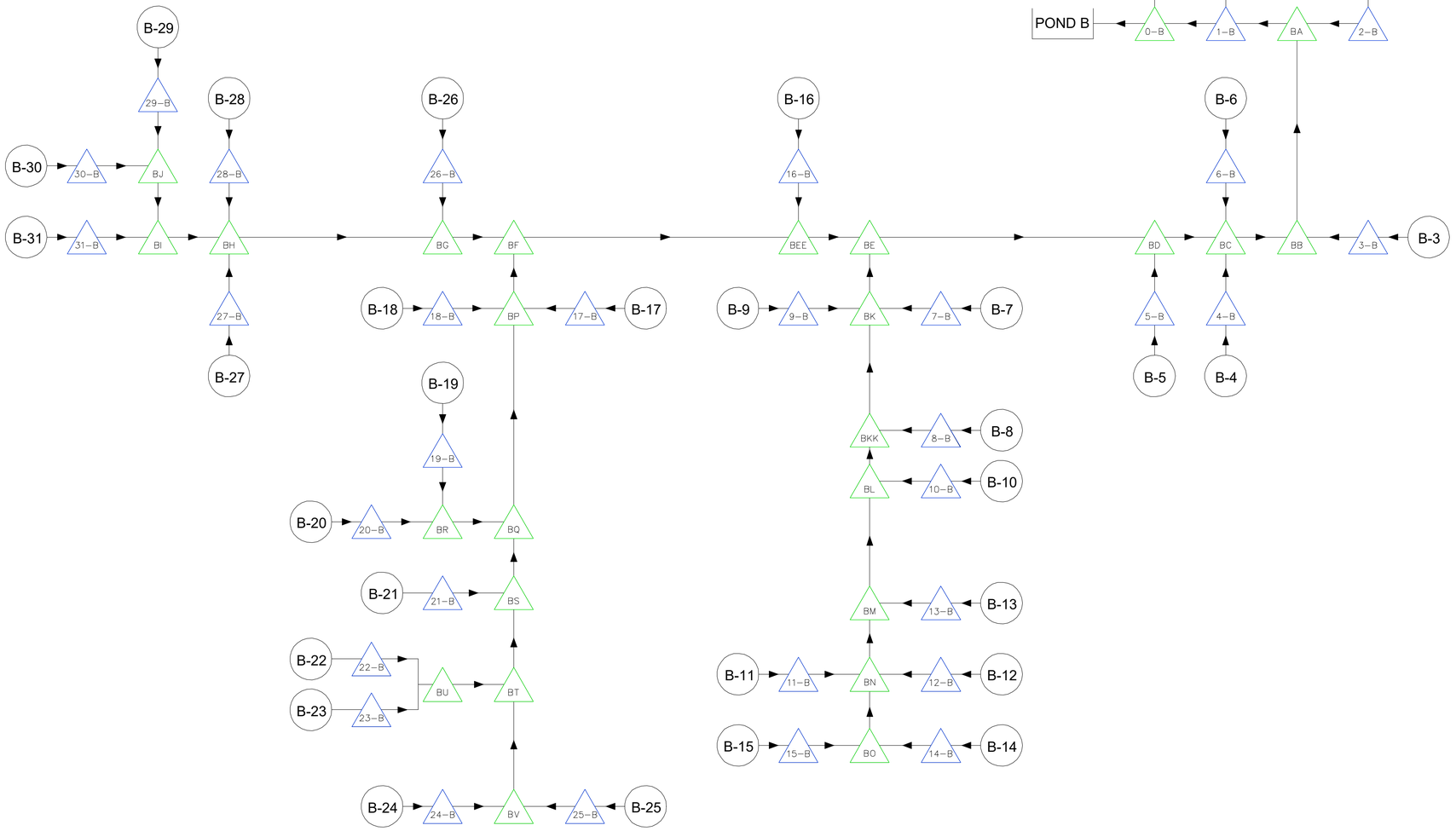
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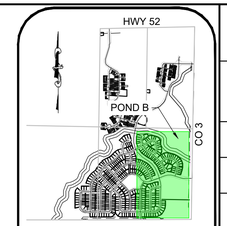
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POND B ROUTING



KEYMAP
SCALE 1" = 2000'

LEGEND

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DESIGN POINT W/ INLET	1 — A
AREA BASIN LABEL	A-1
FLOW PATH W/ ARROW	
OUTFALL TO POND	POND X

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DRAWN BY: EVA
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Basin A Summary				
Basin	Area (acres)	% Imp.	Q2	Q100
A-0	3.49	50.30	2.6	15.1
A-1	1.23	53.97	1.1	6.2
A-1a	1.34	54.63	1.0	5.5
A-2	0.48	73.46	0.8	3.4
A-3a	0.84	56.07	0.7	3.6
A-3	1.98	49.55	1.3	7.6
A-4	0.83	81.11	1.4	5.7
A-5	0.75	58.24	0.7	3.6
A-6	2.09	39.43	1.0	7.3
A-7	2.44	41.00	1.3	8.1
A-7a	0.09	67.33	0.1	0.6
A-8	1.73	58.28	1.4	6.6
A-8a	0.56	53.07	0.5	2.4
A-9	1.13	64.32	1.0	4.5
A-10	0.99	57.68	0.8	3.9
A-11	0.13	77.38	0.2	0.9
A-12	0.73	56.99	0.6	2.8
A-13	0.40	60.80	0.5	2.5
A-14	0.71	75.15	0.9	3.8
A-15	2.85	36.06	1.2	9.3
A-16a	0.98	58.88	0.9	4.7
A-16	0.24	46.92	0.2	1.1
A-17	2.03	34.10	0.8	6.7
A-18	0.27	81.85	0.5	2.0
A-19	1.10	54.95	1.0	5.3
A-20	1.75	41.42	1.1	7.3
A-20a	0.43	33.91	0.2	1.8
A-21	2.66	55.73	2.1	11.5
A-23	0.58	56.31	0.5	2.8
A-24	0.60	65.23	0.7	3.1
A-25	0.19	63.89	0.3	1.3
A-27	1.33	61.13	1.2	6.0
A-28	0.66	47.36	0.4	2.7
A-28a	2.23	51.06	1.5	8.6
A-29	1.75	51.22	1.2	6.7
A-29a	0.80	55.10	0.8	4.2
A-30	0.16	63.25	0.2	1.1
A-31	1.44	50.26	1.1	6.3
A-32	12.32	45.02	6.4	40.8

Design Point Summary Table Basin A			
Design Point	Inlet Type	Q2 (CFS)	Q100 (CFS)
31-A	SHEET FLOW	0.0	0.0
30-A	SHEET FLOW	0.0	0.0
29-A	15' CDOT TYPE R ON-GRADE INLET	2.3	11.1
29a-A	10' CDOT TYPE R ON-GRADE INLET	0.8	4.3
28-A	5' CDOT TYPE R ON-GRADE INLET	0.4	2.3
28a-A	SHEET FLOW	0.0	0.0
27-A	10' CDOT TYPE R ON-GRADE INLET	1.2	5.7
25-A	SHEET FLOW	0.0	0.0
24-A	SHEET FLOW	0.0	0.0
23-A	SHEET FLOW	0.0	0.0
21-A	SHEET FLOW	0.0	0.0
20-A	2 - 10' CDOT TYPE R ON-GRADE INLETS	4.4	18.8
20a-A	15' CDOT TYPE R ON-GRADE INLET	1.7	12.1
19-A	10' CDOT TYPE R ON-GRADE INLET	1.0	5.3
18-A	SHEET FLOW	0.0	0.0
17-A	SHEET FLOW	0.0	0.0
16-A	15' CDOT TYPE R ON-GRADE INLET	2.0	12.4
16a-A	SHEET FLOW	0.0	0.0
15-A	10' CDOT TYPE R ON-GRADE INLET	1.2	7.5
14-A	10' CDOT TYPE R ON-GRADE INLET	0.9	3.8
13-A	SHEET FLOW	0.0	0.0
12-A	SHEET FLOW	0.0	0.0
11-A	SHEET FLOW	0.0	0.0
10-A	SHEET FLOW	0.0	0.0
9-A	10' CDOT TYPE R ON-GRADE INLET	1.0	4.5
8a-A	SHEET FLOW	0.0	0.0
8-A	SHEET FLOW	0.0	0.0
7a-A	15' CDOT TYPE R ON-GRADE INLET	2.6	10.9
7-A	10' CDOT TYPE R ON-GRADE INLET	1.9	8.2
6-A	10' CDOT TYPE R ON-GRADE INLET	1.0	7.7
5-A	SHEET FLOW	0.0	0.0
32-A	STUB OUT	6.4	40.8
4-A	15' CDOT TYPE R ON-GRADE INLET	1.4	5.7
3a-A	10' CDOT TYPE R ON-GRADE INLET	1.3	6.8
3-A	10' CDOT TYPE R ON-GRADE INLET	1.6	8.5
2-A	10' CDOT TYPE R ON-GRADE INLET	0.8	3.5
1a-A	10' CDOT TYPE R ON-GRADE INLET	1.0	5.9
1-A	15' CDOT TYPE R ON-GRADE INLET	1.1	6.1
0-A	OVERLAND TO POND	2.6	15.3

Basin B Summary				
Basin	Area (acres)	% Imp.	Q2	Q100
B-0	3.10	14.17	0.3	3.1
B-1	0.96	52.04	0.7	3.2
B-2	2.14	53.58	1.7	8.0
B-3	2.80	49.01	1.9	9.4
B-4	1.63	51.68	1.0	4.9
B-5	1.66	53.84	1.5	7.0
B-6	1.15	56.33	0.9	4.2
B-7	1.12	65.41	1.1	4.6
B-8	3.33	55.02	2.0	9.4
B-9	2.90	52.30	2.2	10.5
B-10	1.58	57.61	1.2	5.5
B-11	3.52	54.53	2.4	12.4
B-12	1.10	36.80	0.4	2.3
B-13	3.02	19.76	0.4	3.6
B-14	1.31	59.66	1.2	5.8
B-15	2.07	54.68	1.6	8.5
B-16	1.47	62.69	1.4	6.0
B-17	1.01	61.03	1.0	4.2
B-18	0.81	52.67	0.6	2.8
B-19	1.58	60.61	1.3	5.6
B-20	3.31	54.69	2.1	9.9
B-21	0.74	51.03	0.5	2.5
B-22	1.18	61.63	1.1	5.0
B-23	3.96	41.83	1.7	10.5
B-24	2.13	46.32	1.5	8.7
B-25	1.43	60.63	1.4	6.8
B-26	1.56	56.18	1.1	5.0
B-27	2.80	52.31	1.8	8.4
B-28	1.74	53.62	1.2	5.6
B-29	1.98	51.72	1.1	5.2
B-30	1.73	58.90	1.3	5.6
B-31	2.22	45.36	1.1	6.6

Design Point Summary Basin B			
Design Point	Inlet Type	Q2 (CFS)	Q100 (CFS)
31-B	10' CDOT TYPE R INLET ON GRADE	1.1	6.0
30-B	10' CDOT TYPE R INLET ON GRADE	1.3	5.4
29-B	10' CDOT TYPE R INLET ON GRADE	1.1	5.1
28-B	10' CDOT TYPE R INLET ON GRADE	1.2	5.4
27-B	10' CDOT TYPE R INLET ON GRADE	1.8	7.0
26-B	10' CDOT TYPE R INLET ON GRADE	1.1	5.5
25-B	10' CDOT TYPE R INLET ON GRADE	1.4	6.3
24-B	10' CDOT TYPE R INLET ON GRADE	1.5	7.4
23-B	15' CDOT TYPE R INLET ON GRADE	1.7	9.9
22-B	10' CDOT TYPE R INLET ON GRADE	1.1	5.0
21-B	10' CDOT TYPE R INLET ON GRADE	0.5	3.3
20-B	10' CDOT TYPE R INLET ON GRADE	2.1	7.7
19-B	10' CDOT TYPE R INLET ON GRADE	1.3	5.1
18-B	10' CDOT TYPE R INLET ON GRADE	0.6	4.8
17-B	10' CDOT TYPE R INLET ON GRADE	1.0	4.3
16-B	10' CDOT TYPE R INLET ON GRADE	1.4	5.7
15-B	10' CDOT TYPE R INLET ON GRADE	1.6	7.3
14-B	10' CDOT TYPE R INLET ON GRADE	1.2	5.5
13-B	10' CDOT TYPE R INLET ON GRADE	0.4	3.6
12-B	10' CDOT TYPE R INLET ON GRADE	0.4	3.5
11-B	15' CDOT TYPE R INLET ON GRADE	2.4	10.9
10-B	10' CDOT TYPE R INLET ON GRADE	1.2	5.3
9-B	10' CDOT TYPE R INLET ON GRADE	2.2	8.0
8-B	10' CDOT TYPE R INLET ON GRADE	2.0	7.4
7-B	10' CDOT TYPE R INLET ON GRADE	1.1	5.5
6-B	10' CDOT TYPE R INLET IN SUMP	0.9	4.2
5-B	10' CDOT TYPE R INLET ON GRADE	1.5	6.4
4-B	10' CDOT TYPE R INLET IN SUMP	1.0	6.9
3-B	10' CDOT TYPE R INLET ON GRADE	1.9	7.6
2-B	15' CDOT TYPE R INLET IN SUMP	1.7	8.0
1-B	10' CDOT TYPE R INLET IN SUMP	0.7	3.2
0-B	OVERLAND TO POND B	0.3	3.1

Basin C Summary				
Basin	Area (acres)	% Imp.	Q2	Q100
C-0	2.76	5.22	0.1	4.0
C-1	0.52	96.23	1.2	4.2
C-2	6.01	26.20	1.7	13.3
C-3	0.21	100.00	0.5	1.7
C-4	4.99	44.13	3.2	20.6
C-5	0.21	76.67	0.4	1.5
C-6	1.60	44.26	0.8	4.7
C-3a	0.61	51.11	0.5	2.7

Design Point Summary Basin C			
Design Point	Inlet Type	Q2 (CFS)	Q100 (CFS)
0-C	OVERLAND TO POND C	0.0	3.8
1-C	5' CDOT TYPE R INLET IN SUMP	1.2	4.2
2-C	2-15' CDOT TYPE R INLET IN SUMP	1.7	13.3
3-C	15' CDOT TYPE R INLET ON GRADE	0.7	3.8
4-C	2-15' CDOT TYPE R INLET ON GRADE	3.2	17.4
5-C	5' CDOT TYPE R INLET IN SUMP	0.4	1.5
6-C	10' CDOT TYPE R INLET IN SUMP	0.9	4.7
3a-C	BYPASS	0.0	0.0

Basin D Summary				
Basin	Area (acres)	% Imp.	Q2	Q100
D-0	1.18	97.63	2.3	8.4
D-1	2.40	58.47	2.2	10.6
D-2	3.80	49.34	2.5	14.5
D-3	0.16	35.25	0.1	0.5
D-4	1.36	77.52	1.7	7.2
D-5	0.87	50.92	0.7	3.9
D-6	3.89	18.22	0.7	10.0
D-7	1.19	70.13	1.3	6.0

Design Point Summary Table Basin D			
Design Point	Inlet Type	Q2 (CFS)	Q100 (CFS)
0-D	OVERLAND TO POND D	2.3	8.4
1-D	15' CDOT TYPE R IN SUMP	2.2	11.1
2-D	15' CDOT TYPE R IN SUMP	2.5	14.9
3-D	10' CDOT TYPE R ON GRADE	0.1	0.9
4-D	10' CDOT TYPE R ON GRADE	1.7	6.3
5-D	10' CDOT TYPE R ON GRADE	0.7	5.6
6-D	10' CDOT TYPE R IN SUMP	0.7	6.9
7-D	10' CDOT TYPE R ON GRADE	1.3	5.7

Basin E Summary				
Basin	Area (acres)	% Imp.	Q2	Q100
E-1	1.08	100.00	2.0	7.1
E-2	1.48	84.11	2.0	8.0
E-3	1.92	38.20	1.0	7.5
E-4	2.55	66.40	2.1	9.7
E-5	1.34	81.19	1.7	6.9
E-6	1.62	76.23	2.2	9.5
E-7	1.26	68.36	1.5	7.0
E-8	1.18	75.14	1.6	7.0
E-9	1.06	80.11	1.5	6.3
E-0	1.33	52.84	1.3	7.3
OS-E1	5.34	30.39	1.6	13.3
OS-E2	4.02	33.86	1.4	11.0
OS-E3	4.15	19.21	0.7	8.9

Design Point Summary Basin E			
Design Point	Inlet Type	Q2 (CFS)	Q100 (CFS)
9-E	BYPASS	0.0	0.0
8-E	15' CDOT TYPE R ON-GRADE INLET	2.7	10.3
7-E	15' CDOT TYPE R ON-GRADE INLET	1.5	6.3
6-E	15' CDOT TYPE R ON-GRADE INLET	2.2	7.6
5-E	15' CDOT TYPE R ON-GRADE INLET	1.7	6.2
4-E	15' CDOT TYPE R ON-GRADE INLET	2.1	7.5
3-E	15' CDOT TYPE R ON-GRADE INLET	1.0	6.5
2-E	CDOT TYPE C SUMP INLET	2.0	8.0
1-E	CDOT TYPE C SUMP INLET	2.0	8.0
0-E	OVERLAND TO POND	1.3	7.3
E1-OS	SWALE	2.6	13.3
E2-OS	SWALE	0.0	0.0
E3-OS	CDOT TYPE C INLET IN DEPRESSION	0.7	8.9

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Accepted by: _____ Town Engineer _____ Date

PREPARED UNDER THE SUPERVISION OF

MARK SCHEURER
COLORADO P.E. 48988

No.	Revisions	Date	Init.	Appr.	Date
			CVL		

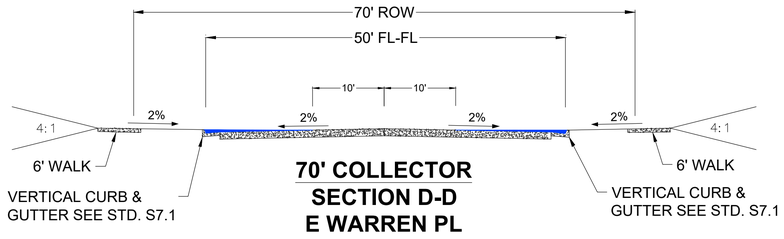
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10333 E DRY CREEK RD.
SUITE 240
ENGLEWOOD, CO 80112
TEL: 720.482.9526
Westwoodps.com
Westwood Professional Services, Inc.

ME ERIE, LLC
7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112

SPRING HILL
PRELIMINARY DRAINAGE MAPS
BASIN SUMMARY TABLES

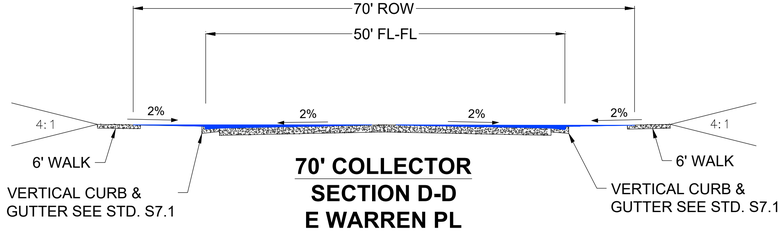
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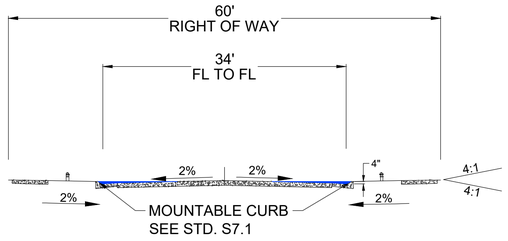
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SECTION D-D
E WARREN PL

MINOR (2-YEAR) STORM EVENT



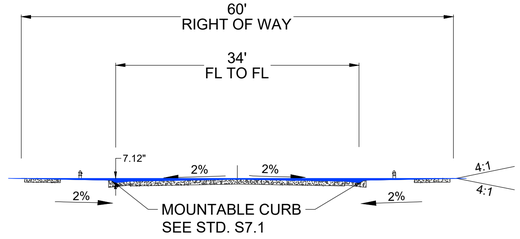
70' COLLECTOR
SECTION D-D
E WARREN PL

MAJOR (100-YEAR) STORM EVENT



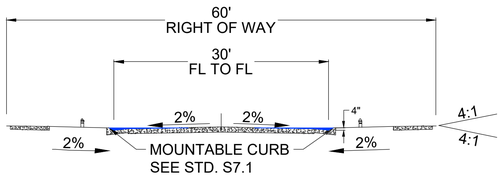
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SECTION F-F
VARIOUS INTERNAL STREETS

MINOR (2-YEAR) STORM EVENT



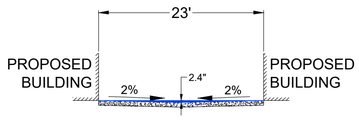
60' LOCAL STREET TYPE 1
SECTION F-F
VARIOUS INTERNAL STREETS

MAJOR (100-YEAR) STORM EVENT



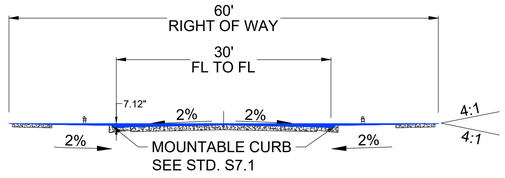
60' LOCAL STREET TYPE 2
SECTION G-G
VARIOUS INTERNAL STREETS

MINOR (2-YEAR) STORM EVENT



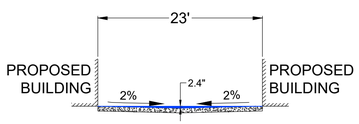
TYPICAL ALLEY

MINOR (2-YEAR) STORM EVENT



60' LOCAL STREET TYPE 2
SECTION G-G
VARIOUS INTERNAL STREETS

MAJOR (100-YEAR) STORM EVENT



TYPICAL ALLEY

MAJOR (100-YEAR) STORM EVENT

TABLE 800-7
ALLOWABLE PAVEMENT ENCROACHMENT AND DEPTH OF FLOW FOR INITIAL STORM RUNOFF

Street Classification	Maximum Encroachment*
Local	No curb overtopping; flow may spread to crown of street.
Collector	No curb overtopping; flow spread must leave the equivalent of one 10-foot driving lane clear of water.
Arterials	No curb overtopping; flow spread must leave the equivalent of two 10-foot driving lanes clear of water - one lane in each direction.
Freeways	No encroachment is allowed on any traffic lane.

TABLE 800-8
ALLOWABLE DEPTH OF FLOW AND INUNDATED AREA FOR MAJOR STORM RUNOFF

Street Classification	Allowable Depth and Inundated Areas
Local & Collector	Residential dwellings and public, commercial, and industrial buildings shall be no less than 12 inches above the 100-year flood at the ground line or lowest water entry of the building. The depth of water over the gutter flow line must not exceed 12 inches.
Arterial & Freeway	Residential dwellings and public, commercial, and industrial buildings must be no less than 12 inches above the 100-year flood at the ground line or lowest water entry of the building. The depth of water must not exceed the street crown to allow operation of emergency vehicles. The depth of water over gutter flow line must not exceed twelve (12).inches

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10 5 0 10 20
SCALE: 1" = 10

BENCHMARK
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Accepted by: _____ _____
Town Engineer Date

PREPARED UNDER THE SUPERVISION OF

MARK SCHEURER
COLORADO P.E. 48988

No.	Revisions	Date	Init.	Appr.	Date
			CVL		

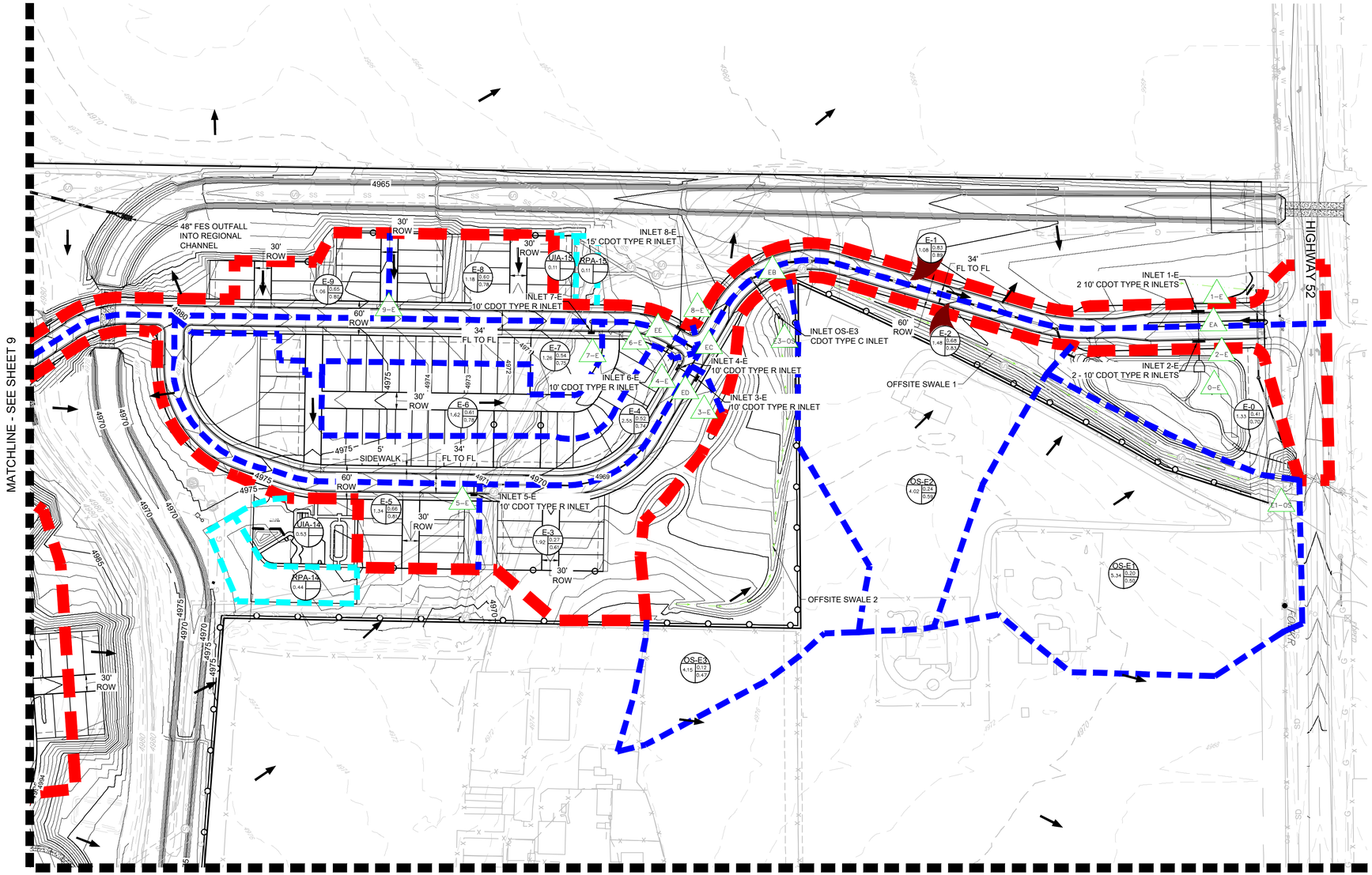
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Westwoodps.com
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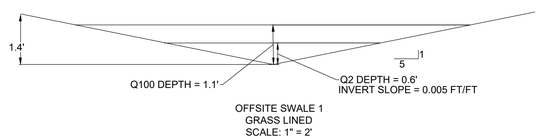
ME ERIE, LLC
7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112

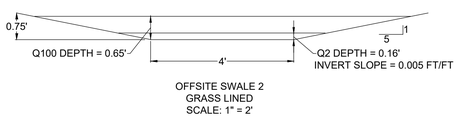
SPRING HILL
PRELIMINARY DRAINAGE MAPS
AREA DRAINAGE MAP

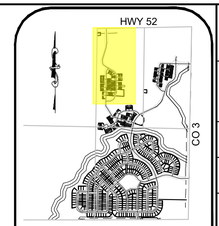
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CHECKED BY:
DATE: JUNE 2025
SHEET NUMBER 6

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KEYMAP
SCALE 1" = 2000'

100 50 0 100 200

SCALE: 1" = 100

LEGEND

- XX = BASIN ID
- DESIGN POINT
- EXISTING DRAINAGE BOUNDARY
- MINOR BASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- RUNOFF BASIN BOUNDARY
- LAYOUT MATCHLINE
- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- PROPOSED MAJOR CONTOURS
- PROPOSED MINOR CONTOURS
- EMERGENCY OVERFLOW PATH
- PROPOSED STORM
- EXISTING STORM
- PROPOSED FLOW ARROW
- 100-YEAR FLOOD PLAIN
- LOT TYPES
- PAGE BOUNDARIES
- AREAS OUTSIDE OF POND DELINEATION

NOTES:

1. ALL PONDS ARE PRIVATE AND ARE MAINTAINED BY METRO DISTRICT.
2. ALL STORM INLETS PIPES HAVE BEEN DESIGNED FOR THE 100-YEAR STORM.
3. ALL STORM INLETS AND PIPES SHOWN ARE PUBLIC AND WILL BE MAINTAINED BY THE METRO DISTRICT UNLESS OTHERWISE NOTED.
4. PIPE SIZING AND DEPTHS WILL BE PROVIDED WITH THE FINAL DRAINAGE REPORT
5. OUTLET STRUCTURE AND OVERFLOW WEIR DETAILS WILL BE PROVIDED WITH FINAL DRAINAGE REPORT.
6. ALL ROADS ARE CLASSIFIED AS PUBLIC WITH THE EXCEPTION OF THE PRIVATE ALLEYWAYS.
7. SEE FIRM MAP, APPENDIX A FOR MORE INFORMATION REGARDING THE FLOODPLAIN.
8. DIRECT RUNOFF BASINS SHOWN IN CYAN ARE NOT INCLUDED IN STORM PIPE AND INLET SIZING. DIRECT RUNOFF BASINS ARE TREATED THROUGH THE RUNOFF REDUCTION METHOD SHOWN IN THE DRAINAGE REPORT.

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Accepted by: _____ Town Engineer _____ Date

PREPARED UNDER THE SUPERVISION OF

MARK SCHEURER
COLORADO P.E. 48988

No.	Revisions	Date	Init.	Appr.	Date
			CVL		

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SUITE 240
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TEL: 720.482.9526

ME ERIE, LLC
7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112

SPRING HILL
PRELIMINARY DRAINAGE MAPS
AREA DRAINAGE MAP

SCALE: AS SHOWN
FILE NO: 81303075O1
DRAWN BY: DJS
CHECKED BY:
DATE: JUNE 2025
SHEET NUMBER 7

N:\PROJECTS\SPRING HILL\SERVICE GROUPS\WATER RESOURCES\03 PRELIMINARY DRAINAGE\04_EXHIBITS\AREA DRAINAGE MAPS.DWG, GREHM, 6/6/2025 9:40 AM

MATCHLINE - SEE SHEET 7

EX IRRIGATION DITCH

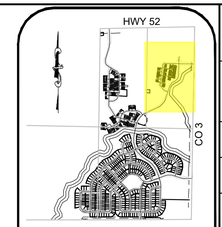
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D-7 1.19 0.55 0.76
D-6 3.89 0.11 0.50
D-5 0.87 0.38 0.66
D-2 3.86 0.36 0.62
D-3 0.16 0.22 0.38
D-0 1.18 0.81 0.85
D-1 2.40 0.43 0.64

INLET 4-D
10' CDOT TYPE R INLET
INLET 7-D
10' CDOT TYPE R INLET
INLET 6-D
10' CDOT TYPE R INLET
INLET 5-D
10' CDOT TYPE R INLET

30' ROW
60' ROW
80' ROW
34' FL TO FL
62' FL TO FL
5' SIDEWALK

COUNTY ROAD 3

MATCHLINE - SEE SHEET 12



KEYMAP
SCALE 1" = 2000'

80 40 0 80 160
SCALE: 1" = 80

LEGEND

- XX = BASIN ID
- DESIGN POINT
- EXISTING DRAINAGE BOUNDARY
- MINOR BASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- RUNOFF BASIN BOUNDARY
- LAYOUT MATCHLINE
- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- PROPOSED MAJOR CONTOURS
- PROPOSED MINOR CONTOURS
- EMERGENCY OVERFLOW PATH
- PROPOSED STORM
- EXISTING STORM
- PROPOSED FLOW ARROW
- 100-YEAR FLOOD PLAIN
- LOT TYPES
- PAGE BOUNDARIES
- AREAS OUTSIDE OF POND DELINEATION

NOTES:

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1-800-922-1987

BENCHMARK
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SPRING HILL
PRELIMINARY DRAINAGE MAPS
AREA DRAINAGE MAP

SCALE: AS SHOWN
FILE NO: 8130307501
DRAWN BY: DJS
CHECKED BY:
DATE: JUNE 2025
SHEET NUMBER 8

N:\PROJECTS\SPRING HILL\SERVICE GROUPS\WATER RESOURCES\03 PRELIMINARY DRAINAGE\04_EXHIBITS\AREA DRAINAGE MAPS.DWG, GREHM, 6/6/2025 9:40 AM

MATCHLINE - SEE SHEET 7

MATCHLINE - SEE SHEET 8

MATCHLINE - SEE SHEET 10

MATCHLINE - SEE SHEET 12

48" FES OUTFALL INTO REGIONAL CHANNEL

30" FES OUTFALL INTO REGIONAL CHANNEL

EX IRRIGATION DITCH

INLET 3-C
15' CDOT TYPE R INLET

INLET 4-C
15' CDOT TYPE R INLET

INLET 5-C
5' CDOT TYPE R INLET

INLET 6-C
10' CDOT TYPE R INLET

INLET 1A-C
5' CDOT TYPE R INLET

INLET 2-C
15' CDOT TYPE R INLET

C-0 2.76 0.02 0.37

C-1 0.52 0.80 0.85

C-2 6.01 0.15 0.37

C-3 0.21 0.84 0.99

C-3a 0.61 0.38 0.67

C-4 4.99 0.32 0.63

C-5 0.21 0.62 0.76

C-6 1.60 0.30 0.50

UIA-13 1.05

RPA-13 0.64

5' SIDEWALK

30' ROW

60' ROW

34' FL TO FL

HWY 52

CO 3

KEYMAP
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- LOT TYPES
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SPRING HILL
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AREA DRAINAGE MAP

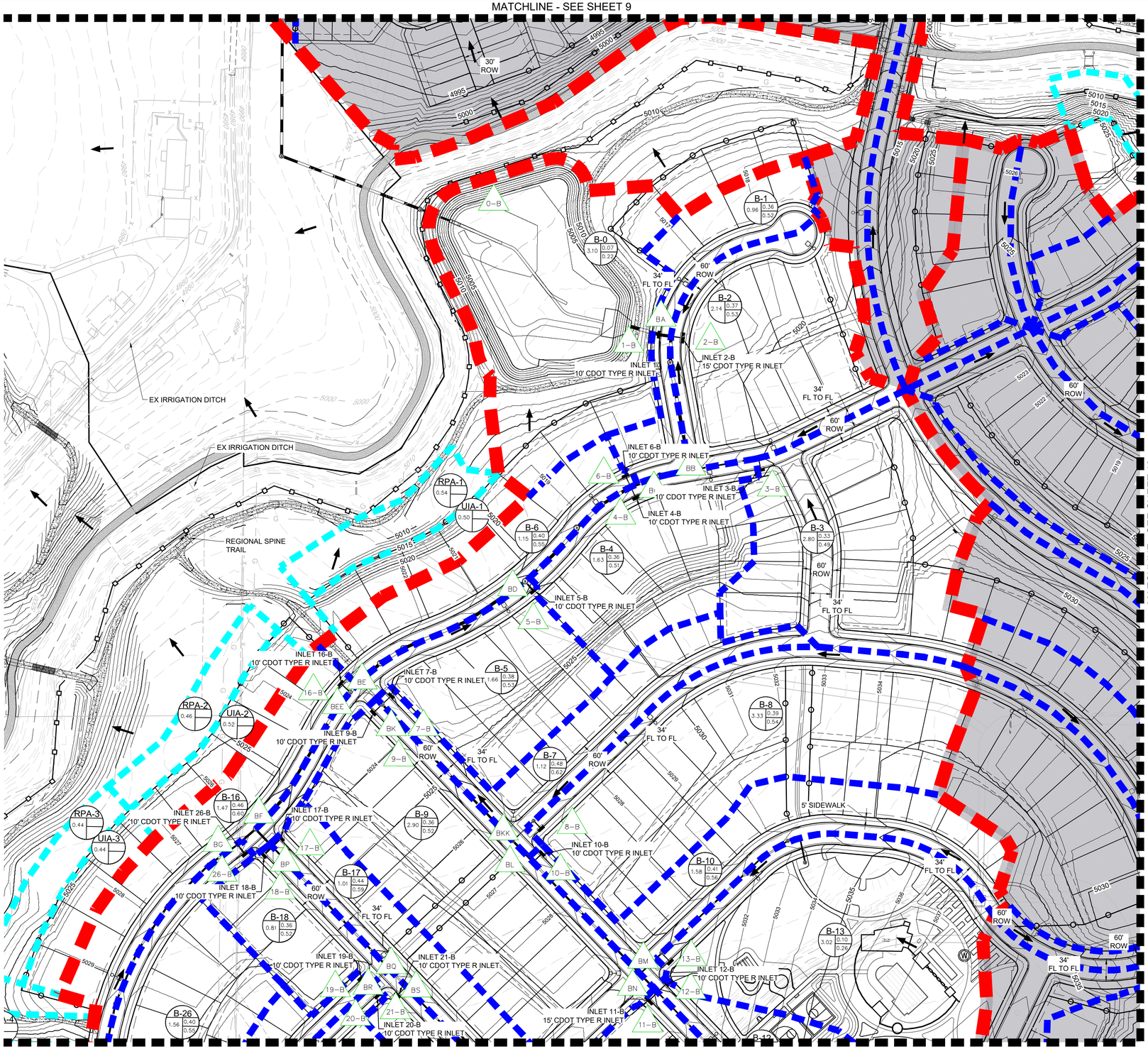
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AS SHOWN	8130307501

DRAWN BY:	CHECKED BY:	DATE:
DJS		JUNE 2025

SHEET NUMBER 9

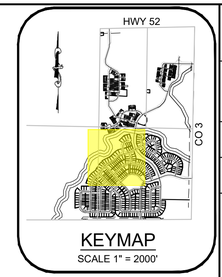
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MATCHLINE - SEE SHEET 9



MATCHLINE - SEE SHEET 12

MATCHLINE - SEE SHEET 11



KEYMAP
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80 40 0 80 160

SCALE: 1" = 80

LEGEND

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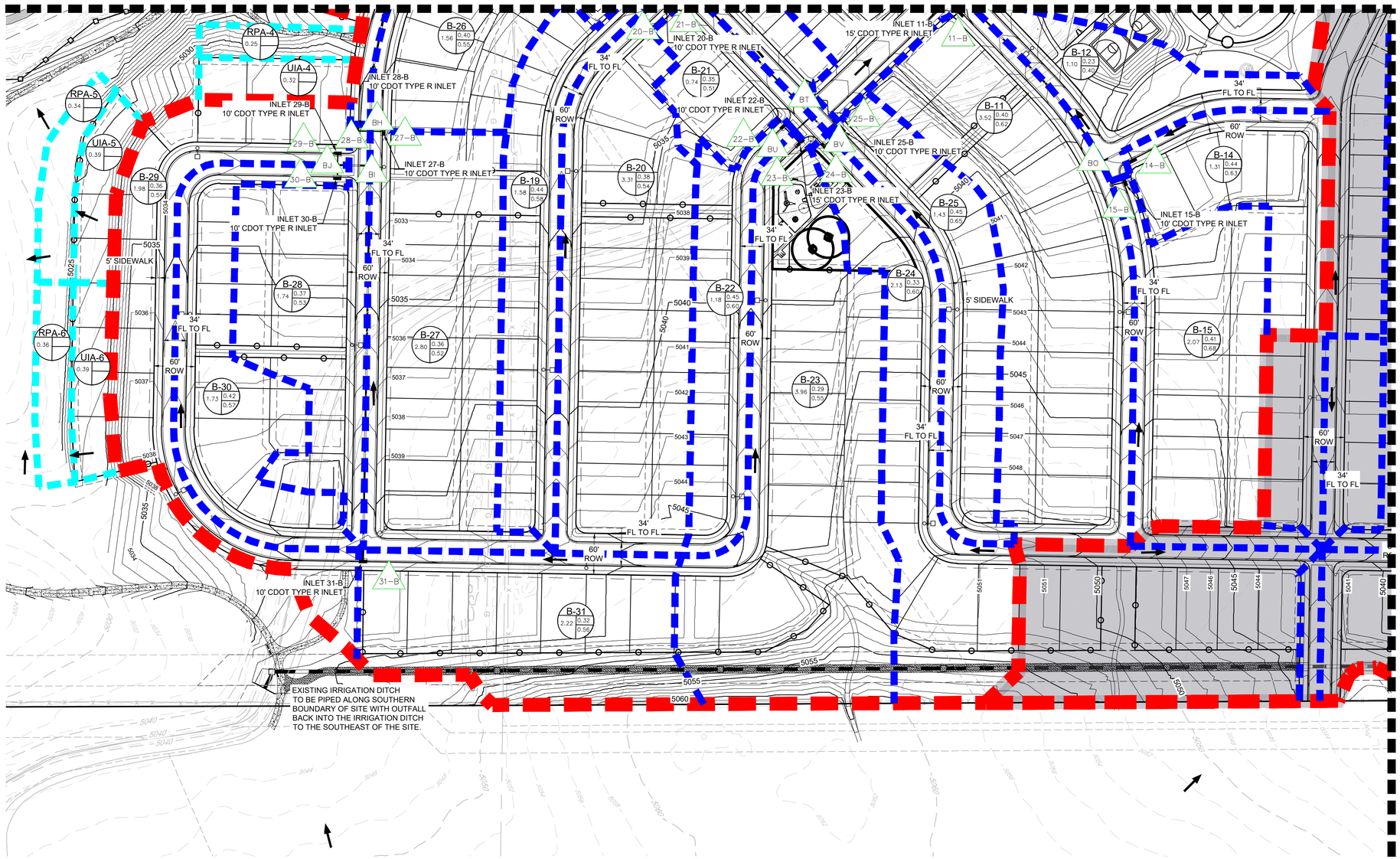
SPRING HILL
PRELIMINARY DRAINAGE MAPS
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DRAWN BY:	DJS	CHECKED BY:	
DATE:	JUNE 2025		

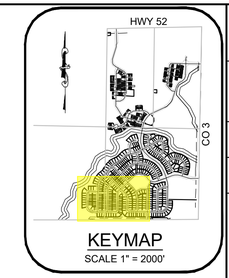
SHEET NUMBER 10

N:\PROJECTS\SPRING HILL\SERVICE GROUP\SW\WATER RESOURCES\03 PRELIMINARY DRAINAGE\04_EXHIBITS\AREA DRAINAGE MAPS.DWG, GREHM, 6/6/2025 9:41 AM

MATCHLINE - SEE SHEET 10



MATCHLINE - SEE SHEET 13



80 40 0 80 160

SCALE: 1" = 80

LEGEND

- XX = BASIN ID
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MATCHLINE - SEE SHEET 8

MATCHLINE - SEE SHEET 10

MATCHLINE - SEE SHEET 13

PROPOSED PEAK SHAVING FACILITY

36" FES OUTFALL INTO REGIONAL CHANNEL

EX IRRIGATION DITCH

COUNTY ROAD 3

60' ROW

34' FL TO FL

5' SIDEWALK

80' ROW

52' FL TO FL

STUB OUT CONNECTION FOR FUTURE SCHOOL SITE

INLET 9-A
10' CDOT TYPE R INLET

INLET 7A-A
15' CDOT TYPE R INLET

INLET 7-A
10' CDOT TYPE R INLET

INLET 1A-A
10' CDOT TYPE R INLET

INLET 3A-A
10' CDOT TYPE R INLET

INLET 6-A
10' CDOT TYPE R INLET

INLET 3-A
10' CDOT TYPE R INLET

INLET 1-A
15' CDOT TYPE R INLET

INLET 14-A
10' CDOT TYPE R INLET

INLET 15-A
10' CDOT TYPE R INLET

INLET 16-A
15' CDOT TYPE R INLET

INLET 29A-A
10' CDOT TYPE R INLET

INLET 20A-A
15' CDOT TYPE R INLET

INLET 19-A
10' CDOT TYPE R INLET

INLET 2-A
10' CDOT TYPE R INLET

INLET 4-A
15' CDOT TYPE R INLET

HWY 52

CO 3

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BENCHMARK
THE SOUTHWEST CORNER OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, BEING A 2-1/2" ALUMINUM CAP STAMPED "LS 23501 POWERS ELEV CO" HAVING A PUBLISHED ELEVATION OF 4983.02 FEET, NAVD 1988 DATUM, PER THE TOWN OF ERIE CONTROL MAP (JANUARY 25, 2004 REVISION).

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All work shall be constructed to Town of Erie STANDARDS AND SPECIFICATIONS. This drawing has been reviewed and found to be in general compliance with these STANDARDS AND SPECIFICATION and other Town requirements. THE ENGINEERING DESIGN AND CONCEPT REMAINS THE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.

Accepted by: _____ Town Engineer _____ Date

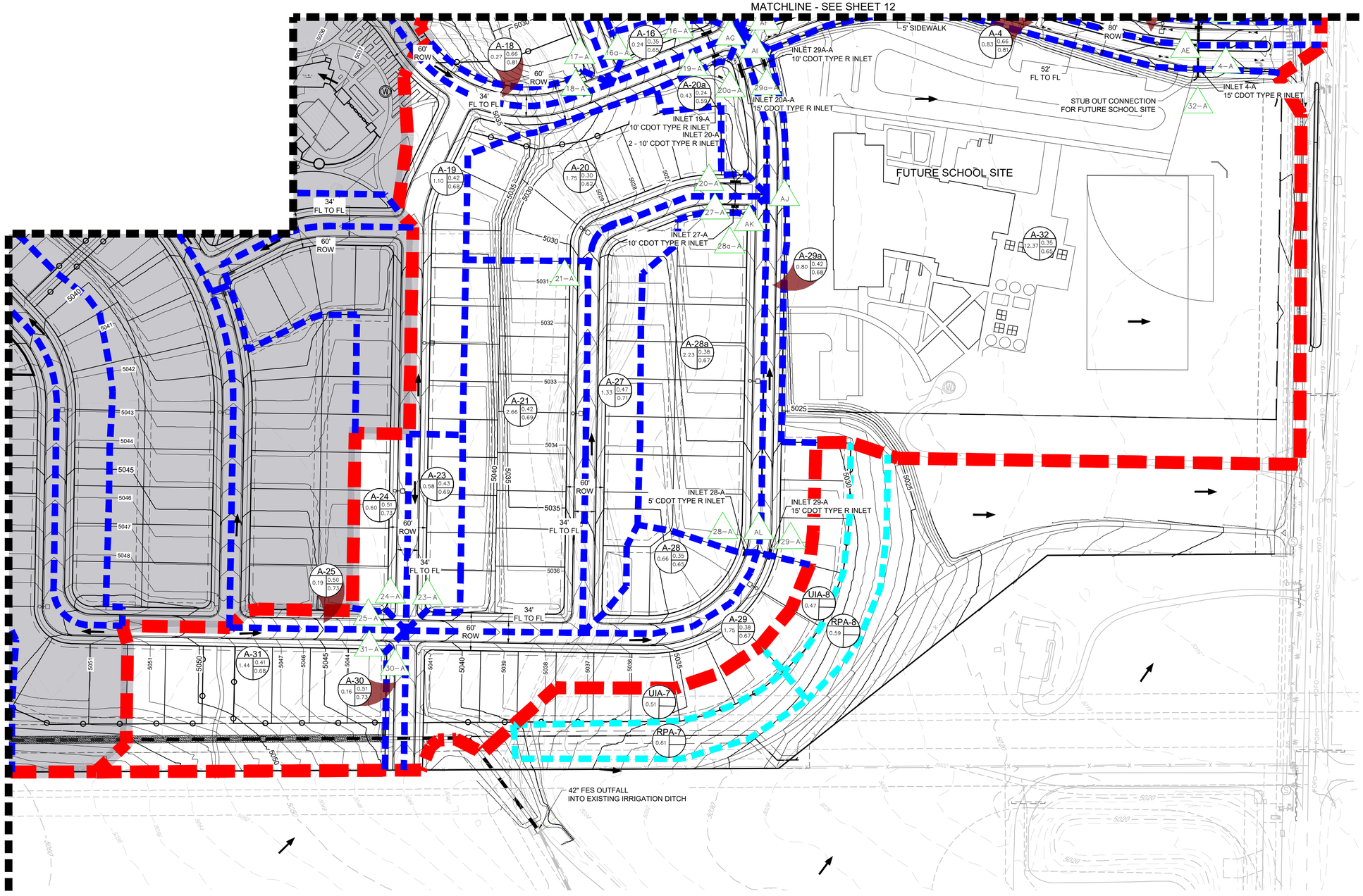
PREPARED UNDER THE SUPERVISION OF

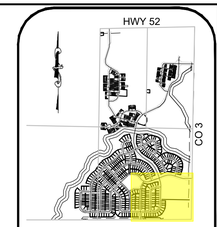
MARK SCHEURER
COLORADO P.E. 48988

N:\PROJECTS\SPRING HILL\SERVICE GROUP\$\WATER RESOURCES\03 PRELIMINARY DRAINAGE\04_EXHIBITS\AREA DRAINAGE MAPS.DWG, GREHM, 6/6/2025 9:41 AM

MATCHLINE - SEE SHEET 12

MATCHLINE - SEE SHEET 11





KEYMAP
SCALE 1" = 2000'

100 50 0 100 200

SCALE: 1" = 100

LEGEND

- XX = BASIN ID
- DESIGN POINT
- EXISTING DRAINAGE BOUNDARY
- MINOR BASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- RUNOFF BASIN BOUNDARY
- LAYOUT MATCHLINE
- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- PROPOSED MAJOR CONTOURS
- PROPOSED MINOR CONTOURS
- EMERGENCY OVERFLOW PATH
- PROPOSED STORM
- EXISTING STORM
- PROPOSED FLOW ARROW
- 100-YEAR FLOOD PLAIN
- LOT TYPES
- PAGE BOUNDARIES
- AREAS OUTSIDE OF POND DELINEATION

NOTES:

1. ALL PONDS ARE PRIVATE AND ARE MAINTAINED BY METRO DISTRICT.
2. ALL STORM INLETS PIPES HAVE BEEN DESIGNED FOR THE 100-YEAR STORM.
3. ALL STORM INLETS AND PIPES SHOWN ARE PUBLIC AND WILL BE MAINTAINED BY THE METRO DISTRICT UNLESS OTHERWISE NOTED.
4. PIPE SIZING AND DEPTHS WILL BE PROVIDED WITH THE FINAL DRAINAGE REPORT
5. OUTLET STRUCTURE AND OVERFLOW WEIR DETAILS WILL BE PROVIDED WITH FINAL DRAINAGE REPORT.
6. ALL ROADS ARE CLASSIFIED AS PUBLIC WITH THE EXCEPTION OF THE PRIVATE ALLEYWAYS.
7. SEE FIRM MAP, APPENDIX A FOR MORE INFORMATION REGARDING THE FLOODPLAIN.
8. DIRECT RUNOFF BASINS SHOWN IN CYAN ARE NOT INCLUDED IN STORM PIPE AND INLET SIZING. DIRECT RUNOFF BASINS ARE TREATED THROUGH THE RUNOFF REDUCTION METHOD SHOWN IN THE DRAINAGE REPORT.

No.	Revisions	Date

CIVIL Init. Appr. Date

Westwood
10333 E DRY CREEK RD. SUITE 240
ENGLEWOOD, CO 80112
TEL: 720.482.9526
Westwoodps.com
Westwood Professional Services, Inc.

ME ERIE, LLC
7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112

SPRING HILL
PRELIMINARY DRAINAGE MAPS
AREA DRAINAGE MAP

SCALE: AS SHOWN
FILE NO: 8130307501
DRAWN BY: EWM
CHECKED BY:
DATE: JUNE 2025
SHEET NUMBER 13

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1-800-922-1987

BENCHMARK
THE SOUTHWEST CORNER OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, BEING A 2-1/2" ALUMINUM CAP STAMPED "LS 23501 POWERS ELEV CO" HAVING A PUBLISHED ELEVATION OF 4983.02 FEET, NAVD 1988 DATUM, PER THE TOWN OF ERIE CONTROL MAP (JANUARY 25, 2004 REVISION).

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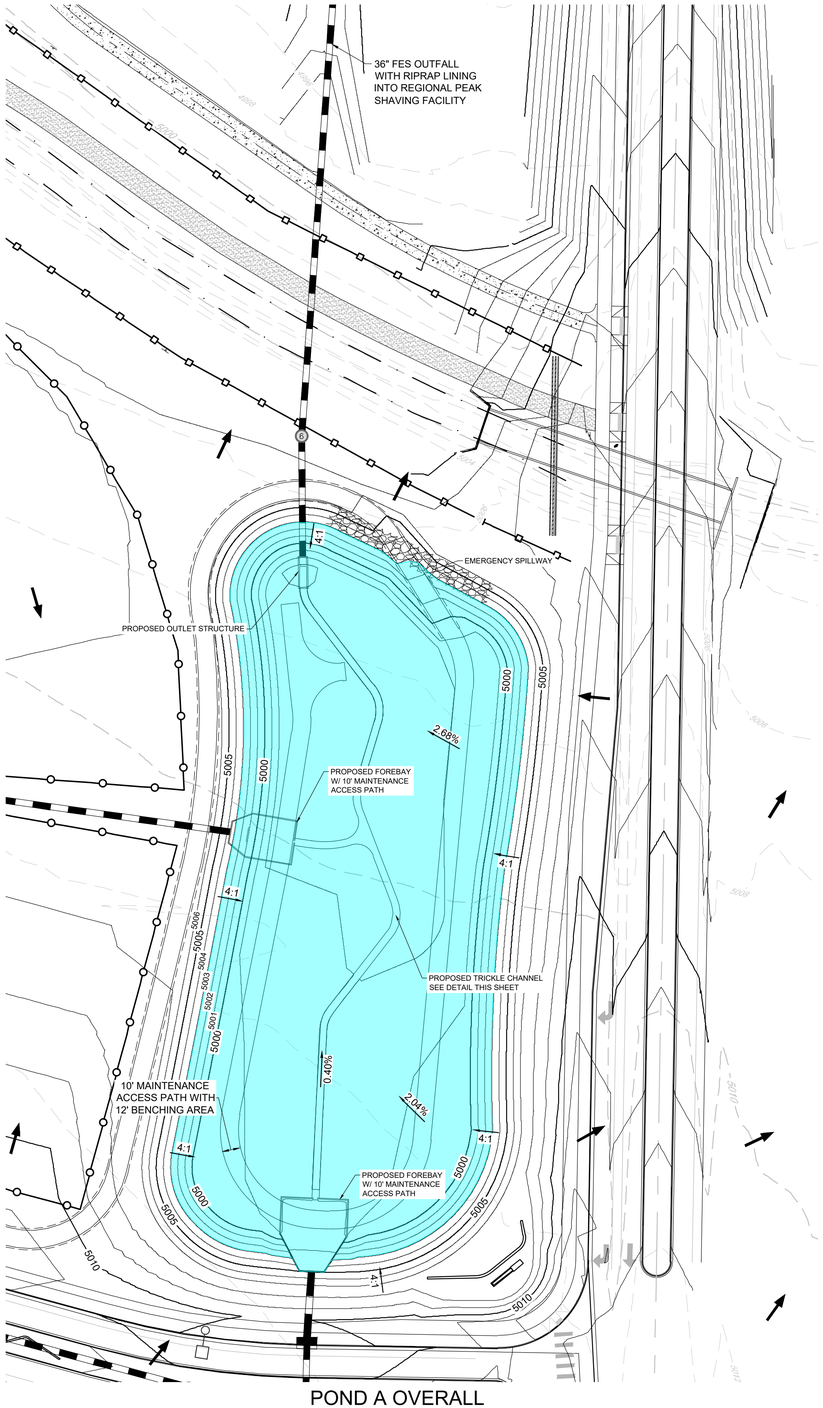
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Accepted by: _____ Town Engineer _____ Date

PREPARED UNDER THE SUPERVISION OF

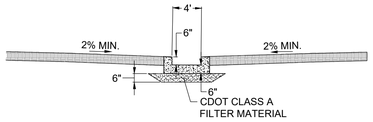
MARK SCHEURER
COLORADO P.E. 48988

N:\PROJECTS\SPRING HILL\SERVICE GROUP\5\WATER RESOURCES\03 PRELIMINARY DRAINAGE\04_EXHIBITS\AREA DRAINAGE MAPS.DWG, GREHM, 6/6/2025 9:41 AM



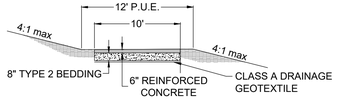
POND A OVERALL

1" = 40'



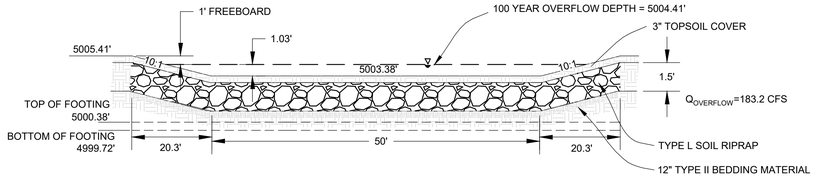
TRICKLE CHANNEL DETAIL

NOT TO SCALE



CONCRETE TRAIL DETAIL

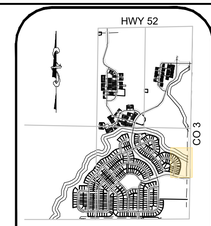
NOT TO SCALE



EMERGENCY SPILLWAY SECTION

NOT TO SCALE

POND A DESIGN SUMMARY			
STAGE	RELATIVE DEPTH	ELEVATION	VOLUME
	(FT)	(FT)	(AC-FT)
STAGE 0	-	4996.58	-
WQCV	2.55	4999.13	1.04
EURV	4.59	5001.17	3.37
100-YEAR	6.36	5002.94	5.73
SPILLWAY INVERT	6.6	5003.18	–



KEYMAP

SCALE 1" = 2000'

40 20 0 40 80

SCALE: 1" = 40

LEGEND

XX / A / C2 / C100	XX = BASIN ID
XX	DESIGN POINT
	EXISTING DRAINAGE BOUNDARY
	MINOR BASIN BOUNDARY
	MAJOR BASIN BOUNDARY
	RUNOFF BASIN BOUNDARY
	LAYOUT MATCHLINE
5050	EXISTING MAJOR CONTOURS
5050	EXISTING MINOR CONTOURS
5050	PROPOSED MAJOR CONTOURS
5049	PROPOSED MINOR CONTOURS
	EMERGENCY OVERFLOW PATH
D	PROPOSED STORM
D	EXISTING STORM
	PROPOSED FLOW ARROW
	100-YEAR FLOOD PLAIN
A	LOT TYPES
	PAGE BOUNDARIES
	AREAS OUTSIDE OF POND DELINEATION

NOTES:

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Accepted by: _____ Town Engineer _____ Date

PREPARED UNDER THE SUPERVISION OF

MARK SCHEURER
COLORADO P.E. 48988

No.	Revisions	Date	Init.	Appr.	Date
			CVL		

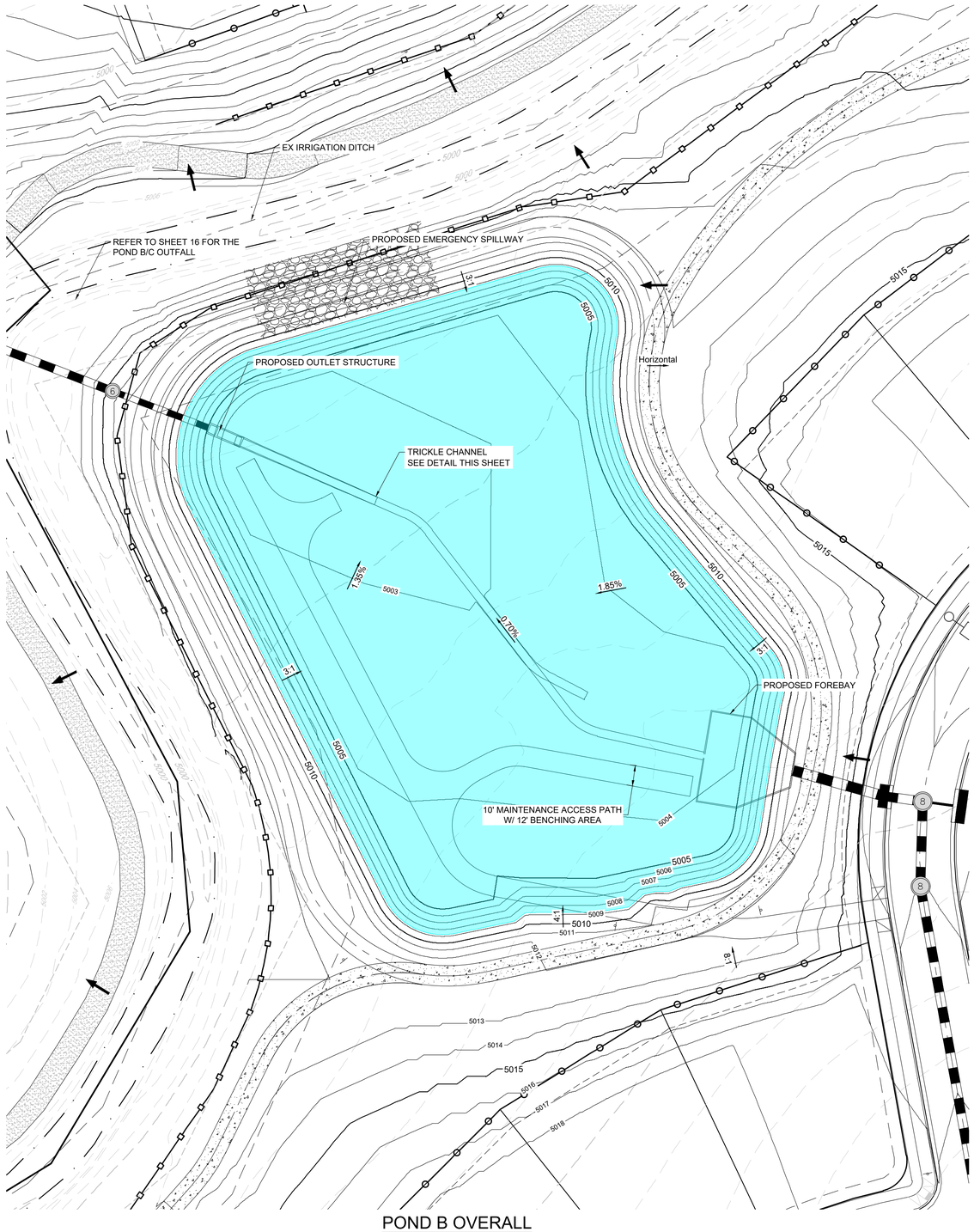
Westwood
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ME ERIE, LLC
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CENTENNIAL, CO 80112

SPRING HILL
PRELIMINARY DRAINAGE MAPS
POND A - OVERALL

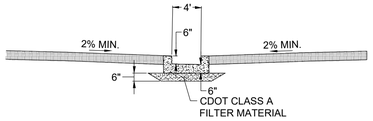
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DRAWN BY: EWA
CHECKED BY:
DATE: JUNE 2025
SHEET NUMBER 14

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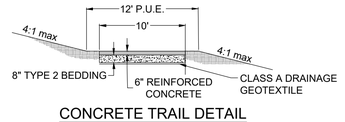
POND B OVERALL

1" = 30'



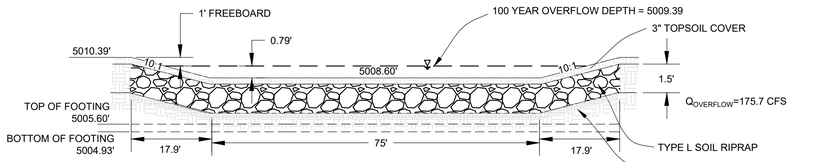
TRICKLE CHANNEL DETAIL

NOT TO SCALE



CONCRETE TRAIL DETAIL

NOT TO SCALE



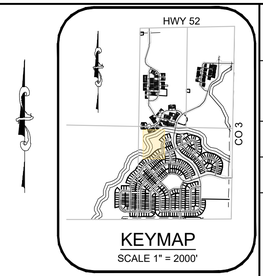
EMERGENCY SPILLWAY SECTION

NOT TO SCALE

POND B DESIGN SUMMARY			
STAGE	RELATIVE DEPTH	ELEVATION	VOLUME
	(FT)	(FT)	(AC-FT)
STAGE 0	-	5001.5	
WQCV	2.95	5004.45	1.16
EURV	5.32	5006.82	4.05
100-YEAR	7.25	5008.75	6.72
SPILLWAY INVERT	7.5	5009	-

NOTES:

1. REFER TO POND C SHEET FOR THE POND B OUTFALL.
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30 15 0 30 60

SCALE: 1" = 30

LEGEND

XX / A / C2 / C100	XX = BASIN ID
XX	DESIGN POINT
	EXISTING DRAINAGE BOUNDARY
	MINOR BASIN BOUNDARY
	MAJOR BASIN BOUNDARY
	RUNOFF BASIN BOUNDARY
	LAYOUT MATCHLINE
5050	EXISTING MAJOR CONTOURS
5050	EXISTING MINOR CONTOURS
5050	PROPOSED MAJOR CONTOURS
5040	PROPOSED MINOR CONTOURS
	EMERGENCY OVERFLOW PATH
	PROPOSED STORM
	EXISTING STORM
	PROPOSED FLOW ARROW
	100-YEAR FLOOD PLAIN
A	LOT TYPES
	PAGE BOUNDARIES
	AREAS OUTSIDE OF POND DELINEATION

BENCHMARK

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MARK SCHEURER
COLORADO P.E. 48988

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N:\PROJECTS\SPRING HILL\SERVICE GROUPS\WATER RESOURCES\03 PRELIMINARY DRAINAGE\04_EXHIBITS\POND B DWG, EJBERTEL, 6/5/2025 5:10 PM

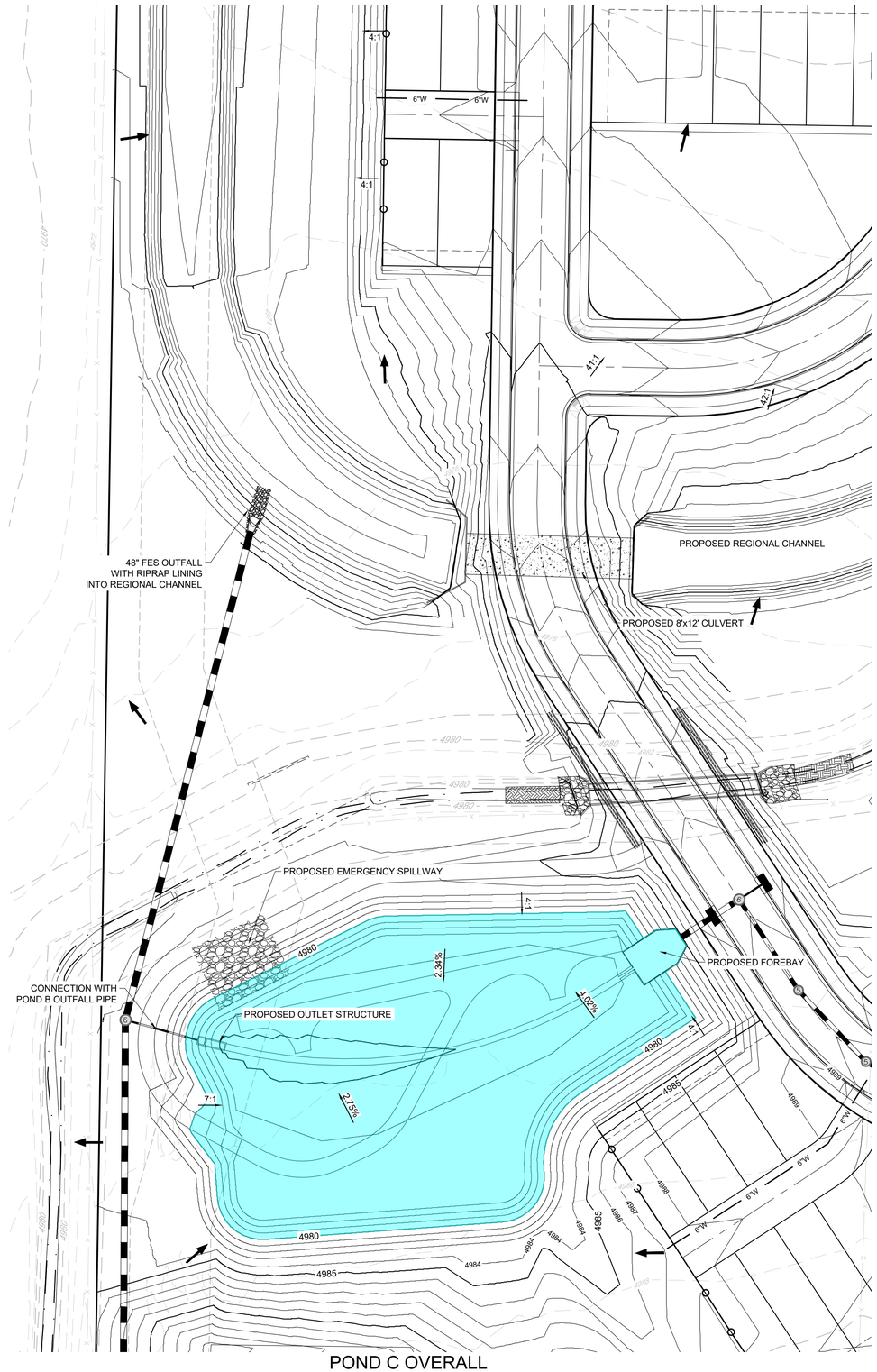
No.	Revisions	Date	Init.	Appr.	Date
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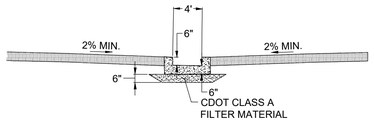
SPRING HILL
PRELIMINARY DRAINAGE MAPS
POND B - OVERALL

SCALE: AS SHOWN
FILE NO: 8130307501
DRAWN BY: EWA
CHECKED BY:
DATE: JUNE 2025
SHEET NUMBER 15



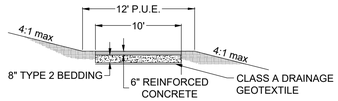
POND C OVERALL

1" = 40'



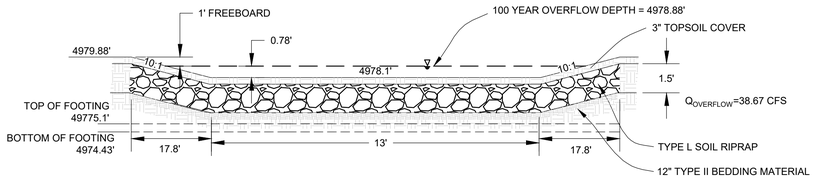
TRICKLE CHANNEL DETAIL

NOT TO SCALE



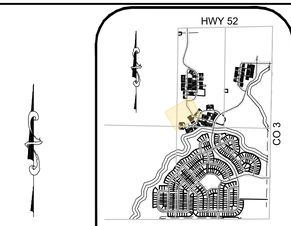
CONCRETE TRAIL DETAIL

NOT TO SCALE



EMERGENCY SPILLWAY SECTION

NOT TO SCALE



KEYMAP

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40 20 0 40 80

SCALE: 1" = 40

LEGEND

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- PROPOSED STORM
- EXISTING STORM
- PROPOSED FLOW ARROW
- 100-YEAR FLOOD PLAIN
- LOT TYPES
- PAGE BOUNDARIES
- AREAS OUTSIDE OF POND DELINEATION

POND C DESIGN SUMMARY			
STAGE	RELATIVE DEPTH	ELEVATION	VOLUME
	(FT)	(FT)	(AC-FT)
STAGE 0	-	4974.3	-
WQCV	1.68	4975.98	0.28
EURV	2.57	4976.87	0.83
100-YEAR	3.69	4977.99	1.8
SPILLWAY INVERT	3.9	4978.2	-

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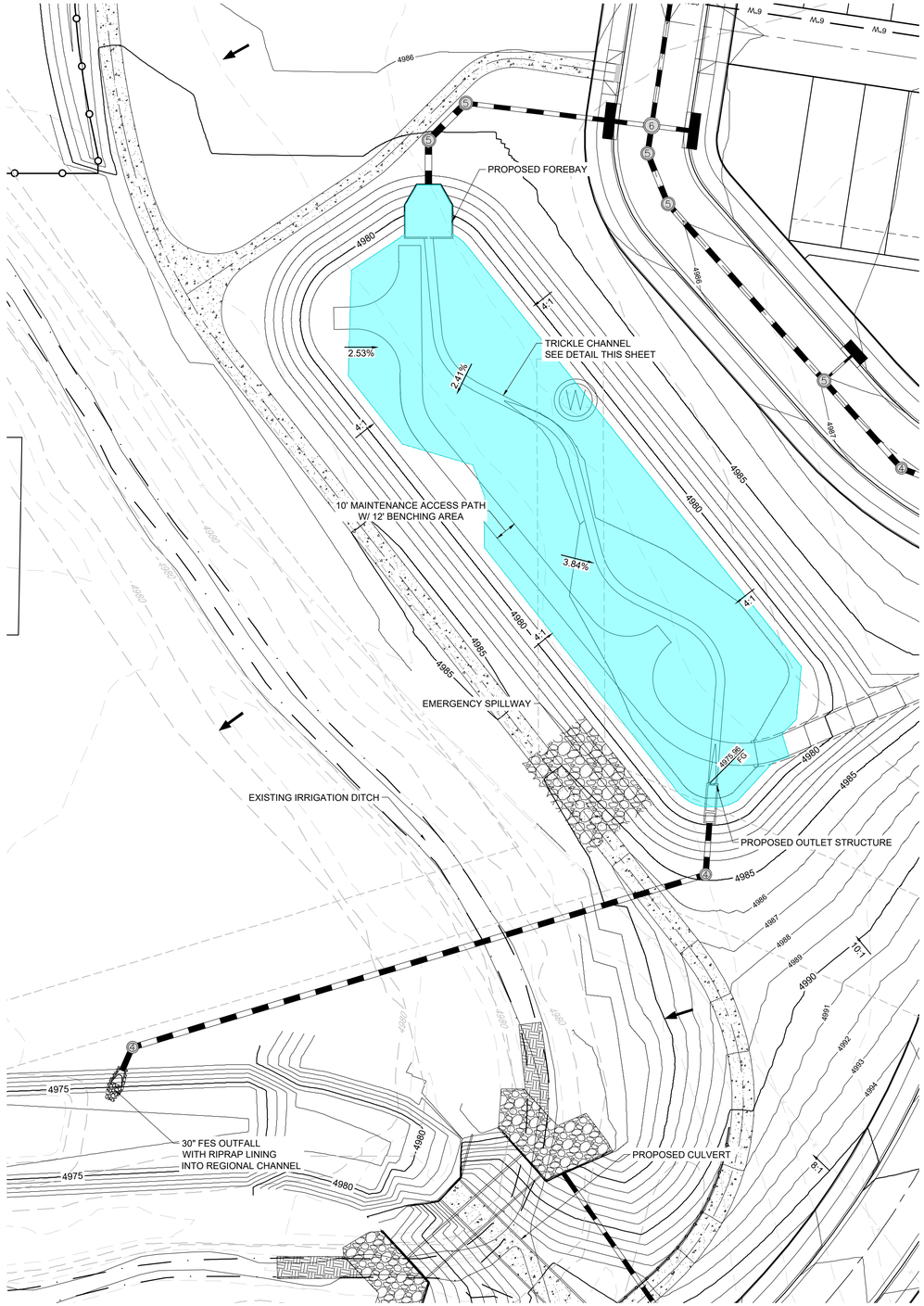
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PRELIMINARY DRAINAGE MAPS
POND C - OVERALL

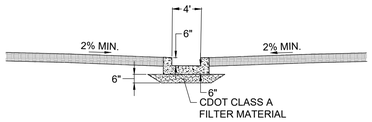
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DATE: JUNE 2025
SHEET NUMBER 16

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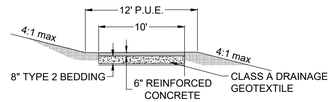
POND D OVERALL

1" =30'



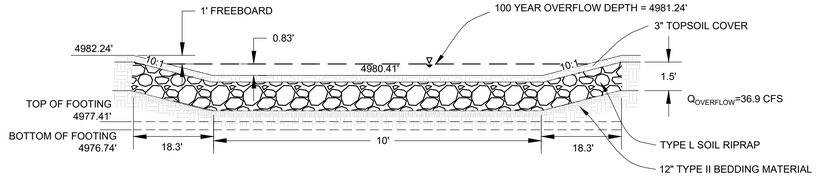
TRICKLE CHANNEL DETAIL

NOT TO SCALE



CONCRETE TRAIL DETAIL

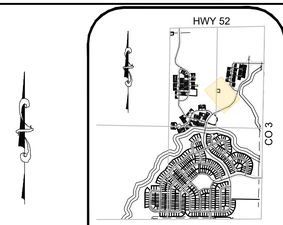
NOT TO SCALE



EMERGENCY SPILLWAY SECTION

NOT TO SCALE

POND D DESIGN SUMMARY			
STAGE	RELATIVE DEPTH	ELEVATION	VOLUME
	(FT)	(FT)	(AC-FT)
STAGE 0	-	4974.3	-
WQCV	1.6	4975.9	0.24
EURV	2.42	4976.72	0.72
100-YEAR	3.69	4977.99	1.8
SPILLWAY INVERT	3.8	4978.1	-



30 15 0 30 60

SCALE: 1" = 30

LEGEND

- XX = BASIN ID
- DESIGN POINT
- EXISTING DRAINAGE BOUNDARY
- MINOR BASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- RUNOFF BASIN BOUNDARY
- LAYOUT MATCHLINE
- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- PROPOSED MAJOR CONTOURS
- PROPOSED MINOR CONTOURS
- EMERGENCY OVERFLOW PATH
- PROPOSED STORM
- EXISTING STORM
- PROPOSED FLOW ARROW
- 100-YEAR FLOOD PLAIN
- LOT TYPES
- PAGE BOUNDARIES
- AREAS OUTSIDE OF POND DELINEATION

NOTES:

1. ALL PONDS ARE PRIVATE AND WILL BE MAINTAINED BY THE METRO DISTRICT.
2. POND FINAL DESIGN WILL BE COMPLETED IN THE FINAL DRAINAGE PLAN.
3. TRICKLE CHANNEL DETAILS WILL BE PROVIDED IN THE FINAL DRAINAGE PLAN/REPORT.
4. OUTLET STRUCTURE AND FOREBAY SIZING/CALCS WILL BE PROVIDED WITHIN THE FINAL DRAINAGE PLAN/REPORT.

BENCHMARK
THE SOUTHWEST CORNER OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, BEING A 2-1/2" ALUMINUM CAP STAMPED "LS 23501 POWERS ELEV CO" HAVING A PUBLISHED ELEVATION OF 4983.02 FEET, NAVD 1988 DATUM, PER THE TOWN OF ERIE CONTROL MAP (JANUARY 25, 2004 REVISION).

BASIS OF BEARINGS:
BEARINGS ARE BASED ON THE NORTH LINE OF THE NORTHEAST QUARTER OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 68 WEST, 6TH PRINCIPAL MERIDIAN, BEING MONUMENTED AT THE NORTH ONE QUARTER CORNER OF SAID SECTION 6 BY A FOUND NO. 6 REBAR WITH A 3-1/4 INCH DIAMETER ALUMINUM CAP SET BY PLS 36053 AND AT THE NORTHEAST CORNER OF SAID SECTION 6 BY A FOUND NO. 6 REBAR WITH A 2-1/2 INCH DIAMETER ALUMINUM CAP SET BY PLS 25937. THE LINE IS ASSUMED TO BEAR N88°46'59"E, A DISTANCE OF 2642.32 FEET.

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Accepted by: _____ Town Engineer _____ Date

PREPARED UNDER THE SUPERVISION OF

MARK SCHEURER
COLORADO P.E. 48988

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1-800-922-1987
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			CVL		

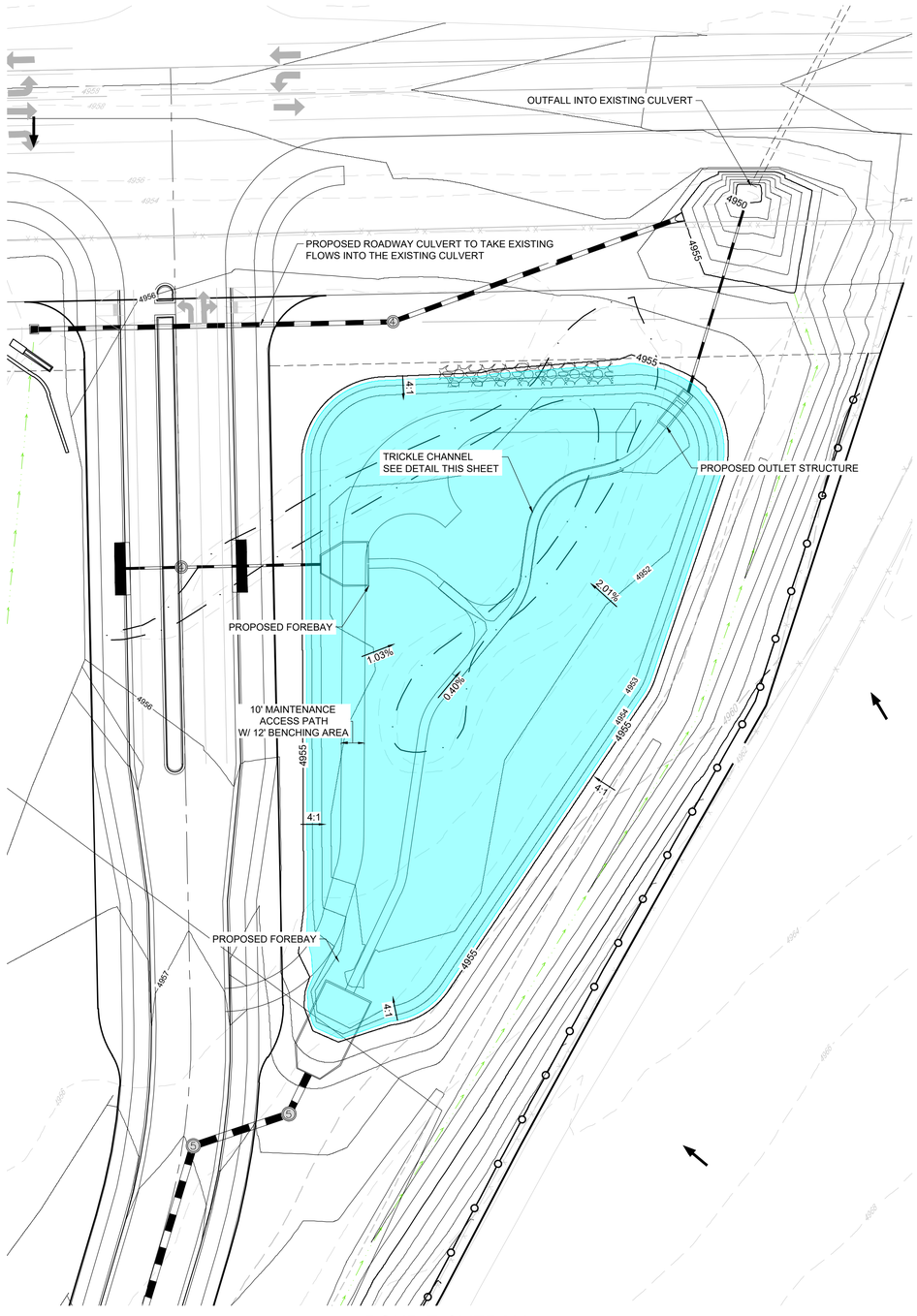
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ENGLEWOOD, CO 80112
TEL: 720.482.9526
Westwoodps.com
Westwood Professional Services, Inc.

ME ERIE, LLC
7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112

SPRING HILL
PRELIMINARY DRAINAGE MAPS
POND D - OVERALL

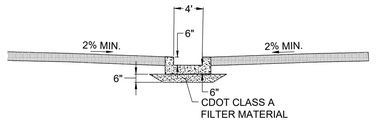
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CHECKED BY:
DATE: JUNE 2025
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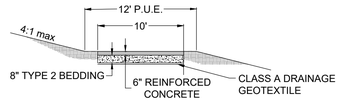


POND E OVERALL

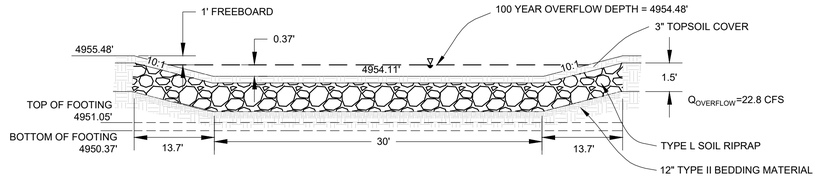
1" =30'



TRICKLE CHANNEL DETAIL
NOT TO SCALE

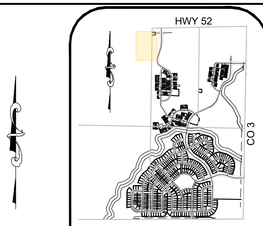


CONCRETE TRAIL DETAIL
NOT TO SCALE



EMERGENCY SPILLWAY SECTION
NOT TO SCALE

POND E DESIGN SUMMARY			
STAGE	RELATIVE DEPTH	ELEVATION	VOLUME
	(FT)	(FT)	(AC-FT)
STAGE 0	-	4950.5	-
WQCV	1.66	4952.16	0.35
EURV	2.85	4953.35	1.14
100-YEAR	4.09	4954.59	2.13
SPILLWAY INVERT	4.2	4954.7	-



KEYMAP
SCALE 1" = 2000'

30 15 0 30 60

SCALE: 1" = 30

LEGEND

XX / A / C2 / C100	XX = BASIN ID
XX	DESIGN POINT
	EXISTING DRAINAGE BOUNDARY
	MINOR BASIN BOUNDARY
	MAJOR BASIN BOUNDARY
	RUNOFF BASIN BOUNDARY
	LAYOUT MATCHLINE
5650	EXISTING MAJOR CONTOURS
5650	EXISTING MINOR CONTOURS
5650	PROPOSED MAJOR CONTOURS
5649	PROPOSED MINOR CONTOURS
	EMERGENCY OVERFLOW PATH
S	PROPOSED STORM
	EXISTING STORM
	PROPOSED FLOW ARROW
	100-YEAR FLOOD PLAIN
A	LOT TYPES
	PAGE BOUNDARIES
	AREAS OUTSIDE OF POND DELINEATION

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Accepted by: _____ Town Engineer _____ Date

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MARK SCHEURER
COLORADO P.E. 48988

No.	Revisions	Date	Init.	Appr.	Date
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ME ERIE, LLC
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CENTENNIAL, CO 80112

SPRING HILL
PRELIMINARY DRAINAGE MAPS
POND E - OVERALL

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CHECKED BY:
DATE: JUNE 2025
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James Enterprises Inc.
-Archaeologists-
P.O. Box 1064, Ft. Collins, CO 80522
(970) 484-3335

CLASS III CULTURAL RESOURCE SURVEY OF THE PROPOSED ANDALUSIA RESIDENTIAL DEVELOPMENT, WELD COUNTY, COLORADO

Report Prepared by:

James M. Brechtel
Principal Investigator, James Enterprises Inc.

for:
I & J Partnership LP

State of Colorado Archaeological Permit #2014-28

8 July 2014

ABSTRACT

At the request of I & J Partnership LP, a Class III intensive cultural resource survey was conducted for the proposed Andalusia residential development. This property has been annexed by the Town of Erie, which requires the survey and report as part of its Preliminary Plat review and approval process. The project is located in Section 6 of Township (T) 1N, Range (R) 68W, in southwestern Weld County, Colorado.

Five segments of four linear sites—5WL1423.40 and .41, 5WL1526.4, 5WL2248.14, and 5WL5461.3—and three isolated finds—5WL7644, 5WL7645, and 5WL7646—were recorded during this survey. 5WL1423.40 and 5WL1423.41 are discontiguous, previously unrecorded segments of the Burlington and Missouri River Railroad; 5WL1526.4 is a previously unrecorded segment of the South Platte Supply Canal/Coal Ridge Ditch; 5WL2248.14 is a previously unrecorded segment of the Cottonwood Extension Ditch; and 5WL5461.3 is a previously unrecorded segment of the Boulder-Weld County Ditch. The State Historic Preservation Officer (SHPO) officially determined the railroad as a whole eligible for the National Register of Historic Places (NRHP) in 1993. The two segments recorded during the current project (5WL1423.40 and 5WL1423.41) are recommended not supporting of this overall eligibility because of their marked deterioration. The State Historic Preservation Office (SHPO) previously determined segments of the South Platte Supply Canal/Coal Ridge Ditch officially not eligible, in 1990 and 2013, because of its mid-century modifications. However, newly recorded segment 5WL1526.4 is recommended contributing to a Colorado-Big Thompson Project National Register district for the canal's relationship to the Bureau of Reclamation's massive engineering project. The SHPO has officially determined some segments of the Boulder-Weld County Ditch not eligible and some eligible, so the eligibility of the entire resource appears to be undetermined. Because the entire ditch has not yet been evaluated, it is considered to be eligible overall for purposes of Section 106 of the National Historic Preservation Act. Accordingly, 5WL5461.3 is recommended supporting of the ditch's overall eligibility. Likewise, because the entire Cottonwood Extension Ditch has not yet been evaluated, the SHPO considers it eligible overall. The segment recorded during the current project, 5WL2248.14, is recommended supporting of this overall eligibility. Isolated Finds (IF's) 5WL7644–5WL7646 consist of a depression of unknown origin, a displaced historic artifact scatter, and a partially exposed, collapsed terra cotta irrigation pipe. All are recommended not eligible for the NRHP.

Any proposed development activities that could cause direct adverse effects or marked changes in the setting, feeling, and association of 5WL1526.4, 5WL2248.14, and/or 5WL5461.3 should be avoided, minimized, or mitigated. The only known such effects at this time are visual. The open, agricultural setting which characterized these 3 ditches historically will be compromised visually by the proposed modern residential development. However, current plans to mitigate these adverse visual effects include retaining these earthen channel ditches in their original, historic locations and courses without modification, and preserving them within an undeveloped corridor at least 100 ft. wide or more. These corridors will be vegetated with pasture grasses, and existing ditch access roads will be retained, effectively preserving the agricultural appearance and setting of the ditches. Accordingly, no additional mitigative measures are recommended for these ditches, or for any of the 7 cultural resources recorded during this survey.

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History Colorado-Office of Archaeology and Historic Preservation
COLORADO CULTURAL RESOURCE SURVEY
Cultural Resource Survey Management Information Form

I. PROJECT SIZE

Total federal acres in project	-0-	Total federal acres surveyed	-0-
Total state acres in project	-0-	Total state acres surveyed	-0-
Total private acres in project	311	Total private acres surveyed	311
Total other acres in project	-0-	Total other acres surveyed	-0-

II. PROJECT LOCATION

County: Weld
USGS Quad Map: Erie 1979
Principal Meridian: 6

Township	1N	Range	68W	Section	6	E1/2/SW	1/4		1/4		1/4		1/4
Township	1N	Range	68W	Section	6	E1/2	1/4		1/4		1/4		1/4
Township		Range		Section			1/4		1/4		1/4		1/4
Township		Range		Section			1/4		1/4		1/4		1/4
Township		Range		Section			1/4		1/4		1/4		1/4

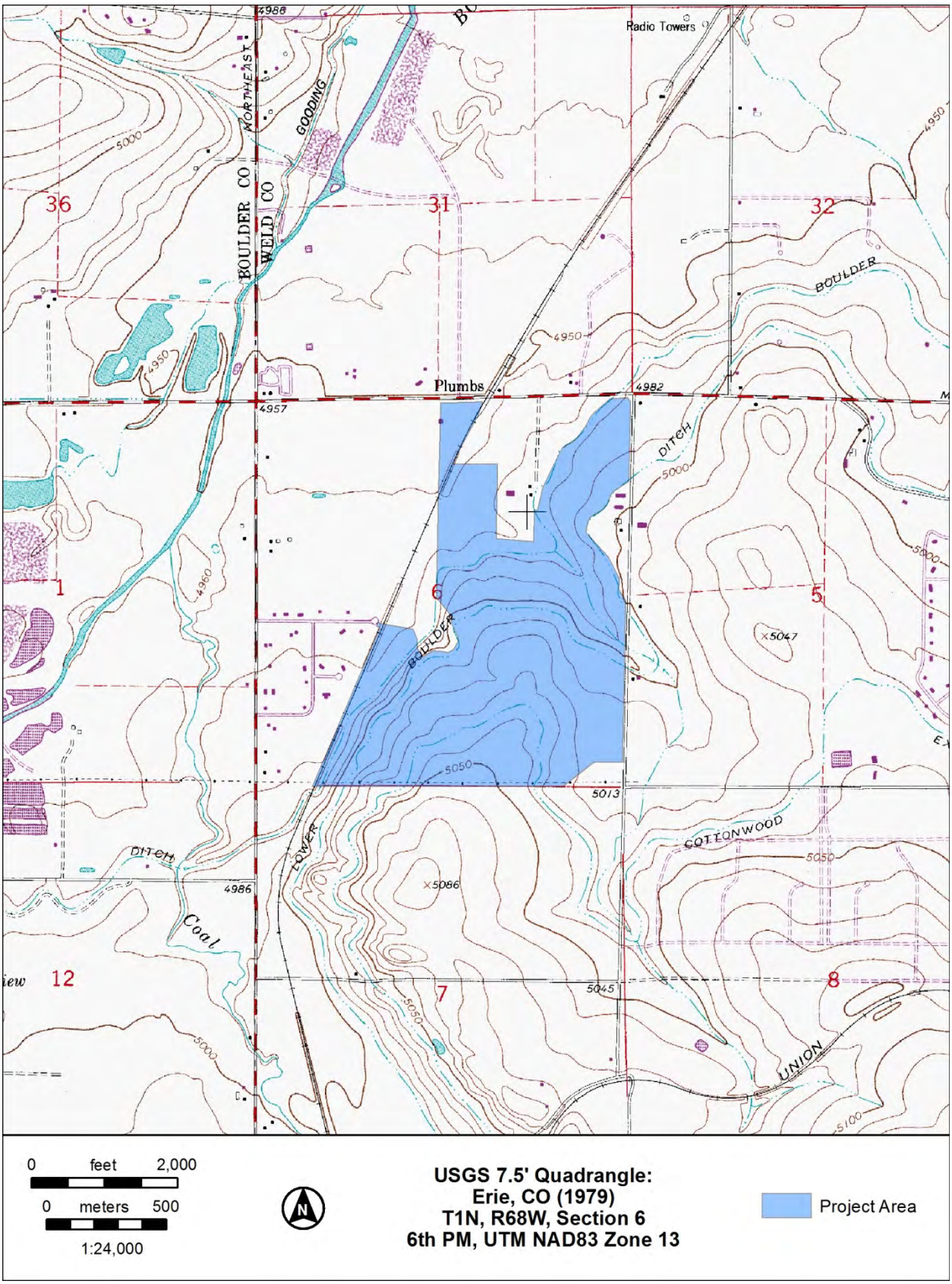
III. SITES

Smithsonian Number	Resource Type				Eligibility				Management Recommendations						
	Prehistoric	Historic	Paleontological	Unknown	Eligible	Not Eligible	Need Data	Contributes to a District	No Further Work	Preserve / Avoid	Monitor	Test	Excavate	Archival Research	Other
5WL1423.40		X				X			X						
5WL1423.41		X				X			X						
5WL1526.4		X			X					X					
5WL2248.14		X			X					X					
5WL5461.3		X			X					X					

IV. ISOLATED FINDS

Smithsonian Number	Resource Type			
	Prehistoric	Historic	Paleontological	Unknown
5WL7644		X		
5WL7645		X		
5WL7646		X		

Smithsonian Number	Resource Type			
	Prehistoric	Historic	Paleontological	Unknown


Radio Towers
BOULDER CO
WELD CO
NORTHEAST
GOODING
Plumbs
DITCH
BOULDER
LOWER
COTTONWOOD
UNION
Coal
36
31
32
1
6
5
7
8
12
4986
4957
4982
5047
5013
5086
5045
5050
5000
4950
4960
5100
0 feet 2,000
0 meters 500
1:24,000
USGS 7.5' Quadrangle:
Erie, CO (1979)
T1N, R68W, Section 6
6th PM, UTM NAD83 Zone 13
Project Area

v

INTRODUCTION

The proposed undertaking is the Andalusia residential development, which has been annexed by the Town of Erie. Said development will include the building of homes, streets, utilities, etc. The project area is an irregularly shaped, approximately 311-acre parcel (Figure 1). A Class III intensive inventory of this parcel was conducted at the request of I & J Partnership LP, as required by the Town of Erie. Fieldwork for this project was conducted on June 24 and 25, 2014 by Dr. Rebecca Schwendler, Lindsey Clark, and Shelly Martin on behalf of James Enterprises, Inc.

AFFECTED ENVIRONMENT

The following description of environmental conditions in the project area is derived from observations made during fieldwork, and from data contained in Crabb (1982). The general location of the project area is the northern Colorado Piedmont, an area of high, nearly flat to gently rolling plains located approximately one-half mile east of Coal Creek, which is part of the South Platte River watershed. There are no natural streams or other sources of surface water within the surveyed parcel, aside from a section of wetlands in the east-central portion of the parcel that are fed by a small stream that enters the project area from the southeast. This general region has average precipitation of 12 inches, average relative humidity of 40%, and average summer and winter temperatures of 70 and 29 degrees Fahrenheit, respectively. However, extreme seasonal departures from these averages are common, and until one or two years prior to the time of this survey, the entire Colorado Piedmont region had experienced recurrent episodes of drought conditions for approximately 10 years. Soils throughout this broad region include loams and sandy loams of both residual and eolian origin, underlain by clay and hardpan, with the underlying bedrock in this region being comprised of Cretaceous sediments. Within this region, these bedrock outcrops sometimes include conglomerates and associated siliceous lag gravels, some of which may contain knappable lithic raw material. No gravels of this type were noted within the area surveyed for this project.

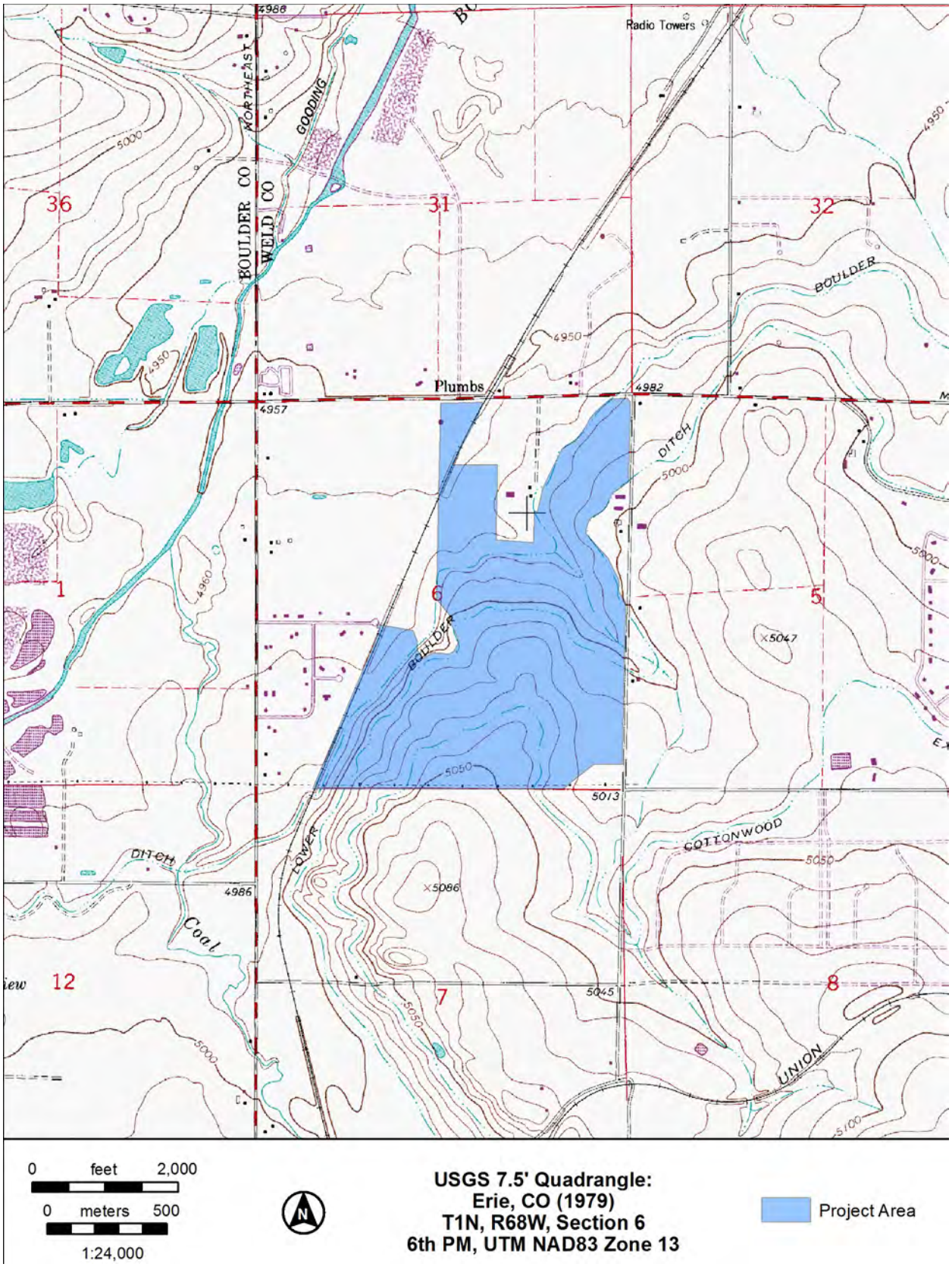


Figure 1. Location of the project area.

Native vegetation in the project area consists mostly of various bunchgrasses, sage, and yucca, although all of the surveyed area has been under cultivation for some time, the proposed project being located in active wheat and alfalfa fields and cow and horse pastures, bordered by patches of cheatgrass and Canadian thistle and stands of cottonwood and Russian olive trees. Ground cover at the time of this survey was comprised mostly of planted wheat, alfalfa, and thick weedy plants resulting in 0–90 percent ground visibility depending on the stage of growth of the agricultural fields. Ground visibility was considered generally adequate for purposes of this survey, considering the effects of long term cultivation. Fauna native to this general area include small burrowing rodents, various raptors (e.g. hawks, owls, and eagles), predatory mammals (e.g. foxes and coyotes), and large herbivores (e.g. mule deer, pronghorn antelope, and bison prehistorically). The use of many of these fauna as subsistence resources by prehistoric cultures has been well established archaeologically in this region. Voles, horses, cattle, and hawks were observed within the project area during survey.

CULTURE HISTORY

In the Platte River Basin, within which the proposed project area lies, human history is typically divided into five major stages or periods: Paleoindian, Archaic, Late Prehistoric, Protohistoric, and Historic. For the first three periods, information is largely summarized from Gilmore et al. (1999). Information about the Protohistoric and Historic eras is derived from the references specifically cited.

Paleoindian Period (12,000–7500 B.P.)

While a growing body of archaeological evidence from across North America and beyond suggests that people lived here tens of thousands of years ago, the oldest period of human occupation of the Platte River Basin that is currently well documented is the Paleoindian period, dating between about 12,000 B.P. and 7500 B.P. From oldest to youngest, broad Paleoindian traditions observed in the Platte River Basin are Clovis (ca. 12,000–11,000 B.P.), Folsom (ca. 11,000–10,000 B.P.), and Plano (ca. 10,000–7500 B.P.). The Paleoindian period was characterized by a cooler and wetter climate than is known today, with widespread grasslands and boreal forest in this area. Paleoindian food economies in general were based on the hunting of megafauna—including mammoth, bison, and camels—although people using the foothills and mountains also hunted small game such as bighorn sheep, elk, and deer and used plant foods such as limber pine nuts. Hunters employed large, lanceolate, stone project points. Groups were probably small and highly mobile, following game into the mountains during warm months and onto the plains during cooler times.

Archaic Period (7500–1800 B.P.)

The Archaic period is defined as that time when people still relied on hunting and gathering but used a larger variety of food resources and technologies and adapted to a highly variable but generally warming climate. The Archaic is typically broken into three sub-periods. For the Platte River Basin they are the Early Archaic (7500–5000 B.P.), the Middle Archaic (5000–3000 B.P.), and the Late Archaic (3000–1800 B.P.). Adapting to changing environmental conditions and food resources, people invented new tool forms, including stemmed and notched projectile points that were generally smaller than Paleoindian points, and grinding implements including one-hand manos and small grinding slabs and simple metates. Those ground stone technologies were used

both for wild plants (and other materials) and for domesticated maize, which was incorporated into the diet to various degrees, in some areas, during the later Archaic. Like Paleoindians before them, Archaic peoples inhabited and used the plains, hogbacks/foothills, and mountains, taking advantage of the proximity of diverse plant and animal species.

Late Prehistoric Period (1800–400 B.P./A.D. 150–1540)

The Late Prehistoric period is also sometimes called the Ceramic Period for the new use of that technology, albeit with a continued emphasis on a hunting and gathering economy. During this period people also introduced bow and arrow technology and made small corner- and side-notched projectile points for it. Evidence for horticulture is sparse. In the Platte River Basin the period is divided into the Early Ceramic (A.D. 150–1150) and Middle Ceramic (A.D. 1150–1540). In general, people appear to have used the same camps for a longer period of time, and/or more frequently, than during the Archaic period, suggesting somewhat reduced mobility. Many site assemblages are also concomitantly more complex than those dating to the Archaic period.

Protohistoric Period (A.D. 1540–1860)

The Protohistoric period in the Platte River Basin is considered to date between approximately A.D. 1540 and 1860. This is also known as the Late Ceramic period, although "Protohistoric" is more commonly used. This period represents the time between initial non-Native American entry into or influence in the region, and permanent, widespread settlement by Mexicans and Euroamericans. By about 1816, there were Euroamerican reports that some Cheyenne and Arapaho were hunting together between the sources of the North and South Platte rivers (Baker et al. 1997), although the Cheyenne generally remained farther north (Fowler 2001). After Mexico declared its independence from Spain in 1822 and opened its borders for trade, an increasing number of trappers and traders traveled through or settled in the region, sending goods back to a market in Taos, in northern New Mexico (Clark 1999). Exploration also became more frequent during the 1830s and 1840s. Following the California Gold Rush in 1849, a steady stream of miners traveled through portions of Colorado's Front Range along overland routes, such as Trapper's Trail and the Cherokee Trail, to reach mining sites (Miller et al. 2005). Then in 1858 gold was discovered at the confluence of the Platte River and Cherry Creek about 25 miles south of the project area. This brought significantly larger numbers of Euroamerican settlers to the region, with miners moving onto lands reserved for tribes and demanding that the government dissolve Indian claims (Clark 1999). With a marked increase in Euroamerican presence in the region, the federal government increasingly tried to control land and resource use by the Arapaho and other tribes, leading to a series of treaties between the government and tribes.

Historic Period (A.D. 1860–1960)

The year 1860 is used as a somewhat arbitrary beginning of the Historic period, although in that year Anglos firmly established their control over most lands in eastern Colorado, relegating the Cheyenne and Arapaho to a small reservation located between the Arkansas River and Sand Creek. Then in 1861 the Colorado Territory was established and tensions between Native Americans and Anglos continued to increase, with one result being the massacre of at least 500 Arapaho and Cheyenne camping on their Sand Creek Reservation by federal troops on November 29, 1864. After subsequent revenge and counter attacks, the government crafted the Medicine Lodge Creek Treaty in October 1867, whereby the southern Cheyenne and Arapaho

agreed to move to Indian Territory in modern-day Oklahoma. More Anglo-Indian skirmishes occurred over the next two years, with the final military engagement between Indians and federal troops occurring at Summit Springs in northeastern Colorado. After that time, Colorado's Eastern Slope was permanently opened for rapid Anglo exploitation and settlement (Ubbelohde et al. 1995).

Denver and Golden were founded at the end of the 1850s as a result of the nearby discovery of gold. First Golden and then Denver, beginning in 1867, served as seats of government for the newly created Colorado Territory. Boulder became the county seat of Boulder County that same year. Located about 15 miles east of Boulder, the town of Erie began as an agricultural area, and then saw additional development as a small population center for mining the Northern Coalfields, along with nearby settlements such as Lafayette and Louisville. In 1871 the Union Pacific Railroad extended a spur west to Erie from Brighton off its Denver to Cheyenne line. Erie coal was used to fuel the steam locomotives, and the Boulder Valley Railroad, as the spur was called at that time, was a catalyst for coal field development. After subsequent growth, Erie was incorporated in 1874 (Town of Erie Colorado 2014). Development of silver, gold, coal, and other mining in the Northern Coalfields and in the mountains to the west of Boulder continued into the early 1900s, although the plains saw increasingly intensive ranching and agriculture (Clark and Corbett 2007). Today Erie's economy is based largely on agriculture and other services provided to a rapidly increasing population.

EXISTING DATA AND LITERATURE REVIEW

A Class I file search of the Office of Archaeology and Historic Preservation's (OAHP's) COMPASS database was conducted on June 19, 2014. This search indicated that 16 surveys have been conducted previously within a one-mile radius around the project area (Table 1). Thirteen of the surveys were intensive Class III inventories, one was a reconnaissance survey, and two were Class II sample surveys. These previous projects were conducted between 1977 and 2011. Twenty-six cultural resources have been recorded previously within the one-mile radius file search area (Figure A.1 and Table A.1). All but two of the cultural resources are historic and primarily pertain to historic farming and ranching. The two prehistoric resources are IFs comprising chipped and ground stone artifacts. Four of the previously recorded historic cultural resources (5WL1423, 5WL1526, 5WL2248, and 5WL5461) extend into the current project area and represent a railroad and three ditches, respectively. All were recorded during the current project.

Table 1. Surveys Conducted Previously within One Mile of the Project Area

Survey ID	Name	Institution	Method	Date
BL.LG.R141	CULTURAL RESOURCE SURVEY OF LOWER BOULDER CREEK, BOULDER COUNTY, COLORADO	Native Cultural Services	CLASS II	9/1/1997
BL.SHF.R49	UNINCORPORATED BOULDER COUNTY HISTORIC SITES SURVEY REPORT (SHF 98-02-064, 93-02-062, 96-02-171, 99-02-059)	Boulder County Parks & Open Space Department	Historic Survey - CII	2/1/2003
MC.CH.R155	AN INTENSIVE ARCHAEOLOGICAL RESOURCE INVENTORY OF THE BOULDER CREEK BRIDGE REPLACEMENT ON STATE HIGHWAY 52, BOULDER AND WELD COUNTIES, COLORADO (CDOT # BR 052A-025 BOULDER CREEK BRIDGE)	CDOT Colorado Department of Transportation	CLASS III	10/17/2006
MC.CPO.R27	SURVEY REPORT, WELD COUNTY, COLORADO FARM AND RANCH INVENTORY, WELD AND BROOMFIELD COUNTIES	Western Historical Studies, Inc.	RECONNAISSANCE SURVEY	3/15/1989
MC.EP.R1	A CULTURAL RESOURCE SURVEY OF SELECTED PORTIONS OF THE ERIE WATER AND SANITATION DISTRICT, BOULDER AND WELD COUNTIES, COLORADO	Cultural Resource Consultants	CLASS III	11/25/1977
MC.LM.NR110	AN INTENSIVE CULTURAL RESOURCES INVESTIGATION FOR INTERSECTION IMPROVEMENTS AT STATE HIGHWAY 52 AND COUNTY LINE ROAD, BOULDER AND WELD COUNTIES, COLORADO (SHE 052A-020)	CDOT Colorado Department of Transportation	CLASS III	9/30/2003
MC.R.R17	CULTURAL RESOURCES INVENTORY OF THE ANDERSON, LUMRY & NORTHRIDGE PARCELS, BOULDER AND WELD COUNTIES, COLORADO	Native Cultural Services	CLASS III	5/6/1996

WL.CH.NR34	AN INTENSIVE ARCHAEOLOGICAL RESOURCE INVENTORY AT FOUR COUNTY ROAD INTERSECTIONS ON STATE HIGHWAY 52 BETWEEN INTERSTATE 25 AND US HIGHWAY 287, BOULDER AND WELD COUNTIES, COLORADO (STA 052A-023, SH 52 I-25 TO US 287)	CDOT Colorado Department of Transportation	CLASS III	12/18/2003
WL.LM.NR24	CULTURAL RESOURCE INVENTORY OF THE FEDERAL NOAA #11-32 WELL. WELD COUNTY, CO. (CR-RG-02-92(N))	Native Cultural Services	CLASS III	7/31/2002
WL.R.NR17	A CULTURAL RESOURCES INVENTORY OF THE RICE PARCEL, WELD COUNTY, COLORADO	Tate and Associates Inc.	CLASS III	5/7/2002
WL.R.NR24	INTENSIVE CULTURAL RESOURCE SURVEY OF THE PROPOSED IHRIG NCWCD INCLUSION, WELD COUNTY, COLORADO (GRUP #03-GP-09-S)	James Enterprises, Inc. (JEI)	CLASS III	11/4/2004
WL.R.NR31	INTENSIVE CULTURAL RESOURCE SURVEY OF PROPOSED IRWIN NCWCD INCLUSION WELD COUNTY, COLORADO	James Enterprises, Inc. (JEI)	CLASS III	10/15/2008
WL.R.R16	A CLASS III CULTURAL RESOURCES SURVEY OF THE BELL TOWER ANNEXATION PARCEL WELD COUNTY, COLORADO	Western Cultural Resource Management, Inc. (WCRM)	CLASS III>	8/26/1999
WL.R.R37	CLASS III CULTURAL RESOURCE INVENTORY OF THE BELL TOWER EVENT CENTER PROJECT, TOWN OF ERIE, WELD COUNTY, COLORADO	Centennial Archaeology, Inc.	CLASS III>	3/7/2002
WL.R.R68	CULTURAL RESOURCE SURVEY OF PROPOSED MORGAN HILL DEVELOPMENT NCWCD INCLUSION, WELD COUNTY, COLORADO	Bureau of Reclamation - Eastern Colorado Area Office Loveland	CLASS III>	8/22/2011
WL.R.R70	CLASS III CULTURAL RESOURCE INVENTORY BRIDGEWATER DEVELOPMENT PROJECT, WELD COUNTY, COLORADO	Bureau of Reclamation - Eastern Colorado Area Office Loveland	CLASS III>	9/14/2011

Previous archaeological investigations conducted throughout the Colorado Piedmont region by the principal investigator and others suggest that prehistoric sites may have a higher occurrence in locations near reliable water sources, e.g. streams and/or large playas, as well as in blowouts and on elevated landforms with extensive overviews, or at locations which have surface deposits of knappable, siliceous gravels. The current project area generally lacks these favorable conditions. As summarized in the previous section, archaeological research in this region has confirmed the presence of aboriginal cultures on the Colorado Piedmont during the Paleoindian (>12,000–7500 B.P), Archaic (7500–1800 B.P.), Late Prehistoric (1800–400 B.P./A.D. 150–1540), and Protohistoric (A.D. 1540–1860) periods (Gilmore et al. 1999). More than 7600 sites and isolated artifacts, representing all of these periods, have been recorded in Weld County previously. These prehistoric periods are evidenced by various projectile points and other distinctive lithic and some ceramic artifacts; and by such sites as open campsites, which are often indicated by lithic scatters and hearth remnants, as well as stone rings and subsistence resource procurement and processing sites, e.g. quarry areas and game butchering sites. The differing types of cultural resources associated with each period are presumed to reflect variations in general prehistoric cultural adaptations and subsistence strategies over time. Historic themes associated with the Euroamerican history of this region include those of early exploration, ranching, farming, homesteading, irrigation developments, and the Great Depression (Mehls 1984).

STATEMENT OF OBJECTIVES AND RESEARCH DESIGN

This survey was conducted to fulfill Preliminary Plat submittal requirements for the Town of Erie. The objective of the survey was to locate and record all cultural resources within the project area, to evaluate those resources against National Register of Historic Places (NRHP) criteria, and to recommend management strategies for avoiding adverse effects to historic properties (cultural resources eligible for or listed on the NRHP). Such evaluation is made by assessing the significance of a cultural resource within the existing local/regional prehistoric and historic context outlined above, in terms of the following four NRHP Criteria:

Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

Criterion B: Associated with the lives of persons significant in our past.

Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Criterion D: Have yielded or may be likely to yield information important in prehistory or history.

Based on existing regional data, the current project area was presumed to have some potential for cultural materials associated with any/all of the prehistoric periods and historic themes described above, although the potential for significant prehistoric resources was considered relatively low because of the project area's lack of extensive views and knappable stone materials, and the impacts of long-term cultivation as noted earlier. Nevertheless, potential prehistoric resources within the surveyed parcel could include various lithic artifacts (e.g., flaked and/or ground stone debitage and tools) and possibly ceramic artifacts, as well as open camps, stone rings, and lithic

procurement sites. Historic Euroamerican cultural resources for which the greatest potential in the project area might be anticipated could include scattered remains of structures and/or foundations associated with abandoned homesteads and/or ranches, as well as irrigation works and other agriculture-related materials. Any archaeological remains that might occur within the current project area could help elucidate general patterns of prehistoric settlement/subsistence on the Colorado Piedmont, and might also provide chronological data leading to the establishment of absolute date/artifact associations in this region.

FIELD METHODS

The field methods and the format of this report, including the resource evaluations and recommendations, follow the current standards and guidelines of the Colorado State Historic Preservation Office (SHPO), as this project was conducted under a State of Colorado Archaeological Permit. The Town of Erie Planning Dept. was contacted prior to conducting this survey. A Class III intensive inventory or survey was conducted for this project. The total area inventoried consisted of an irregularly shaped block containing approximately 311 acres. For purposes of this survey, a cultural resource *site* was defined as a discrete locus of interpretable, patterned human behavior, generally evidenced by more than 5 artifacts and/or one or more cultural features more than 50 years old. An *isolated find* was defined as one or very few artifacts not representing patterned behavior or multiple artifacts that lack context and integrity of location and do not represent a locus of interpretable patterned human behavior. The intensive survey was conducted using a series of parallel, pedestrian transects spaced not more than 20 meters (m) apart and covering all surveyed areas uniformly. No collections were made during this survey. Field notes and digital photo files pertaining to this project are on file at the office of James Enterprises, Inc. in Fort Collins, Colorado.

RESULTS

Approximately one-quarter of the project area exhibited limited or no ground surface visibility due to dense vegetation growth primarily in cow and horse pastures, a mature wheat field, and a wetlands area in the northern half of the survey block and a thriving alfalfa field in the south-central portion of the block. Otherwise no adverse field conditions prohibited a thorough survey of the project area, particularly given the effects of long-term cultivation on any existing cultural resources within the area. There were no surface indications of higher than usual potential for subsurface cultural resources within the area surveyed. Seven cultural resources were recorded, namely four sites (one of which is represented by two segments) and three IFs. All of these resources are described in detail on the Colorado Cultural Resource Forms included with the SHPO copy of this report, and they are summarized below.

Sites

The first site (5WL1423.40 and 5WL1423.41) is a segment of a historic railroad. The other three sites are segments of historic ditches (5WL1526.4, 5WL2248.14, and 5WL5461.3).

5WL1423.40 and 5WL1423.41

These are newly recorded, discontinuous segments of the Burlington and Missouri River Railroad, constructed in 1889, that runs along and near the western edge of the project area. The

SHPO officially determined the entirety of the resource eligible for the NRHP in 1993, although individual segment eligibility varies primarily based on the condition of the segment. The two segments documented during the current project were previously unrecorded. Segment 5WL1423.40 represents the portion of the railroad that runs along the southwest boundary of the project area, while 5WL1423.41 cuts through the northwest corner of the project area (Figure B.1). As a result of development and agriculture, the segments of the railroad that cross through the project area are hard to recognize.

Segment 5WL1423.40 appears as a discontinuous, heavily vegetated (willows, cheatgrass, Canadian thistle), elevated grade made of quartzite and granite ballast. Two sections of grade are visible, separated by a section that appears to have been destroyed by natural erosion from flooding or development or a combination thereof. The northern intact section terminates at the south edge of a horse pasture, about 341 feet (104 m) south of the north edge of this portion of the project area. No associated structural materials or artifacts were observed. The two discontinuous sections are approximately five meters wide on top, with five-meter wide slopes on either side. The southern section is approximately 1,247 feet (380 m) long, while the northern section is approximately 525 feet (160 m) long. The intervening, destroyed section is approximately 259 feet (79 m) long. Currently a barbed wire fence runs along the top of the grade.

Segment 5WL1423.41 is barely visible in the northwestern portion of the project area as a short section of heavily eroded grade, consisting of quartzite and granite ballast, with a maximum width of one meter (3.3 feet) and a maximum height of the same. The discernible section of grade, measuring only about 98 feet (30 m) long, is found at the southwest end of the segment. A wire fence runs along its southern end, at the eastern edge of a pasture with thick grass. The remainder of the segment, whose total length is approximately 1,312 feet (400 m) and whose location is assumed from the 1979 topographic map of the area, has been leveled, plowed over, and/or used as the location of a recently installed sewer line. As a result, this segment of the site has largely been destroyed, with only a very deteriorated remnant remaining.

5WL1526.4

This is a newly recorded segment of the South Platte Supply Canal/Coal Ridge Ditch. The Coal Ridge Ditch had been constructed in 1859 by the Lower Boulder Ditch Company, having some of the earliest water rights (Chambellan 1989). In 1954–1956 the Bureau of Reclamation (BOR) constructed the South Platte Supply Canal by widening and connecting the Coal Ridge Ditch, the Lower Boulder Ditch, and the Sullivan Ditch and a new 1.3-mile section. This was the BOR's last created element of the massive Colorado-Big Thompson Project (C-BT) that brings water from Colorado's Western Slope and mountains to the Eastern Slope and has contributed significantly to the state's 20th century economic development. The segment present within the project area, measuring approximately 5,855 feet (1,784 m) long, remains an earthen ditch that is still in use and routinely maintained, albeit with thick vegetation along its banks. It runs through a variety of environmental settings, including—from southwest to northeast—a heavily vegetated natural area, a field with nearly mature wheat, a cow pasture, wetlands, and a field containing young alfalfa. The ditch is approximately 16 feet (4.9 m) wide. The water appeared to be about 1 foot (0.3 m) deep at the time of recording. Four features were identified in association with this ditch.

Feature 1 is a T-shaped concrete diversion structure with a metal Parshall flume to the east. The diversion structure feeds water to an east-west trending lateral ditch (Feature 4) that has been abandoned. Feature 1 is no longer in use and a Russian olive tree is currently growing within the metal flume. Feature 4 is 8–12 inches (20–30 cm) deep and approximately 3 feet (0.9 m) wide.

Feature 2 is a second, more recently constructed, concrete diversion structure with a metal Parshall flume and attached gauge to its east. Feature 2 is located approximately 65 feet (20 m) southwest of Feature 1. Feature 2 diverts water to a second east-west running lateral ditch (Feature 3) that is younger than the Feature 4 ditch Feature 3 is approximately 1.5 feet (0.5 m) deep and approximately 5 feet (1.5 m) wide at ground level. Both features 3 and 4 run on the north side of an access road paralleling the South Platte Supply Canal/Coal Ridge Ditch. Feature 3 is located about 5 m south of Feature 4, separated from it by an earthen berm. Feature 3 may have been built to replace Feature 4 when Feature 1 became unusable due to the growth of the Russian olive tree.

5WL2248.14

This is a newly recorded segment of the Cottonwood Extension Ditch. This ditch diverts water from Coal Creek several miles south of the current project area and terminates several miles northeast of the project area. Because the entirety of the ditch has not yet been evaluated, the SHPO is treating it as eligible for the National Register. Previously recorded segments 5WL2248.11 and 5WL2248.12—both recommended supporting of the ditch's overall eligibility—immediately bracket the west and east ends of 5WL2248.14. The newly recorded segment is 3,534 feet (1,077 m) long and winds through fields with both young and more mature alfalfa, with tall wild grasses and plants generally flanking either side of the ditch. This segment remains a simple earthen ditch that is in well-maintained, albeit overgrown condition and was in use with approximately 6 inches (15 cm) of water at the time of recording. Eight features were recorded in association with this segment.

Feature 1 is a currently unused headgate located on the west side of 5WL2248.14. A typical headgate, it comprises a concrete wall paralleling the western wall of 5WL2248.14, with a metal screw stem and handwheel rising from the concrete. The headgate allows water to flow into a small parallel lateral irrigation ditch (Feature 2) that is approximately 3 feet (0.9 m) wide and 1.5 feet (0.5 m) deep. Feature 2 parallels the west side of 5WL2248.14 approximately 33 feet (10 m) from the ditch's western edge. Feature 2 flows north from Feature 1 until it bends slightly northeast then turns due north at a fence line, and south from Feature 1 until it disappears near the southern project boundary. It parallels 5WL2248.14 for only a short way. The gradual disappearance of the feature's southern end may be intentional, as it is likely used for flood irrigation. Feature 3 is an in-use headgate that was open at the time of recording. It is located on the north wall of 5WL2248.14 and allows water to flow from 5WL2248.14 through a PVC pipe into a lateral irrigation ditch (Feature 8) that borders an agricultural field located north of the headgate. Feature 4 is an in-use headgate and drop complex located on the east side of a dirt access road, north of 5WL2248.14. This headgate allows water to flow from 5WL2248.14 into a lateral ditch (Feature 7) that borders the western edge of an agricultural field, immediately east of an access road. A drop complex constructed of concrete, wood, and steel sheet metal is located near the south end of this portion of Feature 7. Feature 5 is an in-use headgate on the north side of

5WL2248.14. It appears to be modern and feeds a lateral irrigation ditch (also called Feature 7) paralleling the north bank of 5WL2248.14. Associated with the headgate in an adjacent agricultural field to the northeast is a 3-foot (0.9-m) wide square box built of cinder blocks that may act as a diversion structure. Feature 6 is the location of a possible former headgate or erosion control feature. It is currently a partially deteriorated concrete wall along the east bank of 5WL2248.14. Feature 7 is a 3-foot (0.9-m) wide parallel ditch that begins at Feature 4 and flows north for a short ways, as well as east then south along the east side of 5WL2248.14. It is located approximately 10 m from the eastern edge of 2248.14. The parallel ditch ends before the southern project area boundary and appears to feather out for flood irrigation. Feature 8 is a 3-foot (0.9-m) wide ditch paralleling the north side of 5WL2248.14 approximately 10 m from its northern edge. The lateral's east end is a north-south oriented dirt road that crosses the ditch. It flows west until it bends north at a fence line, parallelling Feature 2 on the opposite side of the fence. Water is diverted into this Feature 8 lateral from Feature 3.

5WL5461.3

This is a newly recorded segment of the Boulder-Weld County Ditch. The Boulder-Weld County Ditch originates at Boulder Creek, approximately 3 miles west of Erie, then flows northeast into Weld County and through the project area. The original construction of the ditch dates to 1871 (Winters and Winchell 1994). Several segments previously recorded in Boulder County have been determined officially not eligible for the NRHP, but at least two segments recorded previously in Weld County have been determined or recommended eligible or supporting of the ditch's overall eligibility. Because it appears that the entirety of the ditch has not yet been evaluated, it can be assumed that the SHPO is treating it as eligible for the National Register.

Newly recorded segment 5WL5461.3 is a simple earthen ditch measuring 7,362 feet (2,244 m) long and about 25 feet (7.6 m) at ground surface and 6 feet (1.8 m) near its base. This segment includes two features. It is still in use and is in good condition, albeit with heavy vegetation along both banks. According to Boulder and Weld County Ditch president Jon File, the ditch remains in its same location as when it was originally constructed, with the possible exception of some corners that may have been straightened after episodes of erosion (J. File, personal communication 2014). At the time of recording, the water in the ditch was approximately 21 inches (53 cm) deep. This segment flows past a gas well pad, through a densely vegetated unworked area, a cow pasture, wetlands, a field containing young alfalfa, and a field with mature hay. The ditch segment is in overall good condition, with some minor erosion observed along its banks at livestock crossings. Two features are associated with 5WL5461.3.

Feature 1 is a headgate on the western bank of 5WL5461.3 that does not appear historic although it is no longer in use. Feature 2 comprises a concrete diversion structure and concrete flume located west of Feature 1. The diversion structure and flume are separated by about 19.7 feet (6 m). No lateral ditches were observed extending from this feature so its degree and timing of use is unclear.

Isolated Finds

The three isolated finds include a depression (5WL7644), a historic artifact scatter (5WL7645), and a partially exposed terra cotta water conveyance pipe (5WL7646).

5WL7644

This IF is an anomalous circular depression of unknown age and origin observed in the middle of a field of mature wheat. The depression contains some cheatgrass. It measures 10 feet in diameter and 1–2 feet (0.3–0.6 m) deep. No artifacts were observed in or around the depression.

5WL7645

This IF is a displaced historic artifact scatter within a plowed field. The artifacts manifest in a north-bending arc-shaped distribution, which is likely the result of displacement from agricultural activities. The scatter is dispersed and consists of five brick fragments, two china ware fragments, a light blue plastic cap or bottle base, one sandstone flagstone fragment, two aqua bottle glass pieces, one clear unknown glass piece, two stoneware jug fragments, and one zinc fastener or machinery part. The artifact scatter measures approximately 115 feet (35 m) north-south by 115 feet (35 m) east-west. No evidence of a structure, dump, or other feature or concentrated area of artifacts could be found although a deep pit filled with sediment, trees, and other vegetal debris is located about 131 feet (40 m) southeast of the IF.

5WL7646

This IF is a section of collapsed terra cotta irrigation pipe exposed in an open hole within a field containing young alfalfa. The pipe is 12 inches (30.5 cm) in diameter, runs east-west, and is buried about 1 foot (0.3 m) below the ground surface. The open hole exposing the pipe measures about 3 × 4 feet (0.9 × 1.2 m) and may have been an access point for the pipe or a sink hole that formed when the pipe collapsed.

SITE EVALUATIONS AND RECOMMENDATIONS

Segments **5WL1423.40 and 5WL1423.**41 of the Burlington and Missouri River Railroad are recommended *not supporting* of the railroad's overall eligibility for the National Register of Historic Places (NRHP), which the SHPO determined in 1993. These two segments of the railroad have been heavily impacted by erosion, plowing, leveling, and modern sewer line installation. What remains are only discontinuous segments of the original railroad grade. No artifacts or features are present and further investigation of these segments is unlikely to yield additional information about the construction and use of the railroad.

Segment **5WL1526.4** of the South Platte Supply Canal/Coal Ridge Ditch is recommended supporting of the overall resource's eligibility/contribution to a C-BT historic district. This represents a change in eligibility; the SHPO officially determined at least 5WL1526.1 and 5WL1526.2 officially not eligible for the NRHP in 1990 and 2013 based on mid-century modifications to the Coal Ridge Ditch. However, given that the South Platte Supply Canal is now itself more than 50 years old, 5WL1526 should be evaluated in the context of the C-BT.

Segment **5WL2248.14** of the Cottonwood Extension Ditch is recommended *supporting* of the eligibility of the site as a whole. Per SHPO guidance, the ditch is assumed to be eligible for the NRHP for purposes of Section 106 of the NHPA because its entirety has not been inventoried. The ditch has been recommended eligible for the NRHP under Criterion A for its association with late-19th and early-20th century agriculture and settlement of the area. This segment of the ditch

minimally retains integrity of location, design, setting, materials, feeling, and association. It also contains multiple historic water control features. The project proponent currently has no plans to modify or impact 5WL2248.14, aside from building multiple bridges over it. The construction of the bridges and the surrounding residential development will have some adverse visual impact on the setting, feeling, and association of the ditch segment but will not affect its integrity of location, design, and materials. The open, rural setting which characterized the ditch historically will be converted to a modern residential setting with homes, streets, etc. This adverse visual impact will be effectively mitigated by preserving this ditch, as well as the other 2 ditches recorded during this survey, within an undeveloped, grassy corridor at least 100 ft. wide.

Segment **5WL5461.3** of the Boulder-Weld County Ditch is recommended supporting of the ditch's overall eligibility for the NRHP. Although several previously recorded segments in Boulder County have been determined officially not eligible, at least two others in Weld County have more recently been determined eligible or recommended supporting of the ditch's overall eligibility. The segment of the ditch recorded during the current project is in good physical condition, exemplifies late 18th and early 19th century irrigation and agricultural systems in the region, and continues to fill this role.

IFs 5WL7644–5WL7646 are recommended *not eligible* for the NRHP, with no further evaluative or protective measures needed.

EVALUATION OF RESEARCH

The stated objective of this survey—that of recording all cultural resources within the project area and evaluating them for the NRHP—was met. Resources recorded during this survey represent types for which potential in this area had been anticipated, thus confirming the expectations presented in the Statement of Objectives section of this report. Some of the newly recorded resources do not contribute significant information about the history of the area. However, the segments of the Cottonwood Extension Ditch, the South Platte Supply Canal, and the Boulder-Weld County Ditch do contribute information relevant to the historically significant theme of turn-of-the-century era irrigation and agricultural development.

SUMMARY AND CONCLUSIONS

Currently the only project-related impacts planned for the Cottonwood Extension Ditch (5WL2248.14) are simple bridges that span the ditch but do not otherwise physically affect it. These would not physically impact the ditch or its integrity of location, design, or materials although they would introduce minor visual changes to its integrity of setting, feeling, and association. The larger cumulative effect of the overall project will be to change the open, rural setting which characterized this area historically to a modern residential setting. This visually compromised setting will adversely affect this ditch's, the South Platte Supply Canal's, and the Boulder-Weld County Ditch's integrity of setting, feeling, and association. Thus the project will have some adverse visual effect on the Cottonwood Extension Ditch, the South Platte Supply Canal, and the Boulder-Weld County Ditch. However, the adverse visual effects to all 3 ditches will be effectively mitigated by preserving them within an undeveloped, grassy corridor at least 100 feet wide, which will visually recall the rural/agricultural uses of this area historically.

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Winters, R., and C. Winchell
1994 Management Data Form for 5BL861.3. On file at OAHP, Denver.

APPENDIX A
RESOURCES PREVIOUSLY RECORDED IN THE PROJECT AREA

FOR OFFICIAL USE ONLY.
DISCLOSURE OF SITE LOCATIONS IS PROHIBITED (36 CFR 296.18)

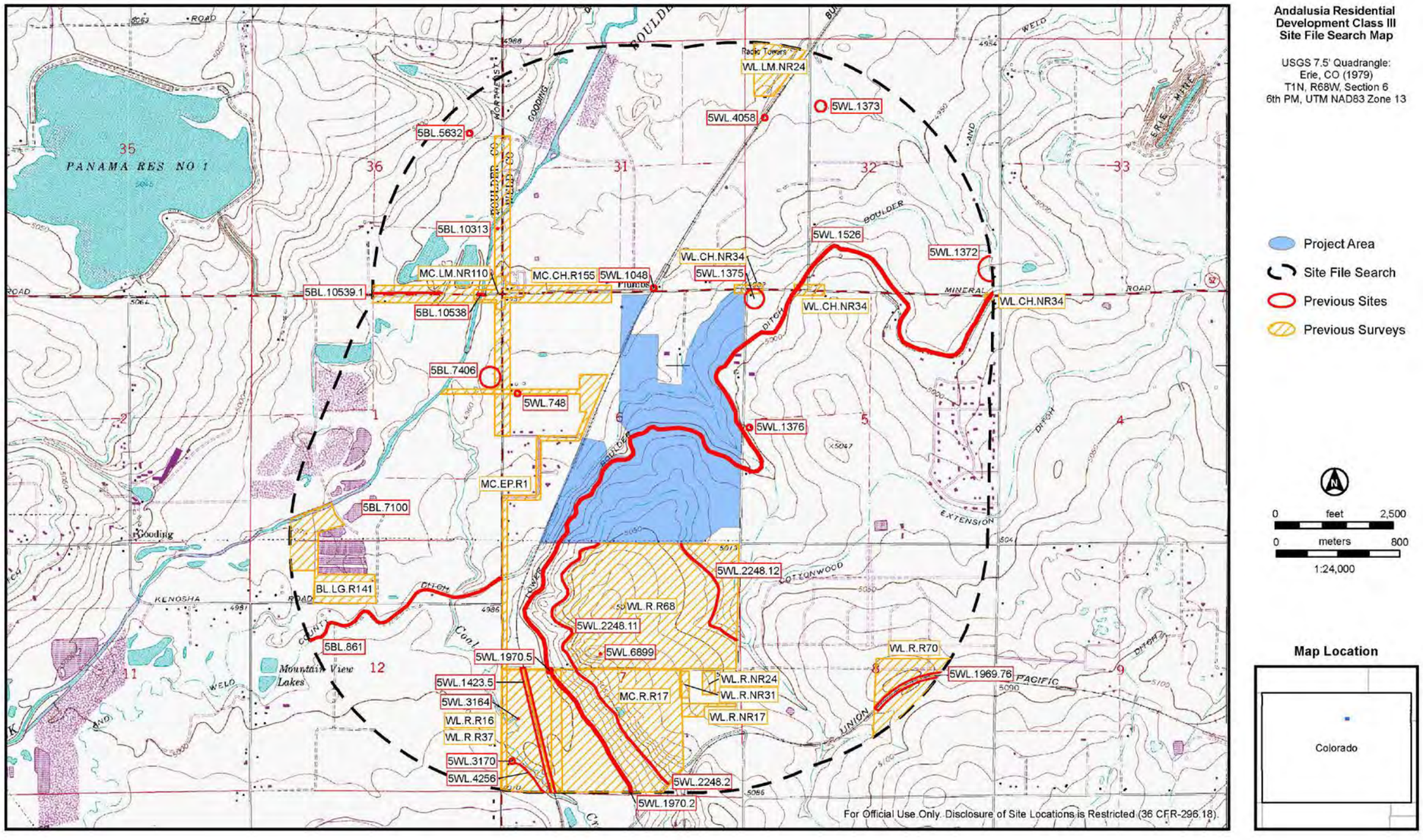


Figure A.1. Previous projects and cultural resources within one mile of the current project area.

Table A.1. Resources Recorded Previously within One Mile of the Project Area

Site Number	Site Name	NRHP Status	Period	Site Type	Consultant or Agency
5BL.10313		Field not eligible	Prehistoric	Isolated Find	CDOT Colorado Department of Transportation
5BL.10538	STATE HIGHWAY 52 BRIDGE (MP 7.2), BOULDER CREEK BRIDGE (D-16-U)	Officially not eligible>Field not eligible	Historic	Bridge	CDOT Colorado Department of Transportation
5BL.10539.1	PANAMA RESERVOIR NO. 1 OUTLET DITCH - SEGMENT	Officially not eligible>Field eligible	Historic	Ditch Segment	CDOT Colorado Department of Transportation
5BL.5632	LUTZ PROPERTY	Field not eligible	Historic	Single Dwelling	Cultural Resource Historians>Tatanka Research, Inc.
5BL.7100	HOWELL-ROBINSON FARM	Field not eligible	Historic	Agricultural Complex	Boulder County Parks & Open Space Department>Native Cultural Services
5BL.7406	NEPHI HOMESTEAD, WHEELER RANCH	106 - Officially eligible>Field eligible>Field not eligible	Historic	Homestead	CDOT Colorado Department of Transportation >Cultural Resource Historians
5BL.861	BOULDER-WELD COUNTY DITCH	Officially not eligible>Field not eligible	Historic	Irrigation Ditch	Colorado Department of Highways
5WL.1048	PLUMBS	Field not eligible	Historic	Railroad Siding	
5WL.1372		Field not eligible	Historic		Western Historical Studies, Inc.
5WL.1373		Field not eligible	Historic	Agricultural Complex	Western Historical Studies, Inc.
5WL.1375		Field not eligible	Historic	Agricultural Complex	Western Historical Studies, Inc.
5WL.1376	KOCH PLACE	Field not eligible	Historic	Farm Compelx	Western Historical Studies, Inc.

5WL.1423.5	BURLINGTON AND MISSOURI RIVER RAILROAD, CHICAGO, BURLINGTON & QUINCY RAILROAD, BURLINGTON NORTHERN RAILROAD - SEGMENT, DENVER, UTAH AND PACIFIC RAILROAD (SEGMENT)	Officially not eligible>Officially not eligible>Field not eligible>Field not eligible>Field not eligible	Historic	Railroad Grade	CDOT Colorado Department of Transportation >Centennial Archaeology, Inc.>Western Cultural Resource Management, Inc. (WCRM)
5WL.1526	SOUTH PLATTE SUPPLY CANAL, COAL RIDGE DITCH	Field not eligible>Officially not eligible	Historic	Water Control System	Bureau of Reclamation - Denver
5WL.1969.76	UNION PACIFIC RAILROAD/DENVER AND BOULDER VALLEY BRANCH	Supports eligibility of entire linear resource>Field eligible	Historic	Railroad	ERO Resources Corporation
5WL.1970.2	LOWER BOULDER DITCH (SEGMENT), SOUTH PLATTE SUPPLY CANAL	106 - Officially eligible>106 - Officially eligible>Field eligible>Field eligible	Historic	Irrigation Ditch	Centennial Archaeology, Inc.>Native Cultural Services
5WL.1970.5	LOWER BOULDER DITCH; SOUTH PLATTE SUPPLY CANAL	106 - Officially eligible>Field eligible	Historic	Irrigation Ditch	Centennial Archaeology, Inc.
5WL.2248.11	COTTONWOOD EXTENSION DITCH - SEGMENT	Supports eligibility of entire linear resource>Field eligible	Historic	Ditch	James Enterprises, Inc. (JEI)
5WL.2248.12	COTTONWOOD EXTENSION DITCH - SEGMENT	Supports eligibility of entire linear resource>Field eligible	Historic	Ditch	James Enterprises, Inc. (JEI)
5WL.2248.2	COTTONWOOD EXTENSION DITCH	Officially not eligible>Field not eligible	Historic	Irrigation Ditch	Native Cultural Services

5WL.3164		Field not eligible	Historic	Isolated Find	Western Cultural Resource Management, Inc. (WCRM)
5WL.3170	SINGLE HAND RANCH HAND'S HOUSE	Field not eligible>Field not eligible	Historic	Single Dwelling	Centennial Archaeology, Inc.>Western Cultural Resource Management, Inc. (WCRM)
5WL.4058		Field not eligible	Historic	Dam	Western Cultural Resource Management, Inc. (WCRM)
5WL.4256		Field not eligible	Historic	Irrigation Ditch	Centennial Archaeology, Inc.
5WL.6899		Field not eligible	Prehistoric	Isolated Find	James Enterprises, Inc. (JEI)
5WL.748	UNION DISTRICT SCHOOL SITE		Historic	Marker	

APPENDIX B
RESOURCES NEWLY RECORDED IN THE PROJECT AREA

FOR OFFICIAL USE ONLY.
DISCLOSURE OF SITE LOCATIONS IS PROHIBITED (36 CFR 296.18)

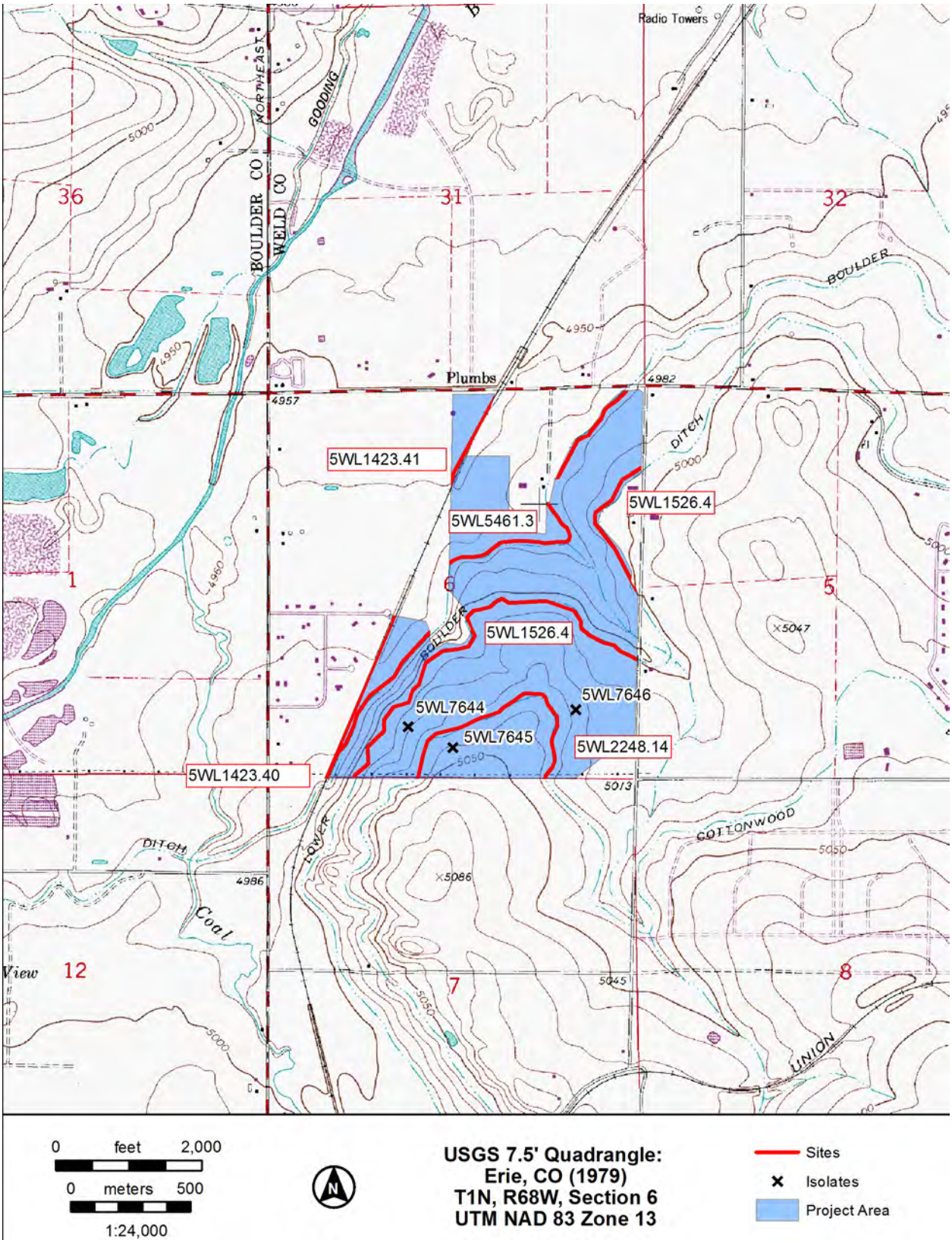


Figure B.1. Resources recorded during the current project.

Management Data Form

A *Management Data Form* should be completed for each cultural resource recorded during an archaeological survey. Isolated finds and revisits are the exception and they do not require a *Management Data Form*. Please attach the appropriate component forms and use continuation pages if necessary. Fields can be expanded or compressed as necessary.

1. **Resource Number**: 5WL1423.40

2. **Temporary Resource Number**: 1423.x

3. **Attachments (check as many as apply)**
- ☐ Prehistoric Archaeological Component
- ☐ Historic Archaeological Component
- ☐ Historic Architectural Component Form
- ☑ Linear Component
- ☑ Sketch/Instrument Map (required)
- ☑ U.S.G.S. Map Photocopy (required)
- ☑ Photograph(s) (required)
- ☐ Other, specify:

4. **Official determination (OAHP use only)**
- ☐ Determined Eligible NR\SR _____
- ☐ Determined Not Eligible NR\SR _____
- ☐ Nominated _____
- ☐ Need Data NR\SR _____
- ☐ Contributing to NR Dist.\SR Dist. _____
- ☐ Not Contributing to NR Dist.\SR Dist. _____
- ☐ Supports overall linear eligibility NR\SR _____
- ☐ Does not support overall linear eligibility NR\SR _____

I. IDENTIFICATION

5. **Resource Name**: Burlington and Missouri River Railroad

6. **Project Name/Number**: Andalusia Residential Development Class III/Project No. 14-65

7. **Government Involvement**: ☑ Local ☐ State ☐ Federal

Agency: N/A

8. **Site Categories (check as many as apply)**:

Prehistoric: ☐ archaeological site ☐ paleontological site ☐ In existing National Register District

National Register District name:

Historic: ☐ archaeology site ☐ building(s) ☑ structure(s) ☐ object(s) ☐ In existing National Register District

National Register District name:

9. **Owner(s) Name and Address**:

I & J Partnership LP, 3733 Florentine Circle, Longmont, CO 80503, ATTN Jerry Bouldin

10. **Boundary Description and Justification**:

The boundary was defined by the extent of the route of the railroad as shown on the Erie, CO (1979) 1:24k topo map within the southwestern portion of the project area.

11. **Site/Property Dimensions** Length: 723 m Width: 15 m Area: 10,845 m^2 Acres (m^2/4047): 2.7

Area was calculated as: ☑ Length x Width (rectangle/square) ☐ Length x Width x 0.785 (Ellipse) ☐ GIS

II. LOCATION

12. **Legal Location**

PM	6th	Township	1N	Range	68W	Section	6	SW ¼		¼
PM		Township		Range		Section			¼	¼
PM		Township		Range		Section			¼	¼
PM		Township		Range		Section			¼	¼

If section is irregular, explain alignment method:

Management Data Form

Resource Number: 5WL1423.40 **Temporary Resource Number**: 1423.x

13. **USGS Quad**: Erie, CO (1979) 14. **County**: Weld

15. **UTM Coordinates**: Datum used ☐ NAD 27 ☑ NAD 83 ☐ WGS 84 Other:

A. Zone	13 ;	495517 mE	4435872 mN	
B. Zone	13 ;	495803 mE	4436539 mN	
C. Zone	;	mE	mN	
D. Zone	;	mE	mN	

16. **UTM Source**: ☑ Corrected GPS/rectified survey (<5m error) ☐ Uncorrected GPS ☐ Map template

Other (explain):

17. **Site elevation** (feet): 4945

18. **Address**: Lot: Block: Addition:

19. **Location/Access**:
From I-25, take exit 235 west on Highway 52 for 4.1 miles. Turn south onto East County Line Road and proceed for 0.6 miles. Then drive east on Westview Road for approximately 0.3 miles to the north end of this segment.

III. NATURAL ENVIRONMENT/SITE CONDITION

20. **General Description** (should include both on site as well as geographical setting with aspect, landforms, vegetation, soils, depositional environment, water, ground visibility):

The railroad runs across a relatively flat plain, between about 10 and 200 m west of an irrigation ditch, and about 100 m east of a private residence. A 259-foot (79-m) long section in the middle of this segment has been destroyed by erosion from an adjacent wetland and/or by modern leveling and the north intact section terminates at the south edge of a horse pasture, about 341 feet (104 m) south of the north edge of this portion of the project area. A wire fence runs on top of the railroad grade for the length of this segment. Thick young willows grow along the southern half of the segment, while native grasses, wild rose, scattered Russian olives, Canadian thistles, and horsetails are present along the northern half of the segment. Ground visibility ranged between 0 and 70 percent during inventory, depending on vegetation cover; visibility was greater along the north half of the segment than along the south half. The grade is recognizable by the exposure of quartzite and granite ballast.

21. **Soil depth (cm) and description**:

Medium brown sandy loam is present on either side of the railroad grade but the grade itself is constructed of quartzite and granite ballast. Depth of the surrounding soil is unknown.

22. **Condition**

a. Architectural/Structural
- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☑ Deteriorated
- ☐ Ruin

b. Archaeological/Paleontological
- ☐ Undisturbed
- ☐ Light disturbance
- ☐ Moderate disturbance
- ☐ Heavy disturbance
- ☐ Total disturbance

23. **Describe condition**:

It is hard to recognize this segment as a railroad because all that remains is its ballast grade covered by moderately to highly dense vegetation. The grade is discontinuous as a result of erosion and probably modern leveling or construction. A wire fence runs along the top of the grade.

24. **Vandalism**: ☐Yes ☑ No
Describe:

IV. NATIONAL/STATE REGISTER ELIGIBILITY ASSESSMENT

25. **Context or Theme**: Late 19th century transportation

26. **Applicable National Register Criteria**:
- ☑ A. Associated with events that have made a significant contribution to the broad pattern of our history
- ☐ B. Associated with the lives of persons significant in our past
- ☐ C. Embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
- ☐ D. Has yielded, or may be likely to yield, information important in history or prehistory
- ☐ Does not meet any of the National Register criteria
- ☐ Qualifies under exceptions A through G. List exception(s):

27. **Applicable State Register Criteria**:
- ☑ A. Property is associated with events that have made a significant contribution to history
- ☐ B. Property is connected with persons significant in history
- ☐ C. Property has distinctive characteristics of a type, period, method of construction or artisan
- ☐ D. Property is of geographic importance
- ☐ E. Property contains the possibility of important discoveries related to prehistory or history
- ☐ Does not meet any of the State Register criteria

28. **Area(s) of significance**:

Transportation

29. **Period(s) of significance**:

1889 to early 1900s (date of abandonment of railroad is unknown)

30. **Level of significance**: ☐ National ☑ State ☑ Local

31. **Statement of significance**:

The SHPO determined the Burlington and Missouri River Railroad as a whole officially eligible in 2003.The railroad was significant for providing transportation and aiding in the settlement of the region. The railroad drilled wells, brought goods and services in, and took products (e.g., coal) away, enabling numerous towns to spring up along it. Accordingly, the railroad as a whole is eligible under Criterion A for its role in transportation and settlement of this portion of the Front Range. However, it is not associated with significant people or engineering and does not retain data potential so it is not eligible under Criteria B, C, or D.

This segment of the railroad does not support the overall eligibility of the site because of its deterioration.

32. **Statement of historic integrity related to significance**:

Some portions of the railroad as a whole do retain enough integrity to convey the site's significance.

This segment of the railroad, however, has been heavily impacted by erosion, leveling, installation of a wire fence along its length, and thick vegetation growth. All remnants of this segment of the railroad except its ballast grade have been removed. Furthermore, the middle section of this segment has been destroyed by erosion and/or leveling. The segment generally retains its integrity of location but lacks integrity of design, materials, and workmanship. Its integrity of setting, feeling, and association have also been somewhat diminished by the construction of a modern house to its west and a well pad to its east and the overgrowth of vegetation along its southern half.

33. **National Register Eligibility Field Assessment**: ☑ Eligible ☐ Not eligible ☐ Need data
Linear Segment Evaluation (if applicable): ☐ Supporting ☑ Non Supporting
34. **Status in an Existing National Register Distric**t: ☐ Contributing ☐ Non-contributing
35. **State Register Eligibility Field Assessmen**t: ☑ Eligible ☐ Not eligible ☐ Need data
36. **Status in an Existing State Register District**: ☐ Contributing ☐ Non-contributing
37. **National/State Register District Potential**: ☐ Yes ☑ No Describe:

38. **Cultural Landscape Potential**: ☐ Yes ☑ No Describe:

39. **If Yes to either 37 or 38, is this site**: ☐ Contributing ☐ Non-contributing Explain:

V. MANAGEMENT AND ADMINISTRATIVE DATA

40. **Threats to Resource**: ☑ Water erosion ☐ Wind erosion ☐ Grazing ☑ Neglect ☐ Vandalism ☐ Recreation ☑ Construction ☐ Other (explain):

41. **Existing protection** ☐ None ☐ Marked ☐ Fenced ☐ Patrolled ☑ Access controlled
Other (specify):

Comments: access controlled through private land ownership

42. **Local landmark designation**:

43. **Easement**:

44. **Recorder's Management Recommendations**:
No further work.

VI. DOCUMENTATION

45. **Previous actions accomplished at the site**: ☐ Tested ☐ Partial excavation ☐ Complete excavation

Date(s):

a. Excavations:

b. Stabilization: Date(s):

c. HABS/HAER documentation [date(s) and numbers]:

d. Other:

46. **Known collections/reports/interviews and other references (list)**:

47. **Primary location of additional data**:

48. **State or Federal Permit number**: SHPO 2014-28

49. **Collection**: Artifact collection authorized: ☑ Yes ☐ No Were artifacts collected: ☐ Yes ☑ No
Artifact repository:

Collection method: ☐ Diagnostics ☐ Grab Sample ☐ Random Sample

Other (specify):

50. **Photograph Numbers**: 14-65_1423.40_1-4

Files or negatives stored at: electronically at James Enterprises, Inc.

51. **Report title**: Class III Cultural Resource Survey of the Proposed Andalusia Residential Development, Weld County, Colorado

52. **Recorder(s)**: R. Schwendler, L. Clark, S. Martin Date: June 25, 2014

53. **Recorder affiliation**: James Enterprises, Inc.

Phone number/Email: 970-484-3335/jbjei@mesanetworks.net

NOTE: Please attach a site map, a photocopy of the USGS 1:24000 map indicating resource location, and photographs.

Colorado Historical Society - Office of Archaeology & Historic Preservation
1560 Broadway, Suite 400 Denver, CO 80202
303-866-3395

Linear Component Form

This form should be completed for each linear resource or linear segment. Use this form in conjunction with the *Management Data Form.* Call OAHP staff (303-866-5216) prior to assigning a resource number.

I. Resource Identification

1. **Resource Number**: 5WL1423.40
2. **Temporary Resource Number**: 1423.x
3. **Site Name**: Burlington and Missouri River Railroad
4. **Record of**: ☐ Entire resource ■ Segment

II. Resource Description

5. **Resource Type**: ☐ Road ■ Railroad ☐ Trail ☐ Ditch/Canal

Other (specify):

6. **Component Description**:

5WL1423.40 is a segment of the Burlington and Missouri River Railroad that was constructed in 1889. This segment was previously unrecorded and forms the western boundary of the southwest portion of the current project area. The segment comprises two discontinuous sections of grade separated by a section that appears to have been destroyed by natural erosion from flooding or development or a combination thereof. The southern section is approximately 1,247 feet (380 m) long, while the northern section is approximately 525 feet (160 m) long. The intervening, destroyed section is approximately 259 feet (79 m) long. The northern intact section terminates at the south edge of a horse pasture, about 341 feet (104 m) south of the north edge of this portion of the project area. Despite the destruction of some of the grade, the railroad's route can be seen on the Erie, CO (1979) quad map. The grade is approximately 1 m high and is made of quartzite and granite ballast. The top of the grade is approximately 15 feet (5 m) wide, with slopes of the same dimension on either side. No artifacts, structural materials, or associated features are present along the segment. A barbed wire fence runs along the top of the grade for the length of the segment. Thick young willows grow along the southern half of the segment, while native grasses, wild rose, scattered Russian olives, Canadian thistles, and horsetails are present along the northern half of the segment. This segment is currently being used as an informal equestrian trail.

7. **Original use**: railroad
8. **Current use**: informal horseback riding trail; railroad is abandoned
9. **Modifications (describe and include dates)**:

At some point the tracks, ties, and other structural elements of the railroad were removed, but the date of this is unknown.

10. **Extent of Entire Resource**:

At a minimum the Burlington and Missouri River Railroad continues southwest through or past Erie, Lafayette, and Broomfield, heading to Denver, as well as northeast then northwest to Longmont.

11. **Associated Artifacts**:

None

12. **Associated Features or Resources**:

None

Linear Component Form

Resource Number: 5WL1423.40 **Temporary Resource Number**: 1423.x

III. Research Information

13. **Architect/Engineer**: Unknown

Source(s) of Information:

14. **Builder**: Colorado Northern Railroad

Source(s) of Information: Linear Component Form for 5WL1423.10 by Fariello et al. 2002 (on file at OAHP)

15. **Date of Construction / Date Range**: 1883-1884

Source(s) of Information: Linear Component Form for 5WL1423.10 by Fariello et al. 2002 (on file at OAHP)

16. **Historical / Archival Data**:

This line was originally constructed by the Colorado Northern (CN) Railroad as a narrow-gauge line in 1883-1884 to service coal mines in the area. The Burlington and Missouri River (B&MR) Railroad, which was operated by the Chicago, Burlington, and Quincy (CB&Q) Railroad, acquired the line from the CN in 1889. The BM&R renamed the line the Lyons Branch. The Burlington Northern (BN) Railroad was created on March 2, 1970 through the merger of four railroads, including the CB&Q. The line was in use up to at least 1980.

17. **Cultural Affiliation and Justification**:

Historic Euroamerican based on railroad company owners

IV. Management Recommendations No further work for segment 5WL1423.40 because of its deterioration.

18. **Eligibility of Entire Resource**

☒ Eligible ☐ Not Eligible ☐ Need Data Is this an official determination? ☒ Yes ☐ No

Remarks / Justification:

SHPO officially determined status of entire resource in 1993.

19. **Evaluation of integrity of the segment of the entire linear resource being recorded** (Complete only if "Segment" under item 4 is checked and the entire resource is marked as Eligible under item 18)

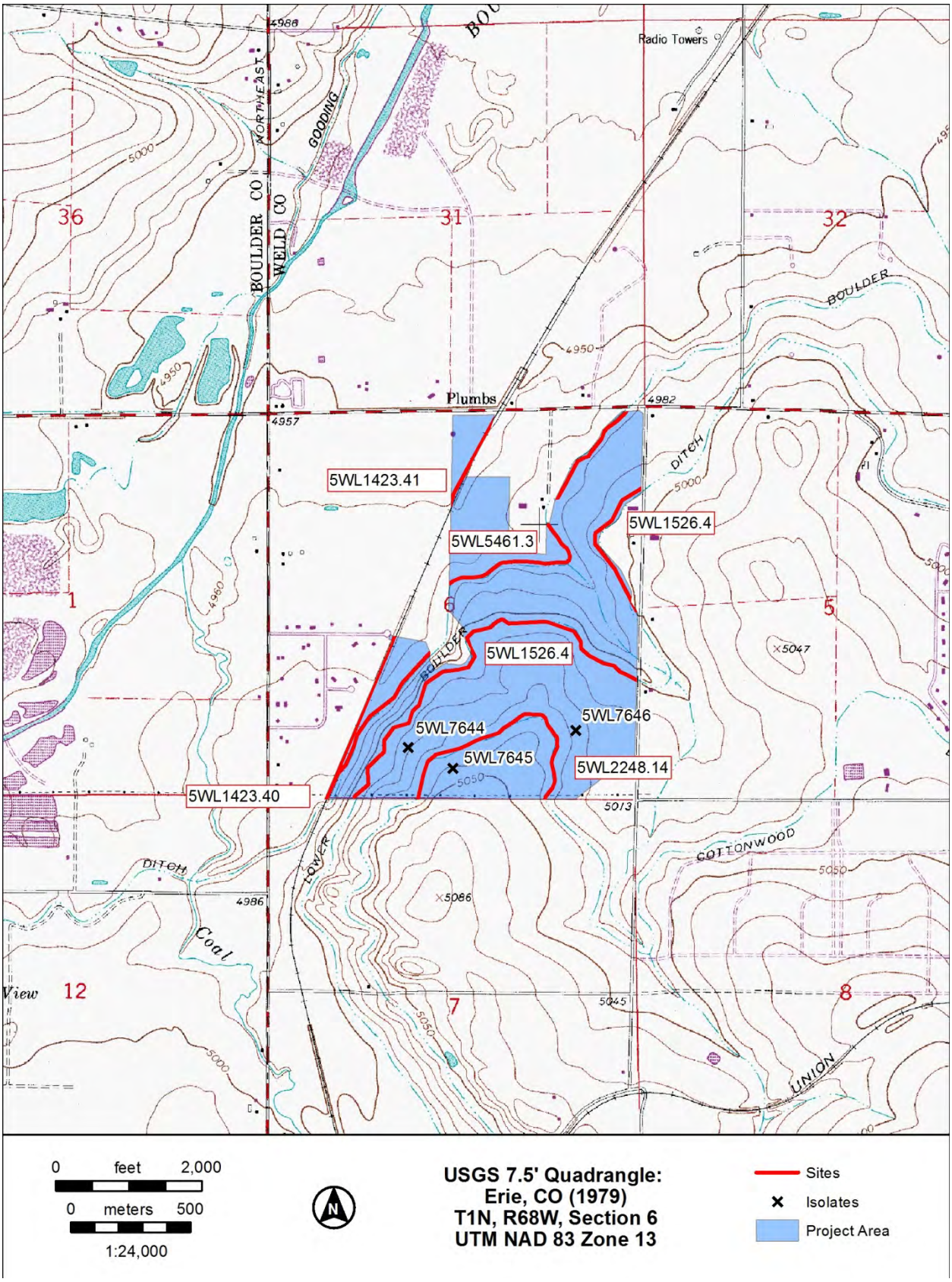
☐ Supporting ☒ Non-supporting ☐ Not applicable

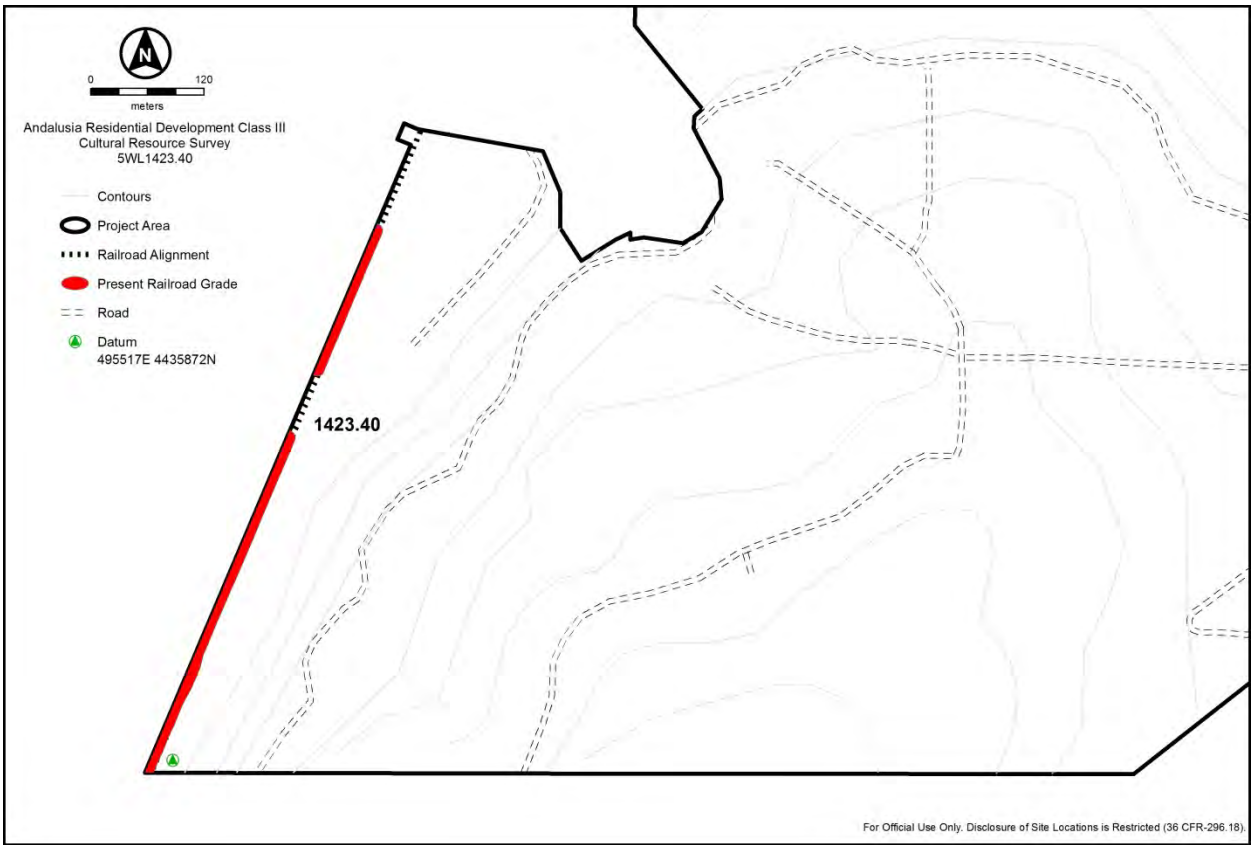
Remarks / Justification:

It is hard to recognize this segment as a railroad because all that remains is its ballast grade covered by moderately to highly dense vegetation. The ties, rails, and other structural elements have been removed and the grade left untended. Furthermore, the grade is discontinuous as a result of erosion and probably modern leveling or construction. A wire fence runs along the top of the grade.

20. **Recorder(s)**: R. Schwendler, L. Clark, S. Martin 21. **Date**: June 25, 2014

Colorado Historical Society - Office of Archaeology & Historic Preservation
1560 Broadway, Suite 400 Denver, CO 80202
303-866-3395


5WL1423.41
5WL5461.3
5WL1526.4
5WL1526.4
5WL7644
5WL7646
5WL7645
5WL2248.14
5WL1423.40
Plumbs
Radio Towers
BOULDER CO
WELD CO
NORTHEAST
GOODING
DITCH
BOULDER
LOWER
COTTONWOOD
UNION
Coal
View
36
31
32
1
6
5
7
8
12
0 feet 2,000
0 meters 500
1:24,000
USGS 7.5' Quadrangle:
Erie, CO (1979)
T1N, R68W, Section 6
UTM NAD 83 Zone 13
Sites
Isolates
Project Area


N
0
120
meters
Andalusia Residential Development Class III
Cultural Resource Survey
5WL1423.40
Contours
Project Area
Railroad Alignment
Present Railroad Grade
Road
Datum
495517E 4435872N
1423.40
For Official Use Only. Disclosure of Site Locations is Restricted (36 CFR-296.18).



Overview of southwest end of 5WL1423.40, facing northeast.



Overview of southwest end of 5WL1423.40, facing northeast, with railroad borrow trench.



Overview of central part of 5WL1423.40, facing northeast.

Management Data Form

A *Management Data Form* should be completed for each cultural resource recorded during an archaeological survey. Isolated finds and revisits are the exception and they do not require a *Management Data Form*. Please attach the appropriate component forms and use continuation pages if necessary. Fields can be expanded or compressed as necessary.

1. **Resource Number**: 5WL1423.41

2. **Temporary Resource Number**: 1423.x

3. **Attachments (check as many as apply)**
- ☐ Prehistoric Archaeological Component
- ☐ Historic Archaeological Component
- ☐ Historic Architectural Component Form
- ☑ Linear Component
- ☑ Sketch/Instrument Map (required)
- ☑ U.S.G.S. Map Photocopy (required)
- ☑ Photograph(s) (required)
- ☐ Other, specify:

4. **Official determination (OAHP use only)**
- ☐ Determined Eligible NR\SR _____
- ☐ Determined Not Eligible NR\SR _____
- ☐ Nominated _____
- ☐ Need Data NR\SR _____
- ☐ Contributing to NR Dist.\SR Dist. _____
- ☐ Not Contributing to NR Dist.\SR Dist. _____
- ☐ Supports overall linear eligibility NR\SR _____
- ☐ Does not support overall linear eligibility NR\SR _____

I. IDENTIFICATION

5. **Resource Name**: Burlington and Missouri River Railroad

6. **Project Name/Number**: Andalusia Residential Development Class III/Project No. 14-65

7. **Government Involvement**: ☑ Local ☐ State ☐ Federal

Agency: N/A

8. **Site Categories (check as many as apply)**:

Prehistoric: ☐ archaeological site ☐ paleontological site ☐ In existing National Register District

National Register District name:

Historic: ☐ archaeology site ☐ building(s) ☑ structure(s) ☐ object(s) ☐ In existing National Register District

National Register District name:

9. **Owner(s) Name and Address**:

I & J Partnership LP, 3733 Florentine Circle, Longmont, CO 80503, ATTN Jerry Bouldin

10. **Boundary Description and Justification**:

The boundary was defined by the extent of the route of the railroad as shown on the Erie, CO (1979) 1:24k topo map within the northwestern portion of the project area.

11. **Site/Property Dimensions** Length: 400 m Width: 1 m Area: 400 m^2 Acres (m^2/4047): 0.1

Area was calculated as: ☑ Length x Width (rectangle/square) ☐ Length x Width x 0.785 (Ellipse) ☐ GIS

II. LOCATION

12. **Legal Location**

PM	6th	Township	1N	Range	68W	Section	6	NW ¼		NE ¼
PM		Township		Range		Section		¼		¼
PM		Township		Range		Section		¼		¼
PM		Township		Range		Section		¼		¼

If section is irregular, explain alignment method:

13. **USGS Quad**: Erie, CO (1979) 14. **County**: Weld

15. **UTM Coordinates**: Datum used ☐ NAD 27 ☑ NAD 83 ☐ WGS 84 Other:

A. Zone	13 ;	496038 mE	4437108 mN
B. Zone	13 ;	496209 mE	4437435 mN
C. Zone	;	mE	mN
D. Zone	;	mE	mN

16. **UTM Source**: ☑ Corrected GPS/rectified survey (<5m error) ☐ Uncorrected GPS ☐ Map template

Other (explain):

17. **Site elevation** (feet): 4950

18. **Address**: Lot: Block: Addition:

19. **Location/Access**:
From I-25, take exit 235 west on Highway 52 for 3.5 miles to the north end of this segment.

III. NATURAL ENVIRONMENT/SITE CONDITION

20. **General Description** (should include both on site as well as geographical setting with aspect, landforms, vegetation, soils, depositional environment, water, ground visibility):

The railroad grade runs across a flat plain on private rural land, crossing a dirt road and dirt parking areas near its southern end. Only the southernmost 98-foot (30-m) long section is visible as a railroad grade. Northeast of that, it appears to have been obliterated by leveling, plowing, and recent construction of a sewer line. Vegetation includes thick pasture grass, native grasses, scattered Russian olives and Canadian thistles. Ground visibility ranged between about 0 and 20 percent during inventory, depending on the thickness of the vegetative cover. The grade consists of quartzite and granite ballast but is bordered by medium brown sandy loam soils.

21. **Soil depth (cm) and description**:

Medium brown sandy loam is present on either side of the railroad grade but the grade itself is constructed of quartzite and granite ballast. Depth of the surrounding soil is unknown.

22. **Condition**

a. Architectural/Structural
- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☑ Deteriorated
- ☐ Ruin

b. Archaeological/Paleontological
- ☐ Undisturbed
- ☐ Light disturbance
- ☐ Moderate disturbance
- ☐ Heavy disturbance
- ☐ Total disturbance

23. **Describe condition**:

It is very hard to recognize this segment as a railroad because all that remains is an approximately 1-m wide and 0.5-m high ballast grade covered by relatively dense vegetation. After about 98 feet (30 meters) from its south end the grade has been obliterated by leveling, plowing, and the recent construction of a sewer line.

24. **Vandalism**: ☐Yes ☑ No
Describe:

IV. NATIONAL/STATE REGISTER ELIGIBILITY ASSESSMENT

25. **Context or Theme**: Late 19th century transportation

26. **Applicable National Register Criteria**:
- ☑ A. Associated with events that have made a significant contribution to the broad pattern of our history
- ☐ B. Associated with the lives of persons significant in our past
- ☐ C. Embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
- ☐ D. Has yielded, or may be likely to yield, information important in history or prehistory
- ☐ Does not meet any of the National Register criteria
- ☐ Qualifies under exceptions A through G. List exception(s):

27. **Applicable State Register Criteria**:
- ☑ A. Property is associated with events that have made a significant contribution to history
- ☐ B. Property is connected with persons significant in history
- ☐ C. Property has distinctive characteristics of a type, period, method of construction or artisan
- ☐ D. Property is of geographic importance
- ☐ E. Property contains the possibility of important discoveries related to prehistory or history
- ☐ Does not meet any of the State Register criteria

28. **Area(s) of significance**:

Transportation

29. **Period(s) of significance**:

1889 to early 1900s (date of abandonment of railroad is unknown)

30. **Level of significance**: ☐ National ☑ State ☑ Local

31. **Statement of significance**:

The SHPO determined the Burlington and Missouri River Railroad as a whole officially eligible in 2003.The railroad was significant for providing transportation and aiding in the settlement of the region. The railroad drilled wells, brought goods and services in, and took products (e.g., coal) away, enabling numerous towns to spring up along it. Accordingly, the railroad as a whole is eligible under Criterion A for its role in transportation and settlement of this portion of the Front Range. However, it is not associated with significant people or engineering and does not retain data potential so it is not eligible under Criteria B, C, or D.

This segment of the railroad does not support the overall eligibility of the site because of its marked deterioration.

32. **Statement of historic integrity related to significance**:

Some portions of the railroad as a whole do retain enough integrity to convey the site's significance.

This segment of the railroad, however, has been heavily impacted by leveling, plowing, and the recent construction of a sewer line. All remnants of this segment of the railroad except its ballast grade have been removed, and only a short southern section of the grade remains. The segment lacks integrity of location, design, materials, and workmanship. Its integrity of setting, feeling, and association have also been diminished by the construction of the dirt road and parking areas and modern storage structures, a house, and a sewer line to its east.

33. **National Register Eligibility Field Assessment**: ☑ Eligible ☐ Not eligible ☐ Need data
Linear Segment Evaluation (if applicable): ☐ Supporting ☑ Non Supporting
34. **Status in an Existing National Register Distric**t: ☐ Contributing ☐ Non-contributing
35. **State Register Eligibility Field Assessmen**t: ☑ Eligible ☐ Not eligible ☐ Need data
36. **Status in an Existing State Register District**: ☐ Contributing ☐ Non-contributing
37. **National/State Register District Potential**: ☐ Yes ☑ No Describe:

38. **Cultural Landscape Potential**: ☐ Yes ☑ No Describe:

39. **If Yes to either 37 or 38, is this site**: ☐ Contributing ☐ Non-contributing Explain:

V. MANAGEMENT AND ADMINISTRATIVE DATA

40. **Threats to Resource**: ☐ Water erosion ☐ Wind erosion ☐ Grazing ☑ Neglect ☐ Vandalism ☐ Recreation ☑ Construction ☐ Other (explain):

41. **Existing protection** ☐ None ☐ Marked ☐ Fenced ☐ Patrolled ☑ Access controlled
Other (specify):

Comments: access controlled through private land ownership

42. **Local landmark designation**:

43. **Easement**:

44. **Recorder's Management Recommendations**:
No further work.

VI. DOCUMENTATION

45. **Previous actions accomplished at the site**: ☐ Tested ☐ Partial excavation ☐ Complete excavation

Date(s):

a. Excavations:

b. Stabilization: Date(s):

c. HABS/HAER documentation [date(s) and numbers]:

d. Other:

46. **Known collections/reports/interviews and other references (list)**:

47. **Primary location of additional data**:

48. **State or Federal Permit number**: SHPO 2014-28

49. **Collection**: Artifact collection authorized: ☑ Yes ☐ No Were artifacts collected: ☐ Yes ☑ No
Artifact repository:

Collection method: ☐ Diagnostics ☐ Grab Sample ☐ Random Sample

Other (specify):

50. **Photograph Numbers**: 14-65_1423.41_1-2

Files or negatives stored at: electronically at James Enterprises, Inc.

51. **Report title**: Class III Cultural Resource Survey of the Proposed Andalusia Residential Development, Weld County, Colorado

52. **Recorder(s)**: R. Schwendler, L. Clark, S. Martin Date: June 25, 2014

53. **Recorder affiliation**: James Enterprises, Inc.

Phone number/Email: 970-484-3335/jbjei@mesanetworks.net

NOTE: Please attach a site map, a photocopy of the USGS 1:24000 map indicating resource location, and photographs.

Colorado Historical Society - Office of Archaeology & Historic Preservation
1560 Broadway, Suite 400 Denver, CO 80202
303-866-3395

Linear Component Form

This form should be completed for each linear resource or linear segment. Use this form in conjunction with the *Management Data Form.* Call OAHP staff (303-866-5216) prior to assigning a resource number.

I. Resource Identification

1. **Resource Number**: 5WL1423.41
2. **Temporary Resource Number**: 1423.x
3. **Site Name**: Burlington and Missouri River Railroad
4. **Record of**: ☐ Entire resource ■ Segment

II. Resource Description

5. **Resource Type**: ☐ Road ■ Railroad ☐ Trail ☐ Ditch/Canal

Other (specify):

6. **Component Description**:

5WL1423.41 is a segment of the Burlington and Missouri River Railroad that was constructed in 1889. This segment was previously unrecorded. It comprises an approximatel 1,312-foot (400-m) long segment, whose route is identified largely from the Erie, CO (1979) quad map, that runs through the northwestern portion of the current project area. A deteriorated portion of grade is visible for the first approximately 98 feet (30 m), starting at the south end of the segment. At its greatest dimensions it measures about 1 m wide and 0.5 m high. Northeast of that, the segment appears to have been obliterated by leveling, plowing, and recent construction of a sewer line. Vegetation covering the route includes thick pasture grass, native grasses, scattered Russian olives and Canadian thistles. The deteriorated grade consists of quartzite and granite ballast.

7. **Original use**: railroad
8. **Current use**: none (abandoned)
9. **Modifications (describe and include dates)**:

At some point the tracks, ties, and other structural elements of the railroad were removed, but the date of this is unknown.

10. **Extent of Entire Resource**:

At a minimum the Burlington and Missouri River Railroad continues southwest through or past Erie, Lafayette, and Broomfield, heading to Denver, as well as northeast then northwest to Longmont.

11. **Associated Artifacts**:

None

12. **Associated Features or Resources**:

None

Linear Component Form

Resource Number: 5WL1423.41 **Temporary Resource Number**: 1423.x

III. Research Information

13. **Architect/Engineer**: Unknown

Source(s) of Information:

14. **Builder**: Colorado Northern Railroad

Source(s) of Information: Linear Component Form for 5WL1423.10 by Fariello et al. 2002 (on file at OAHP)

15. **Date of Construction / Date Range**: 1883-1884

Source(s) of Information: Linear Component Form for 5WL1423.10 by Fariello et al. 2002 (on file at OAHP)

16. **Historical / Archival Data**:

This line was originally constructed by the Colorado Northern (CN) Railroad as a narrow-gauge line in 1883-1884 to service coal mines in the area. The Burlington and Missouri River (B&MR) Railroad, which was operated by the Chicago, Burlington, and Quincy (CB&Q) Railroad, acquired the line from the CN in 1889. The BM&R renamed the line the Lyons Branch. The Burlington Northern (BN) Railroad was created on March 2, 1970 through the merger of four railroads, including the CB&Q. The line was in use up to at least 1980.

17. **Cultural Affiliation and Justification**:

Historic Euroamerican based on railroad company owners

IV. Management Recommendations No further work for segment 5WL1423.41 because of its deterioration.

18. **Eligibility of Entire Resource**

☒ Eligible ☐ Not Eligible ☐ Need Data Is this an official determination? ☒ Yes ☐ No

Remarks / Justification:

SHPO officially determined status of entire resource in 1993.

19. **Evaluation of integrity of the segment of the entire linear resource being recorded** (Complete only if "Segment" under item 4 is checked and the entire resource is marked as Eligible under item 18)

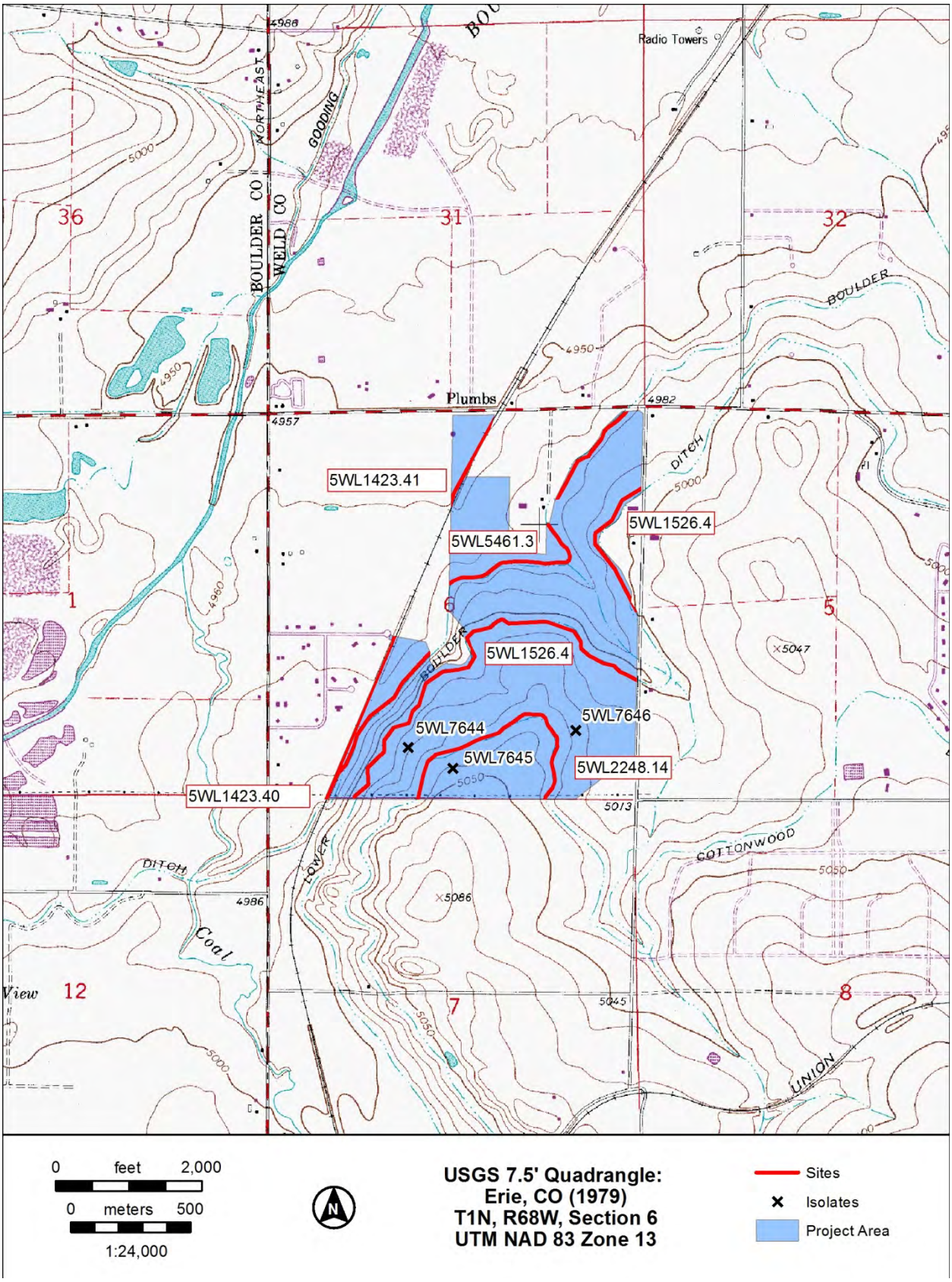
☐ Supporting ☒ Non-supporting ☐ Not applicable

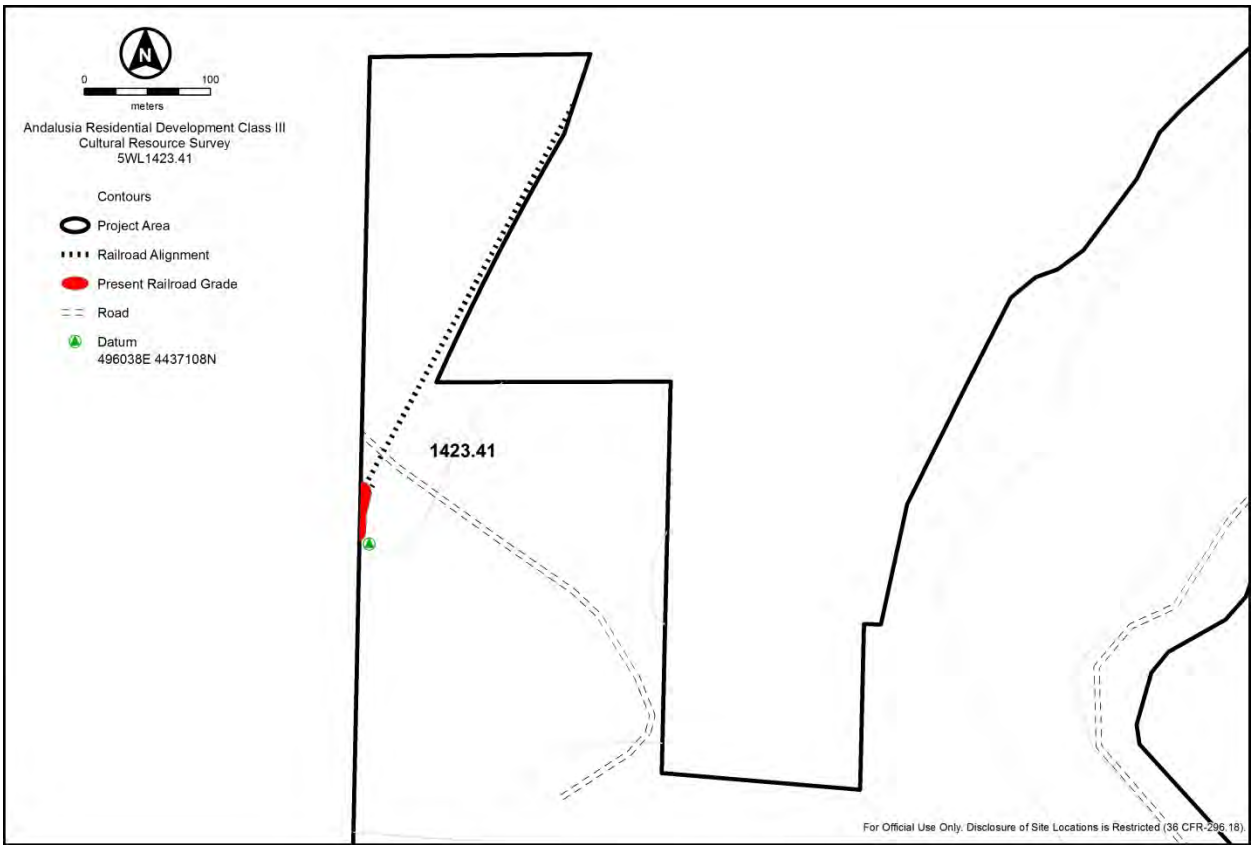
Remarks / Justification:

It is extremely hard to recognize this segment as a railroad because all that remains is a short section of ballast grade covered by moderately dense vegetation. The ties, rails, and other structural elements have been removed and the grade left untended. Furthermore, most of the segment's grade has been destroyed by plowing, leveling, and/or recent construction of a sewer line.

20. **Recorder(s)**: R. Schwendler, L. Clark, S. Martin 21. **Date**: June 25, 2014

Colorado Historical Society - Office of Archaeology & Historic Preservation
1560 Broadway, Suite 400 Denver, CO 80202
303-866-3395


5WL1423.41
5WL5461.3
5WL1526.4
5WL1526.4
5WL7644
5WL7646
5WL7645
5WL2248.14
5WL1423.40
Plumbs
Radio Towers
BOULDER CO
WELD CO
NORTHEAST
GOODING
DITCH
BOULDER
LOWER
DITCH
COTTONWOOD
UNION
Coal
View
36
31
32
1
6
5
7
8
12
0 feet 2,000
0 meters 500
1:24,000
USGS 7.5' Quadrangle:
Erie, CO (1979)
T1N, R68W, Section 6
UTM NAD 83 Zone 13
Sites
Isolates
Project Area


N
0
100
meters
Andalusia Residential Development Class III
Cultural Resource Survey
5WL1423.41
Contours
Project Area
Railroad Alignment
Present Railroad Grade
Road
Datum
496038E 4437108N
1423.41
For Official Use Only. Disclosure of Site Locations is Restricted (36 CFR-296.18).



Overview of south end of 5WL1423.41, facing northeast.



Overview of former location of 5WL1423.41 (destroyed), facing northeast.

Management Data Form

A *Management Data Form* should be completed for each cultural resource recorded during an archaeological survey. Isolated finds and revisits are the exception and they do not require a *Management Data Form*. Please attach the appropriate component forms and use continuation pages if necessary. Fields can be expanded or compressed as necessary.

1. **Resource Number**: 5WL1526.4

2. **Temporary Resource Number**: 1526.x

3. **Attachments (check as many as apply)**
- ☐ Prehistoric Archaeological Component
- ☐ Historic Archaeological Component
- ☐ Historic Architectural Component Form
- ☑ Linear Component
- ☑ Sketch/Instrument Map (required)
- ☑ U.S.G.S. Map Photocopy (required)
- ☑ Photograph(s) (required)
- ☐ Other, specify:

4. **Official determination (OAHP use only)**
- ☐ Determined Eligible NR\SR _____
- ☐ Determined Not Eligible NR\SR _____
- ☐ Nominated _____
- ☐ Need Data NR\SR _____
- ☐ Contributing to NR Dist.\SR Dist. _____
- ☐ Not Contributing to NR Dist.\SR Dist. _____
- ☐ Supports overall linear eligibility NR\SR _____
- ☐ Does not support overall linear eligibility NR\SR _____

I. IDENTIFICATION

5. **Resource Name**: South Platte Supply Canal/Coal Ridge Ditch

6. **Project Name/Number**: Andalusia Residential Development Class III/Project No. 14-65

7. **Government Involvement**: ☑ Local ☐ State ☐ Federal

Agency: N/A

8. **Site Categories (check as many as apply)**:

Prehistoric: ☐ archaeological site ☐ paleontological site ☐ In existing National Register District

National Register District name:

Historic: ☐ archaeology site ☐ building(s) ☑ structure(s) ☐ object(s) ☐ In existing National Register District

National Register District name:

9. **Owner(s) Name and Address**:

I & J Partnership LP, 3733 Florentine Circle, Longmont, CO 80503, ATTN Jerry Bouldin

10. **Boundary Description and Justification**:

The boundary was defined by the extent of the canal, as shown on the Erie, CO (1979) 1:24k topo map, within the project area.

11. **Site/Property Dimensions** Length: 1,784 m Width: 4.9 m Area: 8,742 m^2 Acres (m^2/4047): 2.2

Area was calculated as: ☑ Length x Width (rectangle/square) ☐ Length x Width x 0.785 (Ellipse) ☐ GIS

II. LOCATION

12. **Legal Location**

PM	6th	Township	1N	Range	68W	Section	6	SW	¼	__	¼
PM	6th	Township	1N	Range	68W	Section	6	E2	¼	__	¼
PM	__	Township	_____	Range	_____	Section	__	__	¼	__	¼
PM	__	Township	_____	Range	_____	Section	__	__	¼	__	¼

If section is irregular, explain alignment method:

Management Data Form

Resource Number: 5WL1526.4 **Temporary Resource Number**: 1526.x

13. **USGS Quad**: Erie, CO (1979) 14. **County**: Weld

15. **UTM Coordinates**: Datum used ☐ NAD 27 ☑ NAD 83 ☐ WGS 84 Other:

A. Zone	13 ;	495636 mE	4435861 mN
B. Zone	13 ;	496815 mE	4436350 mN
C. Zone	;	mE	mN
D. Zone	;	mE	mN

16. **UTM Source**: ☑ Corrected GPS/rectified survey (<5m error) ☐ Uncorrected GPS ☐ Map template

Other (explain):

17. **Site elevation** (feet): 4090

18. **Address**: Lot: Block: Addition:

19. **Location/Access**:
From I-25, take exit 235 west on Highway 52 for 3.1 miles. Turn south onto County Road 3 and drive 0.2 miles to the northeast end of this segment.

III. NATURAL ENVIRONMENT/SITE CONDITION

20. **General Description** (should include both on site as well as geographical setting with aspect, landforms, vegetation, soils, depositional environment, water, ground visibility):

This segment of the canal traverses the project area from southwest to northeast, running along the gentle northern and western slopes of a low hill whose peak is located south of the project area. The ditch travels through a variety of environmental settings, including—from southwest to northeast—a heavily vegetated natural area, a field with nearly mature wheat, a cow pasture, wetlands, and a field containing young alfalfa. The banks of the canal are heavily vegetated with cheat grass, Canadian thistle, spiny lettuce, other grasses, and scattered Russian olives. Soils are medium brown sandy loam. Ground visibility along the ditch's banks was about 0-20 percent.

21. **Soil depth (cm) and description**:

Medium brown sandy loam is visible on the surrounding ground surface and up to at least 1 m below ground surface in the ditch's banks.

22. **Condition**

a. Architectural/Structural
- ☑ Excellent
- ☐ Good
- ☐ Fair
- ☐ Deteriorated
- ☐ Ruin

b. Archaeological/Paleontological
- ☐ Undisturbed
- ☐ Light disturbance
- ☐ Moderate disturbance
- ☐ Heavy disturbance
- ☐ Total disturbance

23. **Describe condition**:

The ditch's banks are covered by tall vegetation that is leaning into the ditch in some places. It also has a small amount of edge erosion in a few locations, such as on the outsides of bends, but overall the ditch is in very good, maintained condition. It is currently in use and contains at least 12 inches of water.

24. **Vandalism**: ☐ Yes ☑ No
Describe:

IV. NATIONAL/STATE REGISTER ELIGIBILITY ASSESSMENT

25. **Context or Theme**: Water canals and pipelines, mid-20th century engineering

26. **Applicable National Register Criteria**:
- ☑ A. Associated with events that have made a significant contribution to the broad pattern of our history
- ☐ B. Associated with the lives of persons significant in our past
- ☑ C. Embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
- ☐ D. Has yielded, or may be likely to yield, information important in history or prehistory
- ☐ Does not meet any of the National Register criteria
- ☐ Qualifies under exceptions A through G. List exception(s):

27. **Applicable State Register Criteria**:
- ☑ A. Property is associated with events that have made a significant contribution to history
- ☐ B. Property is connected with persons significant in history
- ☑ C. Property has distinctive characteristics of a type, period, method of construction or artisan
- ☐ D. Property is of geographic importance
- ☐ E. Property contains the possibility of important discoveries related to prehistory or history
- ☐ Does not meet any of the State Register criteria

28. **Area(s) of significance**:

Agriculture, Engineering

29. **Period(s) of significance**:

1954-1976

30. **Level of significance**: ☑ National ☑ State ☐ Local

31. **Statement of significance**:

The South Platte Supply Canal was an integral component of the Bureau of Reclamation's (BOR's) massive Colorado-Big Thompson Project (C-BT). The C-BT is significant on a national level as one of the largest and most complex conservation efforts the Bureau of Reclamation (BOR) has undertaken. It includes more than 100 structures spread over 250 square miles in Colorado. The C-BT stores, regulates, and diverts water from the Colorado River on the west slope of the Continental Divide to the east slope of the Rocky Mountains. It allows Western Slope water to be used on the Eastern Slope and has made significant contributions to the economic development of the Front Range and Eastern Plains. At a minimum, a C-BT National Register District is recognized in Boulder (5BL7953) and Grand (5GA2409) counties. The South Platte Supply Canal was the last element of the C-BT to be constructed, with the purpose of increasing the capacity of the BOR's Eastern Slope facilities. Therefore, it is an important element of the C-BT. Although the canal is not recommended individually eligible for the National Register, it is recommended contributing to a C-BT National Register district under Criterion A. Similarly, although it does not represent a significant feat of engineering by itself, it is a well-preserved example of the type of canal built by the BOR in the 1930s, 1940s, and 1950s. Accordingly, it is also recommended contributing to the C-BT district under Criterion C. The canal is not demonstrably associated with any historically significant people and does not retain data potential so it is not recommended eligible under Criteria B or D.

32. **Statement of historic integrity related to significance**:

This segment of the canal is in excellent condition, albeit with dense vegetation along its banks, and is currently in use. It does not appear to have had any modern changes or additions and it still runs through a largely rural agricultural landscape, reflecting its mid-20th century period of construction, so it retains all aspects of integrity.

33. **National Register Eligibility Field Assessment**: ☑ Eligible ☐ Not eligible ☐ Need data
Linear Segment Evaluation (if applicable): ☑ Supporting ☐ Non Supporting
34. **Status in an Existing National Register Distric**t: ☑ Contributing ☐ Non-contributing
35. **State Register Eligibility Field Assessmen**t: ☑ Eligible ☐ Not eligible ☐ Need data
36. **Status in an Existing State Register District**: ☐ Contributing ☐ Non-contributing
37. **National/State Register District Potential**: ☑ Yes ☐ No Describe:

At a minimum, a C-BT National Register District is recognized in Boulder (5BL7953) and Grand (5GA2409) counties. One should also be recognized in Weld County and this segment of the canal would contribute to the district, although it would probably not be individually eligible for the National Register.

38. **Cultural Landscape Potential**: ☐ Yes ☑ No Describe:

39. **If Yes to either 37 or 38, is this site**: ☐ Contributing ☐ Non-contributing Explain:

V. MANAGEMENT AND ADMINISTRATIVE DATA

40. **Threats to Resource**: ☐ Water erosion ☐ Wind erosion ☐ Grazing ☐ Neglect ☐ Vandalism ☐ Recreation ☑ Construction ☐ Other (explain):

41. **Existing protection** ☐ None ☐ Marked ☐ Fenced ☐ Patrolled ☑ Access controlled
Other (specify):

Comments: access controlled through private land ownership

42. **Local landmark designation**:

43. **Easement**:

44. **Recorder's Management Recommendations**:
Avoid direct adverse effects. Mitigate adverse effects if unavoidable.

VI. DOCUMENTATION

45. **Previous actions accomplished at the site**: ☐ Tested ☐ Partial excavation ☐ Complete excavation

Date(s):

a. Excavations:

b. Stabilization: Date(s):

c. HABS/HAER documentation [date(s) and numbers]:

d. Other:

46. **Known collections/reports/interviews and other references (list)**:

47. **Primary location of additional data**:

48. **State or Federal Permit number**: SHPO 2014-28

49. **Collection**: Artifact collection authorized: ☑ Yes ☐ No Were artifacts collected: ☐ Yes ☑ No
Artifact repository:

Collection method: ☐ Diagnostics ☐ Grab Sample ☐ Random Sample

Other (specify):

50. **Photograph Numbers**: 14-65_1526_1-6

Files or negatives stored at: electronically at James Enterprises, Inc.

51. **Report title**: Class III Cultural Resource Survey of the Proposed Andalusia Residential Development, Weld County, Colorado

52. **Recorder(s)**: R. Schwendler, L. Clark, S. Martin Date: June 25, 2014

53. **Recorder affiliation**: James Enterprises, Inc.

Phone number/Email: 970-484-3335/jbjei@mesanetworks.net

NOTE: Please attach a site map, a photocopy of the USGS 1:24000 map indicating resource location, and photographs.

Colorado Historical Society - Office of Archaeology & Historic Preservation
1560 Broadway, Suite 400 Denver, CO 80202
303-866-3395

Linear Component Form

This form should be completed for each linear resource or linear segment. Use this form in conjunction with the *Management Data Form.* Call OAHP staff (303-866-5216) prior to assigning a resource number.

I. Resource Identification

1. **Resource Number**: 5WL1526.4
2. **Temporary Resource Number**: 1526.x
3. **Site Name**: South Platte Supply Canal/Coal Ridge Ditch
4. **Record of**: ☐ Entire resource ■ Segment

II. Resource Description

5. **Resource Type**: ☐ Road ☐ Railroad ☐ Trail ■ Ditch/Canal

Other (specify):

6. **Component Description**:

This unlined segment of the canal is dug into sandy loam with a maximum base width of 16 feet (4.9 m) and an approximate height of up to 6.6 feet (2 m). The canal is still in use and is routinely maintained, although it has thick vegetation along its banks. It runs through a variety of environmental settings, including—from southwest to northeast within the project area—a heavily vegetated natural area, a field with nearly mature wheat, a cow pasture, wetlands, and a field containing young alfalfa. The water appeared to be about 1 foot deep at the time of recording. Four features, described below, were identified in association with this segment of the canal.

7. **Original use**: canal

8. **Current use**: canal

9. **Modifications (describe and include dates)**:

The original Coal Ridge Ditch was enlarged and incorporated into the South Platte Supply Canal by the BOR between 1954 and 1956. Since then, no modifications are known for this segment.

10. **Extent of Entire Resource**:

The South Platte Supply Canal extends approximately 32 miles from Boulder Creek west of Erie to the South Platte River west of Ft. Lupton.

11. **Associated Artifacts**:

None

12. **Associated Features or Resources**:

Feature 1 is a T-shaped concrete diversion structure with a metal Parshall flume to its east. It sends water to an abandoned east-west trending lateral ditch (Feature 4). Located west of Feature 1, Feature 2 is a second, more recently constructed, concrete diversion structure with a metal Parshall flume and attached gauge to its east. Feature 2 diverts water to a second abandoned east-west running lateral ditch (Feature 3) that is younger than Feature 4. Feature 3 is approximately 1.5 feet (0.5 m) deep and approximately 5 feet (1.5 m) wide at ground level. Both features 3 and 4 run on the north side of an access road paralleling the canal. Feature 3 is located about 5 m south of Feature 4, separated from it by an earthen berm. Feature 3 may have been built to replace Feature 4. All four features are likely associated with the original Coal Ridge Ditch, not the canal.

Linear Component Form

Resource Number: 5WL1526.4 **Temporary Resource Number**: 1526.x

III. Research Information

13. **Architect/Engineer**: Bureau of Reclamation (BOR)

Source(s) of Information: U.S. Dept. of the Interior. Water and Power Resources Service Project Data 1981

14. **Builder**: E.S. Ellett; Linneman, Inc., and the Mazzocco Construction Company working for the BOR

Source(s) of Information: Linear Component Form for 5WL1526 by Fraser and Godfrey 2012 (on file at BOR ECAO)

15. **Date of Construction / Date Range**: 1954-1956

Source(s) of Information: U.S. Dept. of the Interior. Water and Power Resources Service Project Data 1981

16. **Historical / Archival Data**:

The South Platte Supply Canal was completed in 1956 by the BOR and was the last irrigation feature to be developed for the C-BT. Its construction involved modification of three existing ditches – the Lower Boulder Ditch, the Sullivan Ditch, and the Coal Ridge Ditch. The Coal Ridge Ditch had been constructed in 1859 by the Lower Boulder Ditch Company, with some of the earliest water rights. The BOR enlarged the three ditches into one continuous canal and added 1.3 miles of new canal from the Coal Ridge Waste Lake to the South Platte River (the South Platte Section). The BOR kept existing structures (e.g., flumes, drops, turnouts, bridges) that were adequate for the increased water flow, but modified, rebuilt, or replaced inadequate structures. Since its initial construction, the canal has had only relatively minors repairs and/or alterations (from Fraser and Godfrey 2012).

17. **Cultural Affiliation and Justification**:

Historic Euroamerican based on ownership by the Bureau of Reclamation

IV. Management Recommendations Avoid both direct and visual impacts. Mitigate adverse effects if avoidance is not possible.

18. **Eligibility of Entire Resource**

☒ Eligible ☐ Not Eligible ☐ Need Data Is this an official determination? ☐ Yes ☒ No

Remarks / Justification:

In 1990 and 2013, the SHPO determined either segments 5WL1526.1 and 5WL1526.2, or the entire resource, officially not eligible for the National Register, looking at the mid-20th century modification of the original Coal Ridge Ditch. However, evaluation of the resource as the South Platte Supply Canal in 2012 resulted in a recommendation of field eligible for the resource as a whole because of its role in the C-BT. The 2012 draft site forms are on file at the BOR, Eastern Colorado Area Office (ECAO), but have not yet been submitted to OAHP.

19. **Evaluation of integrity of the segment of the entire linear resource being recorded** (Complete only if "Segment" under item 4 is checked and the entire resource is marked as Eligible under item 18)

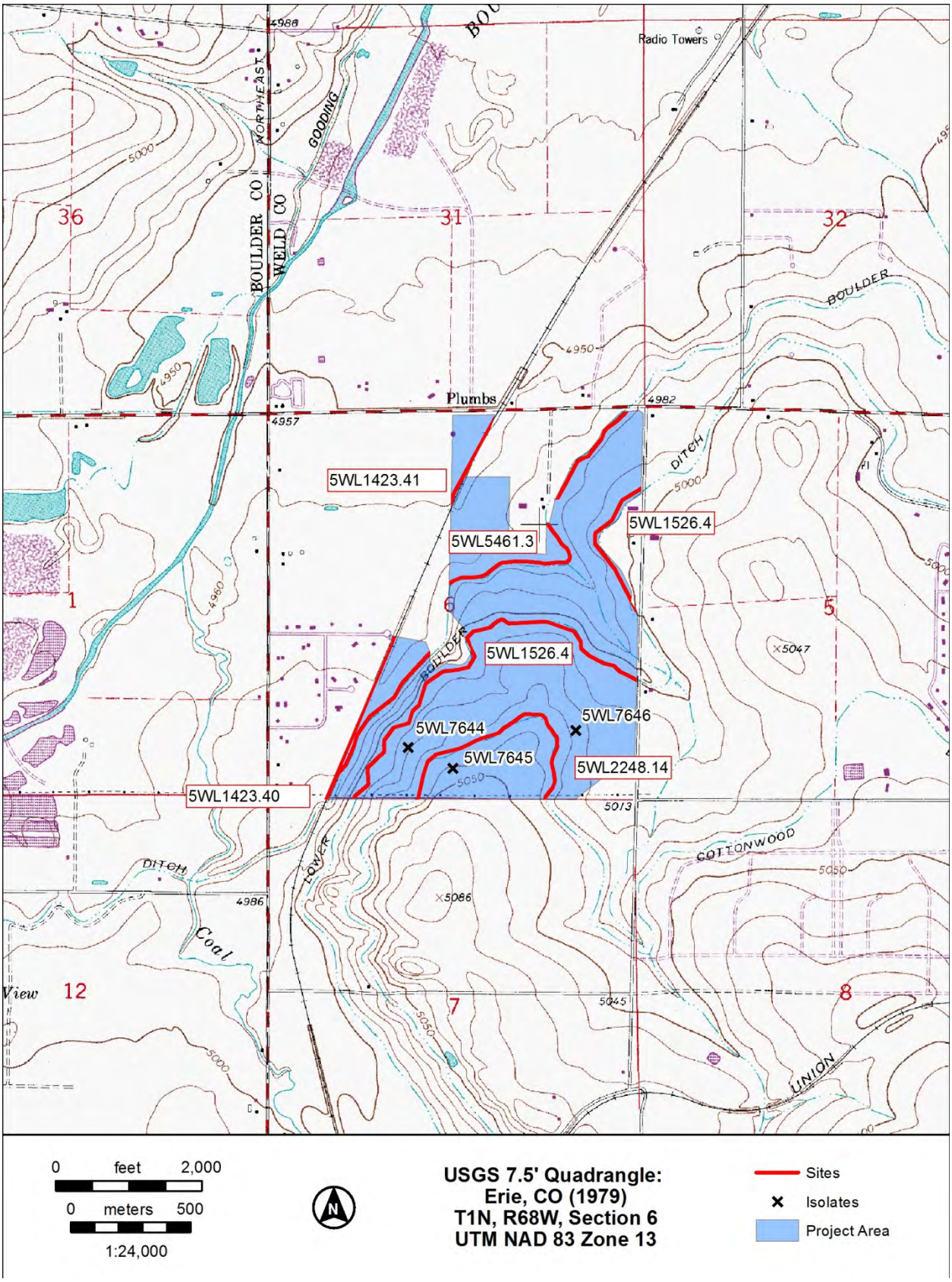
☒ Supporting ☐ Non-supporting ☐ Not applicable

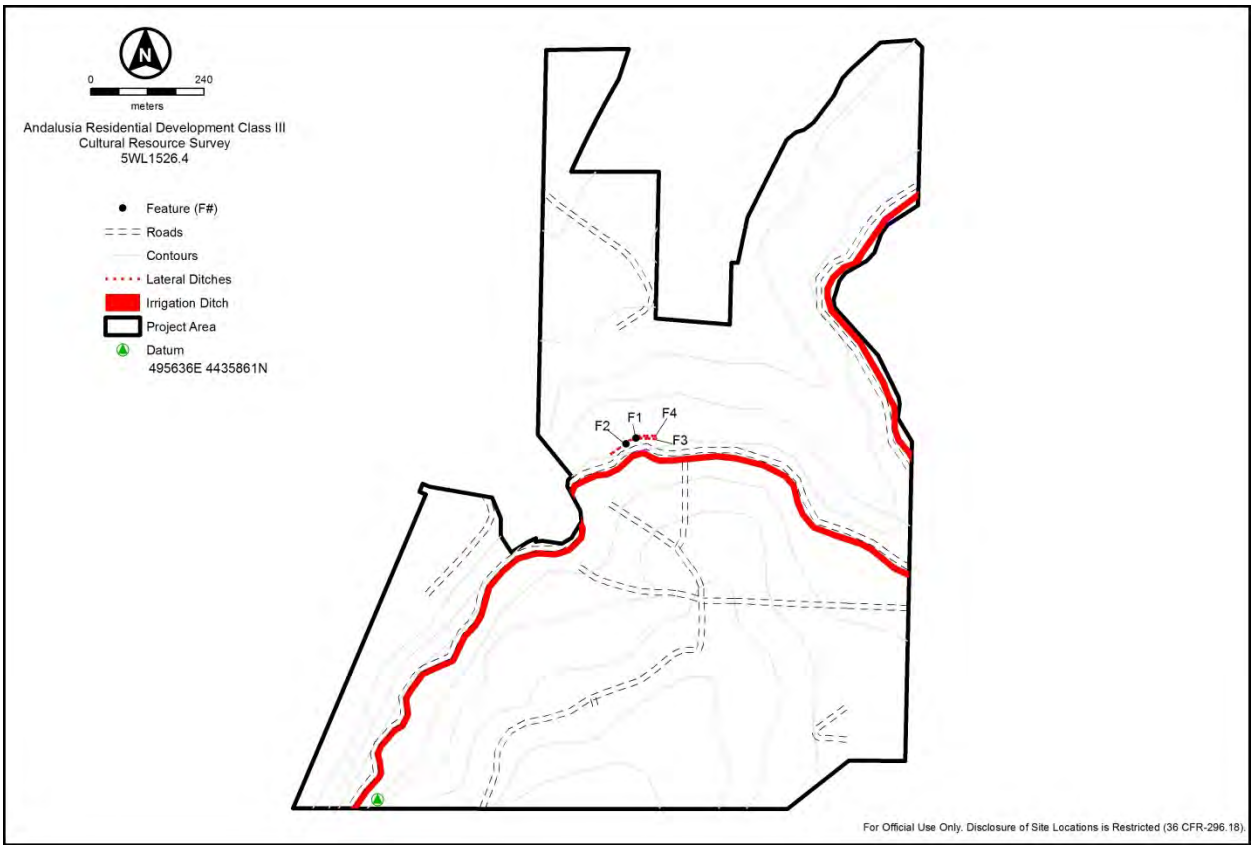
Remarks / Justification:

This segment is in excellent condition, albeit with dense vegetation along its banks, and is currently in use. It does not appear to have had any modern changes or additions and it still runs through a largely rural agricultural landscape, reflecting its mid-20th century period of construction, so it retains all aspects of integrity.

20. **Recorder(s)**: R. Schwendler, L. Clark, S. Martin 21. **Date**: June 25, 2014

Colorado Historical Society - Office of Archaeology & Historic Preservation
1560 Broadway, Suite 400 Denver, CO 80202
303-866-3395


5WL1423.41
5WL5461.3
5WL1526.4
5WL1526.4
5WL7644
5WL7646
5WL7645
5WL2248.14
5WL1423.40
Plumbs
Radio Towers
BOULDER CO
WELD CO
NORTHEAST
GOODING
DITCH
BOULDER
LOWER
COTTONWOOD
UNION
Coal
View
36
31
32
1
6
5
7
8
12
0 feet 2,000
0 meters 500
1:24,000
USGS 7.5' Quadrangle:
Erie, CO (1979)
T1N, R68W, Section 6
UTM NAD 83 Zone 13
Sites
Isolates
Project Area


N
0
240
meters
Andalusia Residential Development Class III
Cultural Resource Survey
5WL1526.4
Feature (F#)
Roads
Contours
Lateral Ditches
Irrigation Ditch
Project Area
Datum
495636E 4435861N
F1
F2
F3
F4
For Official Use Only. Disclosure of Site Locations is Restricted (36 CFR-296.18).



Overview of 5WL1526.4, facing southeast.



Overview of 5WL1526.4 in the southwest portion of the project area, facing southwest.



5WL1526.4 Feature 1, facing north.



5WL1526.4 Feature 2, facing east.



5WL1526.4 Feature 3, facing east.



5WL1526.4 Feature 4, facing east.

Management Data Form

A *Management Data Form* should be completed for each cultural resource recorded during an archaeological survey. Isolated finds and revisits are the exception and they do not require a *Management Data Form*. Please attach the appropriate component forms and use continuation pages if necessary. Fields can be expanded or compressed as necessary.

1. **Resource Number**: 5WL2248.14

2. **Temporary Resource Number**: 2248.x

3. **Attachments (check as many as apply)**
- ☐ Prehistoric Archaeological Component
- ☐ Historic Archaeological Component
- ☐ Historic Architectural Component Form
- ☑ Linear Component
- ☑ Sketch/Instrument Map (required)
- ☑ U.S.G.S. Map Photocopy (required)
- ☑ Photograph(s) (required)
- ☐ Other, specify:

4. **Official determination (OAHP use only)**
- ☐ Determined Eligible NR\SR _____
- ☐ Determined Not Eligible NR\SR _____
- ☐ Nominated _____
- ☐ Need Data NR\SR _____
- ☐ Contributing to NR Dist.\SR Dist. _____
- ☐ Not Contributing to NR Dist.\SR Dist. _____
- ☐ Supports overall linear eligibility NR\SR _____
- ☐ Does not support overall linear eligibility NR\SR _____

I. IDENTIFICATION

5. **Resource Name**: Cottonwood Extension Ditch

6. **Project Name/Number**: Andalusia Residential Development Class III/Project No. 14-65

7. **Government Involvement**: ☑ Local ☐ State ☐ Federal

Agency: N/A

8. **Site Categories (check as many as apply)**:

Prehistoric: ☐ archaeological site ☐ paleontological site ☐ In existing National Register District

National Register District name:

Historic: ☐ archaeology site ☐ building(s) ☑ structure(s) ☐ object(s) ☐ In existing National Register District

National Register District name:

9. **Owner(s) Name and Address**:

I & J Partnership LP, 3733 Florentine Circle, Longmont, CO 80503, ATTN Jerry Bouldin

10. **Boundary Description and Justification**:

The boundary was defined by the extent of the ditch, as shown on the Erie, CO (1979) 1:24k topo map, and its laterals, as observed during fieldwork, within the project area.

11. **Site/Property Dimensions** Length: 1,077 m Width: 2.7 m Area: 2,908 m^2 Acres (m^2/4047): 0.7

Area was calculated as: ☑ Length x Width (rectangle/square) ☐ Length x Width x 0.785 (Ellipse) ☐ GIS

II. LOCATION

12. **Legal Location**

PM	6th	Township	1N	Range	68W	Section	6	SE ¼		SW ¼
PM	6th	Township	1N	Range	68W	Section	6	SW ¼		SE ¼
PM		Township		Range		Section		¼		¼
PM		Township		Range		Section		¼		¼

If section is irregular, explain alignment method:

Management Data Form

Resource Number: 5WL2248.14 **Temporary Resource Number**: 2248.x

13. **USGS Quad**: Erie, CO (1979) 14. **County**: Weld

15. **UTM Coordinates**: Datum used ☐ NAD 27 ☑ NAD 83 ☐ WGS 84 Other:

A. Zone	13 ;	495899	mE	4435863 mN
B. Zone	13 ;	496426	mE	4435853 mN
C. Zone	;		mE	mN
D. Zone	;		mE	mN

16. **UTM Source**: ☑ Corrected GPS/rectified survey (<5m error) ☐ Uncorrected GPS ☐ Map template

Other (explain):

17. **Site elevation** (feet): 5035

18. **Address**: Lot: Block: Addition:

19. **Location/Access**:
From I-25, take exit 235 west on Highway 52 for 3.1 miles. Turn south onto County Road 3 and drive 0.8 miles. Turn west on a dirt oil and gas road and go about 1,500 feet west then south to the top of the ditch.

III. NATURAL ENVIRONMENT/SITE CONDITION

20. **General Description** (should include both on site as well as geographical setting with aspect, landforms, vegetation, soils, depositional environment, water, ground visibility):

The ditch is located on the north side of a gentle north-facing slope of a low hill. The ditch complex runs alongside cultivated fields (wheat and alfalfa) and is flanked by native grasses, small willows, Canadian thistle, milkweed, and large cottonwoods. The soil is a medium brown sandy loam and ground visibility is approximately 0-10 percent due to vegetation on the banks of the ditch.

21. **Soil depth (cm) and description**:

Medium brown sandy loam is visible on the surrounding ground surface and more than 1 m below ground surface in the ditch's banks.

22. **Condition**

a. Architectural/Structural
- ☑ Excellent
- ☐ Good
- ☐ Fair
- ☐ Deteriorated
- ☐ Ruin

b. Archaeological/Paleontological
- ☐ Undisturbed
- ☐ Light disturbance
- ☐ Moderate disturbance
- ☐ Heavy disturbance
- ☐ Total disturbance

23. **Describe condition**:

The ditch's banks are covered by tall vegetation that is leaning into the ditch in some places and there is some minor bank erosion in spots but overall it is in very good, maintained condition. It is currently in use and contains at least 6 inches of water.

24. **Vandalism**: ☐ Yes ☑ No
Describe:

IV. NATIONAL/STATE REGISTER ELIGIBILITY ASSESSMENT

25. **Context or Theme**: Late 19th and early 20th century agriculture and water control

26. **Applicable National Register Criteria**:
- ☑ A. Associated with events that have made a significant contribution to the broad pattern of our history
- ☐ B. Associated with the lives of persons significant in our past
- ☐ C. Embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
- ☐ D. Has yielded, or may be likely to yield, information important in history or prehistory
- ☐ Does not meet any of the National Register criteria
- ☐ Qualifies under exceptions A through G. List exception(s):

27. **Applicable State Register Criteria**:
- ☑ A. Property is associated with events that have made a significant contribution to history
- ☐ B. Property is connected with persons significant in history
- ☐ C. Property has distinctive characteristics of a type, period, method of construction or artisan
- ☐ D. Property is of geographic importance
- ☐ E. Property contains the possibility of important discoveries related to prehistory or history
- ☐ Does not meet any of the State Register criteria

28. **Area(s) of significance**:

Agriculture

29. **Period(s) of significance**:

1894 to early 1900s

30. **Level of significance**: ☐ National ☑ State ☑ Local

31. **Statement of significance**:

Irrigation works generally are of major historical significance throughout the Front Range area, as well as the other irrigated portions of Colorado. The development and expansion of irrigated agriculture, beginning along the South Platte River and its tributaries as early as the 1860s, allowed for permanent agrarian settlement in the Front Range counties and extending eastward onto the plains. As a result, it influenced the demographics, economy, and sociopolitical history of this area for several generations. The Cottonwood Extension Ditch and numerous lateral ditches continue to be used today to irrigate agricultural fields in Weld County and surrounding areas. Although segment 5WL2248.14 is relatively short, it is a well-preserved component of a broad system of irrigation ditches that run throughout this region of Colorado.

The resource as a whole has not been recorded and evaluated so per SHPO policy the resource as a whole is considered eligible, presumably under Criterion A.

32. **Statement of historic integrity related to significance**:

This segment of the Cottonwood Extension Ditch retains the essential physical features that enable it to be identified with its historic associations. Most if not all of the seven aspects of integrity of this resource, including location, design, setting, materials, workmanship, and feeling, are intact. This segment of the ditch retains sufficient integrity to be supporting of the resource's overall eligibility.

33. **National Register Eligibility Field Assessment**: ☑ Eligible ☐ Not eligible ☐ Need data
Linear Segment Evaluation (if applicable): ☑ Supporting ☐ Non Supporting
34. **Status in an Existing National Register Distric**t: ☐ Contributing ☐ Non-contributing
35. **State Register Eligibility Field Assessmen**t: ☑ Eligible ☐ Not eligible ☐ Need data
36. **Status in an Existing State Register District**: ☐ Contributing ☐ Non-contributing
37. **National/State Register District Potential**: ☐ Yes ☑ No Describe:

38. **Cultural Landscape Potential**: ☐ Yes ☑ No Describe:

39. **If Yes to either 37 or 38, is this site**: ☐ Contributing ☐ Non-contributing Explain:

V. MANAGEMENT AND ADMINISTRATIVE DATA

40. **Threats to Resource**: ☑ Water erosion ☐ Wind erosion ☐ Grazing ☐ Neglect ☐ Vandalism ☐ Recreation ☑ Construction ☐ Other (explain):

41. **Existing protection** ☐ None ☐ Marked ☐ Fenced ☐ Patrolled ☑ Access controlled
Other (specify):

Comments: access controlled through private land ownership

42. **Local landmark designation**:

43. **Easement**:

44. **Recorder's Management Recommendations**:
Avoid direct and visual adverse effects. Mitigate adverse effects if unavoidable.

VI. DOCUMENTATION

45. **Previous actions accomplished at the site**: ☐ Tested ☐ Partial excavation ☐ Complete excavation

Date(s):

a. Excavations:

b. Stabilization: Date(s):

c. HABS/HAER documentation [date(s) and numbers]:

d. Other:

46. **Known collections/reports/interviews and other references (list)**:

47. **Primary location of additional data**:

48. **State or Federal Permit number**: SHPO 2014-28

49. **Collection**: Artifact collection authorized: ☑ Yes ☐ No Were artifacts collected: ☐ Yes ☑ No
Artifact repository:

Collection method: ☐ Diagnostics ☐ Grab Sample ☐ Random Sample

Other (specify):

50. **Photograph Numbers**: 14-65_2248.14_1-12

Files or negatives stored at: electronically at James Enterprises, Inc.

51. **Report title**: Class III Cultural Resource Survey of the Proposed Andalusia Residential Development, Weld County, Colorado

52. **Recorder(s)**: R. Schwendler, L. Clark, S. Martin Date: June 25, 2014

53. **Recorder affiliation**: James Enterprises, Inc.

Phone number/Email: 970-484-3335/jbjei@mesanetworks.net

NOTE: Please attach a site map, a photocopy of the USGS 1:24000 map indicating resource location, and photographs.

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1560 Broadway, Suite 400 Denver, CO 80202
303-866-3395

Linear Component Form

This form should be completed for each linear resource or linear segment. Use this form in conjunction with the *Management Data Form.* Call OAHP staff (303-866-5216) prior to assigning a resource number.

I. Resource Identification

1. **Resource Number**: 5WL2248.14
2. **Temporary Resource Number**: 2248.x
3. **Site Name**: Cottonwood Extension Ditch
4. **Record of**: ☐ Entire resource ■ Segment

II. Resource Description

5. **Resource Type**: ☐ Road ☐ Railroad ☐ Trail ■ Ditch/Canal

Other (specify):

6. **Component Description**:

The segment of the Cottonwood Extension Ditch recorded as Site 5WL2248.14 is 3,534 feet (1,077 m) long. The width of this segment of the ditch averages about 9 feet (2.7 m) at the top and 4 feet (1.2 m) near its bottom. It had a water depth of about 6 inches (15 cm) at the time of recording. The ditch is earthen, currently in use, and actively maintained although its banks are covered by thick vegetation. An access road runs along the ditch and crosses the ditch in the form of a cement bridge near the center of the segment within the project area. The ditch appears to have had no major changes since its construction and is still a hand-dug earthen canal.

7. **Original use**: irrigation ditch
8. **Current use**: irrigation ditch
9. **Modifications (describe and include dates)**:

No known modifications have been made to this ditch segment.

10. **Extent of Entire Resource**:

The Cottonwood Extension (aka Erie and Coal Creek Ditch) is about seven miles in length, with its headgate being on Coal Creek, about 3.5 miles south of this segment.

11. **Associated Artifacts**:

None

12. **Associated Features or Resources**:

Eight features are associated with this ditch segment. Feature 1 is a currently unused headgate located on the west side of 5WL2248.14. A typical headgate, it comprises a concrete wall paralleling the western wall of 5WL2248.14, with a metal screw stem and handwheel rising from the concrete. The headgate allows water to flow into a small parallel lateral irrigation ditch (Feature 2) that is approximately 3 feet (0.9 m) wide and 1.5 feet (0.5 m) deep. Feature 2 parallels the west side of 5WL2248.14 approximately 33 feet (10 m) from the ditch's western edge. Feature 2 flows north from Feature 1 until it bends slightly northeast then turns due north at a fence line, and south from Feature 1 until it disappears near the southern project boundary. It parallels 5WL2248.14 for only a short way. The gradual disappearance of the feature's southern end may be intentional, as it is likely used for flood irrigation. (Continued on Page 3)

Resource Number: 5WL2248.14 **Temporary Resource Number**: 2248.x

III. Research Information

13. **Architect/Engineer**: Unknown

Source(s) of Information:

14. **Builder**: Erie and Coal Creek Ditch and Reservation Company

Source(s) of Information: Gabriel 2013

15. **Date of Construction / Date Range**: ca. 1894

Source(s) of Information: Gabriel 2013

16. **Historical / Archival Data**:

Very little information can be found at the Cottonwood Extension Ditch, except that it was also called the Erie and Coal Creek Ditch, which was appropriated in 1894 and adjudicated in 1905. The Erie and Coal Creek Ditch and Reservation Company owned the Erie and Coal Creek Ditch, which diverts water from Coal Creek, and operated it in association with the Leyner Cottonwood Ditch #1, which diverted water from the New Dry Creek Carrier off South Boulder Creek. Some users of the Erie and Coal Creek Ditch also held shares in the Leyner Cottonwood Ditch #1. The Erie and Coal Creek Ditch appeared to be the first ditch to source from Coal Creek in Weld County (Gabriel 2013).

Gabriel, Jessica. 2013. Level II Historic Resource Documentation, Cottonwood Extension Ditch (5WL.2248.11), Weld County, Colorado. Prepared for the Bureau of Reclamation, Eastern Colorado Area Office. ERO Resources, Denver.

17. **Cultural Affiliation and Justification**:

Presumably Euroamerican because that has been the dominant culture in the area

IV. Management Recommendations Avoid both direct and visual impacts. Mitigate adverse effects if avoidance is not possible.

18. **Eligibility of Entire Resource**

☒ Eligible ☐ Not Eligible ☐ Need Data Is this an official determination? ☐ Yes ☒ No

Remarks / Justification:

Irrigation works generally are of major historical significance throughout the Front Range area, as well as the other irrigated portions of Colorado. The development and expansion of irrigated agriculture, beginning along the South Platte River and its tributaries as early as the 1860s, allowed for permanent agrarian settlement in the Front Range counties and extending eastward onto the plains. As a result, it influenced the demographics, economy, and sociopolitical history of this area for several generations. The Cottonwood Extension Ditch and numerous lateral ditches continue to be used today to irrigate agricultural fields in Weld County and surrounding areas. Although segment 5WL2248.14 is relatively short, it is a well-preserved component of a broad system of irrigation ditches that run throughout this region of Colorado.

19. **Evaluation of integrity of the segment of the entire linear resource being recorded** (Complete only if "Segment" under item 4 is checked and the entire resource is marked as Eligible under item 18)

☒ Supporting ☐ Non-supporting ☐ Not applicable

Remarks / Justification:

This segment is in excellent condition and is currently in use. It does not appear to have had any significant modern changes or additions and it still runs through a largely rural agricultural landscape, reflecting its period of construction, so it retains all aspects of integrity.

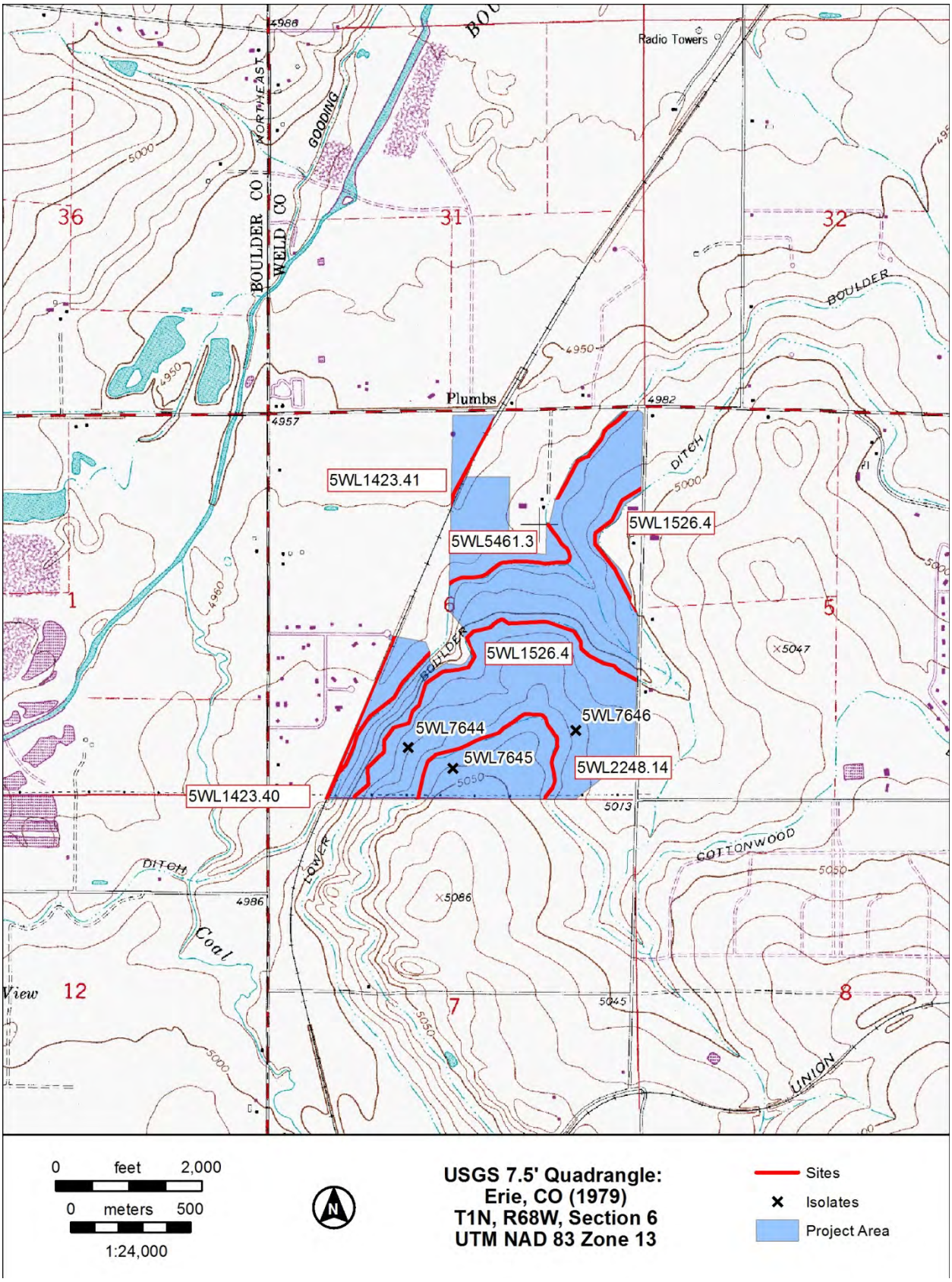
20. **Recorder(s)**: R. Schwendler, L. Clark, S. Martin 21. **Date**: June 25, 2014

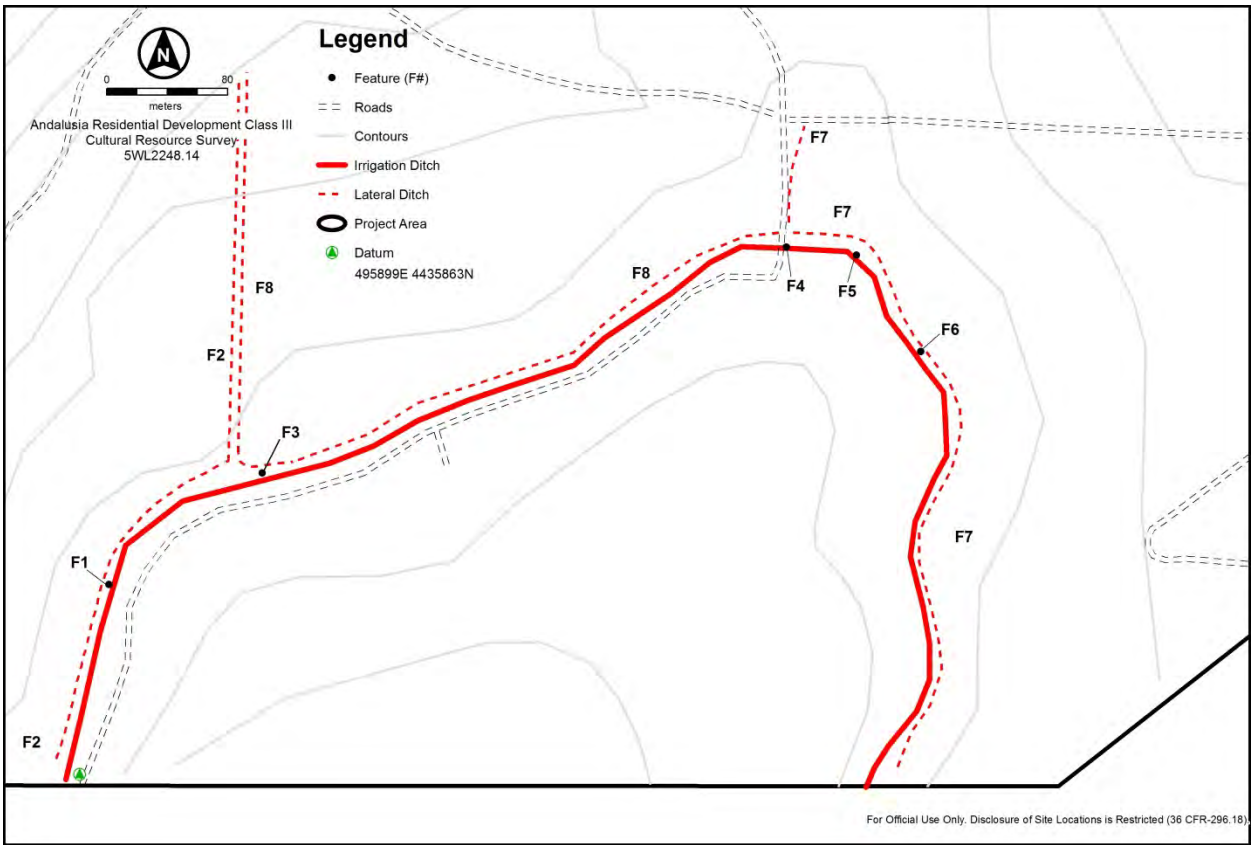
Colorado Historical Society - Office of Archaeology & Historic Preservation
1560 Broadway, Suite 400 Denver, CO 80202
303-866-3395

Continued from Page 1

No. 12 Associated Features or Resources

Feature 3 is an in-use headgate that was open at the time of recording. It is located on the north wall of 5WL2248.14 and allows water to flow from 5WL2248.14 through a PVC pipe into a lateral irrigation ditch (Feature 8) that borders an agricultural field located north of the headgate. Feature 4 is an in-use headgate and drop complex located on the east side of a dirt access road, north of 5WL2248.14. This headgate allows water to flow from 5WL2248.14 into a lateral ditch (Feature 7) that borders the western edge of an agricultural field, immediately east of an access road. A drop complex constructed of concrete, wood, and steel sheet metal is located near the south end of this portion of Feature 7. Feature 5 is an in-use headgate on the north side of 5WL2248.14. It appears to be modern and feeds a lateral irrigation ditch (also called Feature 7) paralleling the north bank of 5WL2248.14. Associated with the headgate in an adjacent agricultural field to the northeast is a 3-foot (0.9-m) wide square box built of cinder blocks that may act as a diversion structure. Feature 6 is the location of a possible former headgate or erosion control feature. It is currently a partially deteriorated concrete wall along the east bank of 5WL2248.14. Feature 7 is a 3-foot (0.9-m) wide parallel ditch that begins at Feature 4 and flows north for a short ways, as well as east then south along the east side of 5WL2248.14. It is located approximately 10 m from the eastern edge of 2248.14. The parallel ditch ends before the southern project area boundary and appears to feather out for flood irrigation. Feature 8 is a 3-foot (0.9-m) wide ditch paralleling the north side of 5WL2248.14 approximately 10 m from its northern edge. The lateral's east end is a north-south oriented dirt road that crosses the ditch. It flows west until it bends north at a fence line, parallelling Feature 2 on the opposite side of the fence. Water is diverted into this Feature 8 lateral from Feature 3.


5WL1423.41
5WL5461.3
5WL1526.4
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5WL7644
5WL7646
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GOODING
DITCH
BOULDER
LOWER
COTTONWOOD
UNION
Coal
View
36
31
32
1
6
5
7
8
12
0 feet 2,000
0 meters 500
1:24,000
USGS 7.5' Quadrangle:
Erie, CO (1979)
T1N, R68W, Section 6
UTM NAD 83 Zone 13
Sites
Isolates
Project Area


Legend
Feature (F#)
Roads
Contours
Irrigation Ditch
Lateral Ditch
Project Area
Datum
495899E 4435863N
0
80
meters
Andalusia Residential Development Class III
Cultural Resource Survey
5WL2248.14
F1
F2
F3
F4
F5
F6
F7
F8
For Official Use Only. Disclosure of Site Locations is Restricted (36 CFR-296.18)



Overview of 5WL2248.14, facing north.



Overview of 5WL2248.14, facing south.



Modern gate across 5WL2248.14 at a fence line, facing north.



Cement bridge across 5WL2248.14 for dirt access road, facing east.



Modern headgate in use at 5WL2248.14, facing northeast.



Overview of 5WL2248.14 Feature 1 facing west.



Overview of5WL2248.14 Feature 2 depression, facing east.



Overview of5WL2248.14 Feature 2, facing north.



Overview of 5WL2248.14 Feature 3, facing west.



Overview of 5WL2248.14 Feature 4 headgate, facing north.



Overview of 5WL2248.14 Feature 4 drop complex, facing north.



Overview of 5WL2248.14 Feature 6, facing northeast.

Management Data Form

A *Management Data Form* should be completed for each cultural resource recorded during an archaeological survey. Isolated finds and revisits are the exception and they do not require a *Management Data Form*. Please attach the appropriate component forms and use continuation pages if necessary. Fields can be expanded or compressed as necessary.

1. **Resource Number**: 5WL5461.3

2. **Temporary Resource Number**: 5461.x

3. **Attachments (check as many as apply)**
- ☐ Prehistoric Archaeological Component
- ☐ Historic Archaeological Component
- ☐ Historic Architectural Component Form
- ☑ Linear Component
- ☑ Sketch/Instrument Map (required)
- ☑ U.S.G.S. Map Photocopy (required)
- ☑ Photograph(s) (required)
- ☐ Other, specify:

4. **Official determination (OAHP use only)**
- ☐ Determined Eligible NR\SR _____
- ☐ Determined Not Eligible NR\SR _____
- ☐ Nominated _____
- ☐ Need Data NR\SR _____
- ☐ Contributing to NR Dist.\SR Dist. _____
- ☐ Not Contributing to NR Dist.\SR Dist. _____
- ☐ Supports overall linear eligibility NR\SR _____
- ☐ Does not support overall linear eligibility NR\SR _____

I. IDENTIFICATION

5. **Resource Name**: Boulder-Weld County Ditch

6. **Project Name/Number**: Andalusia Residential Development Class III/Project No. 14-65

7. **Government Involvement**: ☑ Local ☐ State ☐ Federal

Agency: N/A

8. **Site Categories (check as many as apply)**:

Prehistoric: ☐ archaeological site ☐ paleontological site ☐ In existing National Register District

National Register District name:

Historic: ☐ archaeology site ☐ building(s) ☑ structure(s) ☐ object(s) ☐ In existing National Register District

National Register District name:

9. **Owner(s) Name and Address**:

I & J Partnership LP, 3733 Florentine Circle, Longmont, CO 80503, ATTN Jerry Bouldin

10. **Boundary Description and Justification**:

The boundary was defined by the extent of the ditch, as shown on the Erie, CO (1979) 1:24k topo map, within the project area.

11. **Site/Property Dimensions** Length: 2,244 m Width: 7.6 m Area: 17,054 m^2 Acres (m^2/4047): 4.2

Area was calculated as: ☑ Length x Width (rectangle/square) ☐ Length x Width x 0.785 (Ellipse) ☐ GIS

II. LOCATION

12. **Legal Location**

PM	6th	Township	1N	Range	68W	Section	6	SW	¼	__	¼
PM	6th	Township	1N	Range	68W	Section	6	E2	¼	__	¼
PM	__	Township	_____	Range	_____	Section	__	__	¼	__	¼
PM	__	Township	_____	Range	_____	Section	__	__	¼	__	¼

If section is irregular, explain alignment method:

13. **USGS Quad**: Erie, CO (1979) 14. **County**: Weld

15. **UTM Coordinates**: Datum used ☐ NAD 27 ☑ NAD 83 ☐ WGS 84 Other:

A. Zone	13 ;	495579 mE	4435971 mN	
B. Zone	13 ;	496775 mE	4437483 mN	
C. Zone	;	mE	mN	
D. Zone	;	mE	mN	

16. **UTM Source**: ☑ Corrected GPS/rectified survey (<5m error) ☐ Uncorrected GPS ☐ Map template

Other (explain):

17. **Site elevation** (feet): 4995

18. **Address**: Lot: Block: Addition:

19. **Location/Access**:
From I-25, take exit 235 west on Highway 52 for 3.1 miles to the northeast end of the ditch.

III. NATURAL ENVIRONMENT/SITE CONDITION

20. **General Description** (should include both on site as well as geographical setting with aspect, landforms, vegetation, soils, depositional environment, water, ground visibility):

This ditch segment runs along the gentle northern and western slopes of a low hill whose peak is located south of the project area. The ditch runs alongside cultivated fields (wheat and alfalfa) and a horse boarding facility. Vegetation present along the banks of the ditch include cheatgrass, Canadian thistle, spiny lettuce, willows, other grasses, scattered Russian olive, lambs quarters, goosefoot, and a few cattails. Scattered cottonwoods were present nearby. Ground visibility during inventory was 0-30 percent depending on the density of vegetation along the ditch's edge. Soil is medium brown sandy loam.

21. **Soil depth (cm) and description**:

Medium brown sandy loam is visible on the surrounding ground surface and up to at least 1 m below ground surface in the ditch's banks.

22. **Condition**

a. Architectural/Structural
- ☑ Excellent
- ☐ Good
- ☐ Fair
- ☐ Deteriorated
- ☐ Ruin

b. Archaeological/Paleontological
- ☐ Undisturbed
- ☐ Light disturbance
- ☐ Moderate disturbance
- ☐ Heavy disturbance
- ☐ Total disturbance

23. **Describe condition**:

The ditch's banks are covered by tall vegetation that is leaning into the ditch in some places. It also has some minor erosion in a few locations where livestock have crossed it. However, overall the ditch is in good, maintained condition. It is currently in use, with water about 21 inches deep.

24. **Vandalism**: ☐ Yes ☑ No
Describe:

IV. NATIONAL/STATE REGISTER ELIGIBILITY ASSESSMENT

25. **Context or Theme**: Late 19th and early 20th century agriculture and water control

26. **Applicable National Register Criteria**:
- ☑ A. Associated with events that have made a significant contribution to the broad pattern of our history
- ☐ B. Associated with the lives of persons significant in our past
- ☐ C. Embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
- ☐ D. Has yielded, or may be likely to yield, information important in history or prehistory
- ☐ Does not meet any of the National Register criteria
- ☐ Qualifies under exceptions A through G. List exception(s):

27. **Applicable State Register Criteria**:
- ☑ A. Property is associated with events that have made a significant contribution to history
- ☐ B. Property is connected with persons significant in history
- ☐ C. Property has distinctive characteristics of a type, period, method of construction or artisan
- ☐ D. Property is of geographic importance
- ☐ E. Property contains the possibility of important discoveries related to prehistory or history
- ☐ Does not meet any of the State Register criteria

28. **Area(s) of significance**:

Agriculture

29. **Period(s) of significance**:

1871 to early 1900s

30. **Level of significance**: ☐ National ☑ State ☑ Local

31. **Statement of significance**:

Irrigation works generally are of major historical significance throughout the Front Range area, as well as the other irrigated portions of Colorado. The development and expansion of irrigated agriculture, beginning along the South Platte River and its tributaries as early as the 1860s, allowed for permanent agrarian settlement in the Front Range counties and extending eastward onto the plains. As a result, it influenced the demographics, economy, and sociopolitical history of this area for several generations. The Boulder-Weld County Ditch continues to be used today to irrigate agricultural fields in Weld County and surrounding areas. Although segment 5WL5461.3 is relatively short, it is a well-preserved component of a broad system of irrigation ditches that run throughout this region of Colorado.

The resource as a whole does not appear to have been recorded and evaluated so per SHPO policy the resource as a whole is considered eligible, presumably under Criterion A. However, the ditch does not appear to be directly associated with any historically significant people; its simple earthen structure is not exemplary of a particular type of architecture or engineering; and it lacks data potential so it is not recommended eligible under Criteria B, C, or D.

This segment of the ditch is in good, working condition and continues to be used to irrigate agricultural land in western Weld County so it is recommended supporting of the ditch's overall eligibility.

32. **Statement of historic integrity related to significance**:

This segment of the ditch is in excellent condition, albeit with dense vegetation along its banks, and is currently in use. It retains the essential physical features that enable it to be identified with its historic associations and most if not all of the seven aspects of integrity, including location, design, setting, materials, workmanship, and feeling.

This segment of the ditch retains sufficient integrity to support the resource's overall eligibility.

33. **National Register Eligibility Field Assessment**: ☑ Eligible ☐ Not eligible ☐ Need data
Linear Segment Evaluation (if applicable): ☑ Supporting ☐ Non Supporting
34. **Status in an Existing National Register Distric**t: ☐ Contributing ☐ Non-contributing
35. **State Register Eligibility Field Assessmen**t: ☑ Eligible ☐ Not eligible ☐ Need data
36. **Status in an Existing State Register District**: ☐ Contributing ☐ Non-contributing
37. **National/State Register District Potential**: ☑ Yes ☐ No Describe:

38. **Cultural Landscape Potential**: ☐ Yes ☑ No Describe:

39. **If Yes to either 37 or 38, is this site**: ☐ Contributing ☐ Non-contributing Explain:

V. MANAGEMENT AND ADMINISTRATIVE DATA

40. **Threats to Resource**: ☑ Water erosion ☐ Wind erosion ☑ Grazing ☐ Neglect ☐ Vandalism ☐ Recreation ☑ Construction ☐ Other (explain):

41. **Existing protection** ☐ None ☐ Marked ☐ Fenced ☐ Patrolled ☑ Access controlled
Other (specify):

Comments: access controlled through private land ownership

42. **Local landmark designation**:

43. **Easement**:

44. **Recorder's Management Recommendations**:

VI. DOCUMENTATION

45. **Previous actions accomplished at the site**: ☐ Tested ☐ Partial excavation ☐ Complete excavation

Date(s):

a. Excavations:

b. Stabilization: Date(s):

c. HABS/HAER documentation [date(s) and numbers]:

d. Other:

46. **Known collections/reports/interviews and other references (list)**:

47. **Primary location of additional data**:

48. **State or Federal Permit number**: SHPO 2014-28

49. **Collection**: Artifact collection authorized: ☑ Yes ☐ No Were artifacts collected: ☐ Yes ☑ No
Artifact repository:

Collection method: ☐ Diagnostics ☐ Grab Sample ☐ Random Sample

Other (specify):

50. **Photograph Numbers**: 14-65_5461.3_1-7

Files or negatives stored at: electronically at James Enterprises, Inc.

51. **Report title**: Class III Cultural Resource Survey of the Proposed Andalusia Residential Development, Weld County, Colorado

52. **Recorder(s)**: R. Schwendler, L. Clark, S. Martin Date: June 25, 2014

53. **Recorder affiliation**: James Enterprises, Inc.

Phone number/Email: 970-484-3335/jbjei@mesanetworks.net

NOTE: Please attach a site map, a photocopy of the USGS 1:24000 map indicating resource location, and photographs.

Colorado Historical Society - Office of Archaeology & Historic Preservation
1560 Broadway, Suite 400 Denver, CO 80202
303-866-3395

Linear Component Form

This form should be completed for each linear resource or linear segment. Use this form in conjunction with the *Management Data Form.* Call OAHP staff (303-866-5216) prior to assigning a resource number.

I. Resource Identification

1. **Resource Number**: 5WL5461.3
2. **Temporary Resource Number**: 5461.x
3. **Site Name**: Boulder-Weld County Ditch
4. **Record of**: ☐ Entire resource ■ Segment

II. Resource Description

5. **Resource Type**: ☐ Road ☐ Railroad ☐ Trail ■ Ditch/Canal

Other (specify):

6. **Component Description**:

This is a 7,362-foot (2,244-m) long segment of the Boulder-Weld County Ditch. The width of this segment of the ditch is approximately 25 feet (7.6 m) at the top and 6 feet (1.6 m) at the water surface with a water depth of about 21 inches (53 cm) at the time of recording. The ditch is earthen, currently in use, and actively maintained. Two features were recorded along this segment of the ditch.

7. **Original use**: irrigation ditch
8. **Current use**: irrigation ditch
9. **Modifications (describe and include dates)**:

According to Boulder and Weld County Ditch president Jon File, the ditch remains in its same location as when it was originally constructed, with the possible exception of some corners that may have been straightened after episodes of erosion. None of these are specifically known or confirmed for this segment, however.

10. **Extent of Entire Resource**:

The Boulder and Weld County Ditch comes off Boulder Creek about 3 miles southwest (as the crow flies) from the southwest corner of the project area and heads northeast out of the project area for several miles.

11. **Associated Artifacts**:

None

12. **Associated Features or Resources**:

Two features are associated with 5WL5461.3. Feature 1 is a headgate on the western bank of 5WL5461.3 that does not appear historic although it is no longer in use. Feature 2 comprises a concrete diversion structure and concrete flume located west of Feature 1. The diversion structure and flume are separated by about 19.7 feet (6 m). No lateral ditches were observed extending from this feature so its degree and timing of use is unclear.

Resource Number: 5WL5461.3 **Temporary Resource Number**: 5461.x

III. Research Information

13. **Architect/Engineer**: Unknown

Source(s) of Information:

14. **Builder**: Unknown

Source(s) of Information:

15. **Date of Construction / Date Range**: 1871

Source(s) of Information: site forms for 5BL.861

16. **Historical / Archival Data**:

Almost no information could be found for the Boulder-Weld County Ditch except that it was appropriated in 1871. Although at least some segments in Boulder County have reportedly been moved since that time, based on information provided to other archaeological contractors by landowners, current Boulder and Weld County Ditch Company president Jon File believes that the only modifications to the ditch have been potentially some straightening of bends that have experienced erosion.

17. **Cultural Affiliation and Justification**:

Presumably Euroamerican because that has been the dominant culture in the area

IV. Management Recommendations

18. **Eligibility of Entire Resource**

☒ Eligible ☐ Not Eligible ☐ Need Data Is this an official determination? ☐ Yes ☒ No

Remarks / Justification:

The Boulder-Weld County Ditch was one of the early ditches created in this region to irrigate agricultural fields. Thus it was important in the early settlement and economy of the area. The ditch continues to play this role today.

19. **Evaluation of integrity of the segment of the entire linear resource being recorded** (Complete only if "Segment" under item 4 is checked and the entire resource is marked as Eligible under item 18)

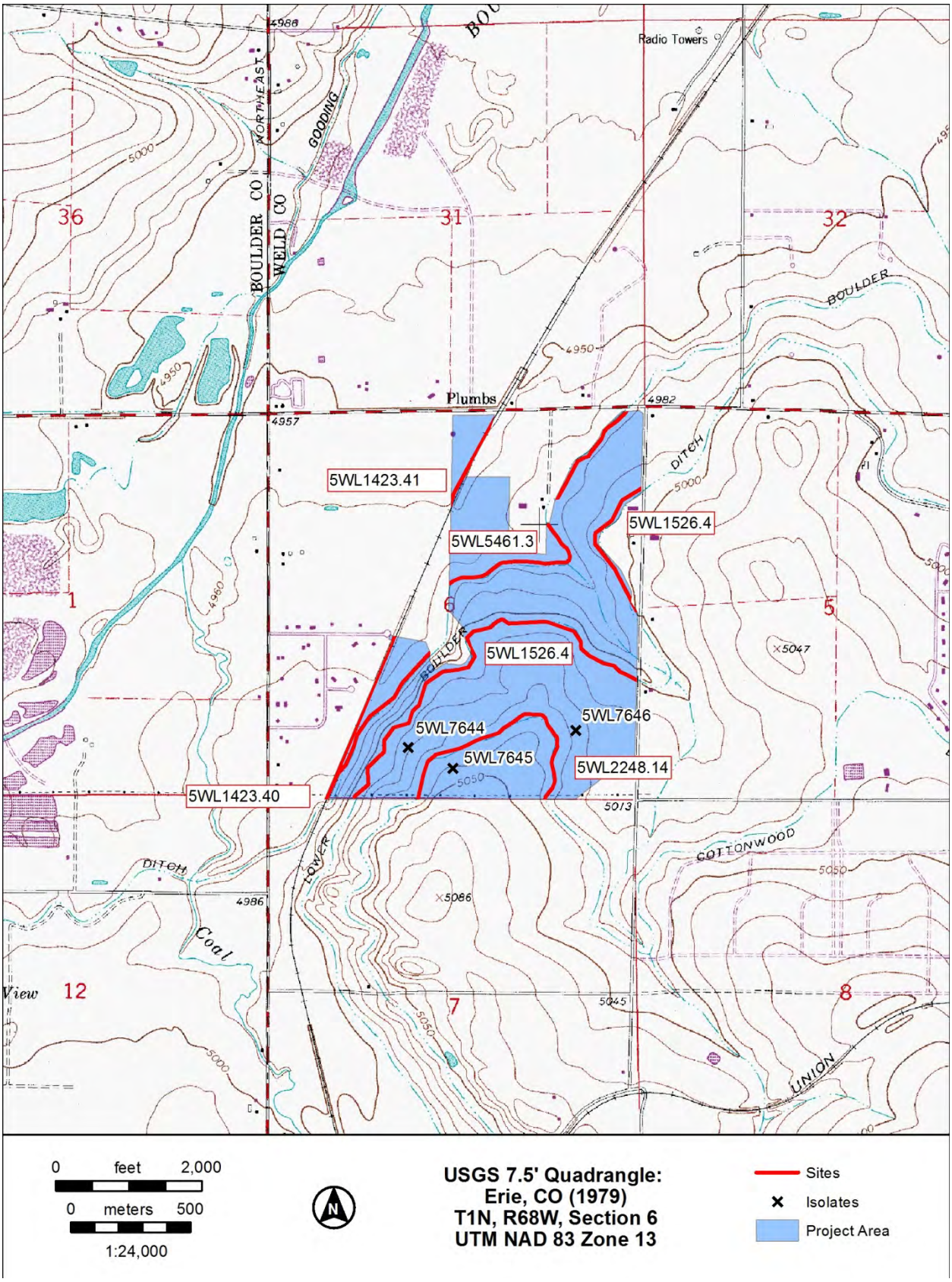
☒ Supporting ☐ Non-supporting ☐ Not applicable

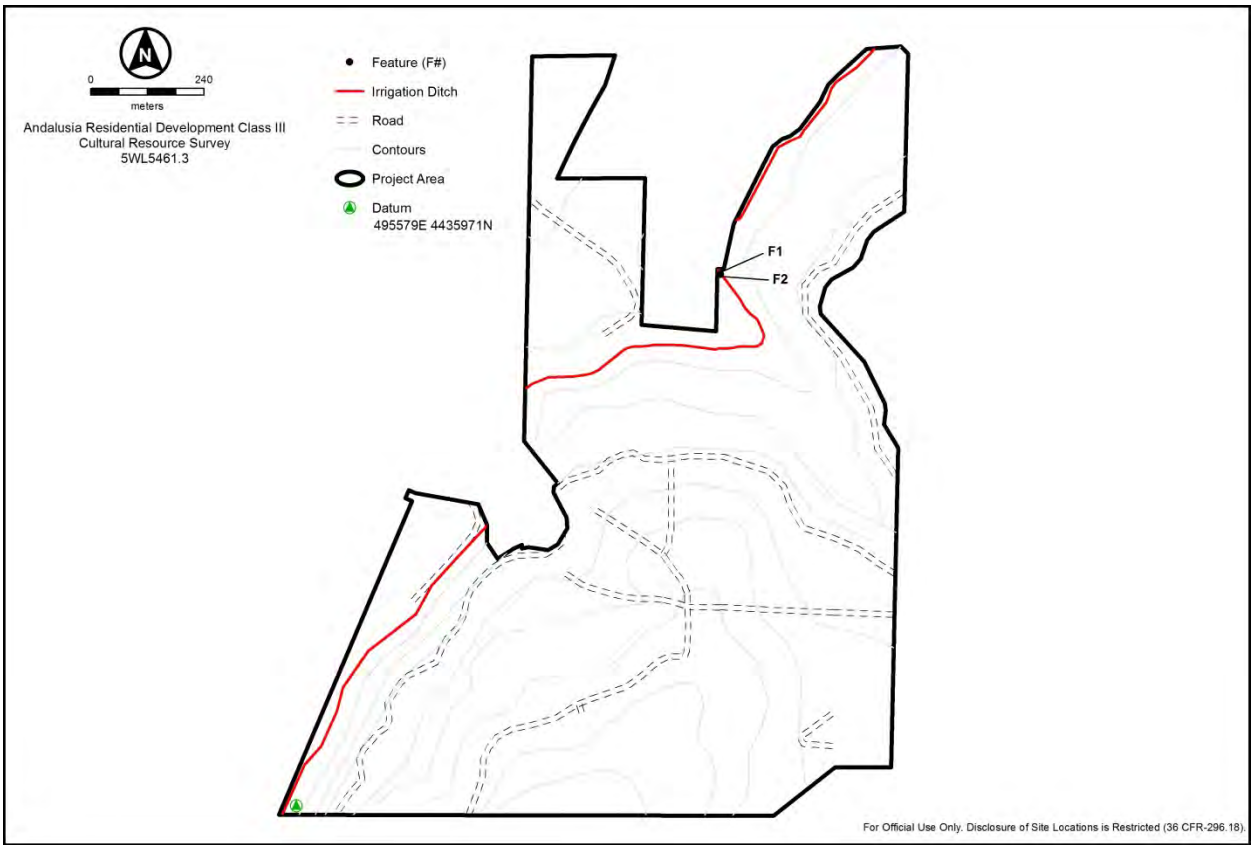
Remarks / Justification:

This segment of the ditch is in good, in-use condition and continues to transport water. It retains sufficient integrity to support the assumed overall eligibility of the ditch.

20. **Recorder(s)**: R. Schwendler, L. Clark, S. Martin 21. **Date**: June 25, 2014

Colorado Historical Society - Office of Archaeology & Historic Preservation
1560 Broadway, Suite 400 Denver, CO 80202
303-866-3395


5WL1423.41
5WL5461.3
5WL1526.4
5WL1526.4
5WL7644
5WL7646
5WL7645
5WL2248.14
5WL1423.40
Plumbs
Radio Towers
BOULDER CO
WELD CO
NORTHEAST
GOODING
BOULDER
DITCH
LOWER
COTTONWOOD
UNION
Coal
View
36
31
32
1
6
5
7
8
12
0 feet 2,000
0 meters 500
1:24,000
USGS 7.5' Quadrangle:
Erie, CO (1979)
T1N, R68W, Section 6
UTM NAD 83 Zone 13
Sites
Isolates
Project Area


N
0
240
meters
Andalusia Residential Development Class III
Cultural Resource Survey
5WL5461.3
Feature (F#)
Irrigation Ditch
Road
Contours
Project Area
Datum
495579E 4435971N
F1
F2
For Official Use Only. Disclosure of Site Locations is Restricted (36 CFR-296.18).



Overview of 5WL5461.3 (on left) and possible former ditch (on right), facing southwest.



Overview of 5WL5461.3 in southwestern portion of the project area, facing northeast.



Overview of 5WL5461.3 showing large modern concrete culvert, facing east.



Overview of 5WL5461.3 northwest of wetlands showing metal culvert in background, facing southeast.



Overview of 5WL5461.3 in northeast corner of the project area, facing southwest.



Overview of 5WL5461.3 Feature 1, facing west.



Overview of 5WL5461.3 Feature 2, facing north.

COLORADO CULTURAL RESOURCE SURVEY

Archaeological Isolated Find/Feature Form

OAHP 1408
Rev. 11/10

This form is not to be used for phenomena that are eligible for the National Register or are part of the built environment. To be ***only*** used for phenomena that meet the requirements of the recorder's definition as provided below. A map at 1:24,000 scale with IF clearly plotted must be attached.

1. **Site Number**: 5WL7644
2. **Temporary Resource Number**: RS1
3. **County**: Weld
4. **Recorder's Definition of Isolated Find**: One or very few artifacts not representing patterned behavior or multiple artifacts that lack context and integrity of location (continued #18 below)
5. **PM** 6th **Township** 1N **Range** 68W **Section** 6 SE ¼ SW ¼
   If section is irregular, explain alignment method: alignment based on southwest section corner
6. **USGS Quad**: Erie, CO (1979)
7. **Elevation**: 5049 ft.
8. **UTM Coordinates**: Datum used ☐ NAD 27 ☑ NAD 83 ☐ WGS 84 Other:
   Zone: 13; 495860 mE 4436078 mN
9. **UTM Source**: ☑ Corrected GPS/rectified survey (<5m error) ☐ Uncorrected GPS ☐ Map template
   Other (explain):
10. **Landowner**: Private
11. **Describe Artifact(s) and their distribution**:

☑ No artifacts

12. **Describe Feature (include dimensions)**:
    This is an anomalous circular depression of unknown age and origin observed in the middle of a field of mature wheat. The depression contains some cheatgrass. It measures 10 feet in diameter and 1–2 feet deep.

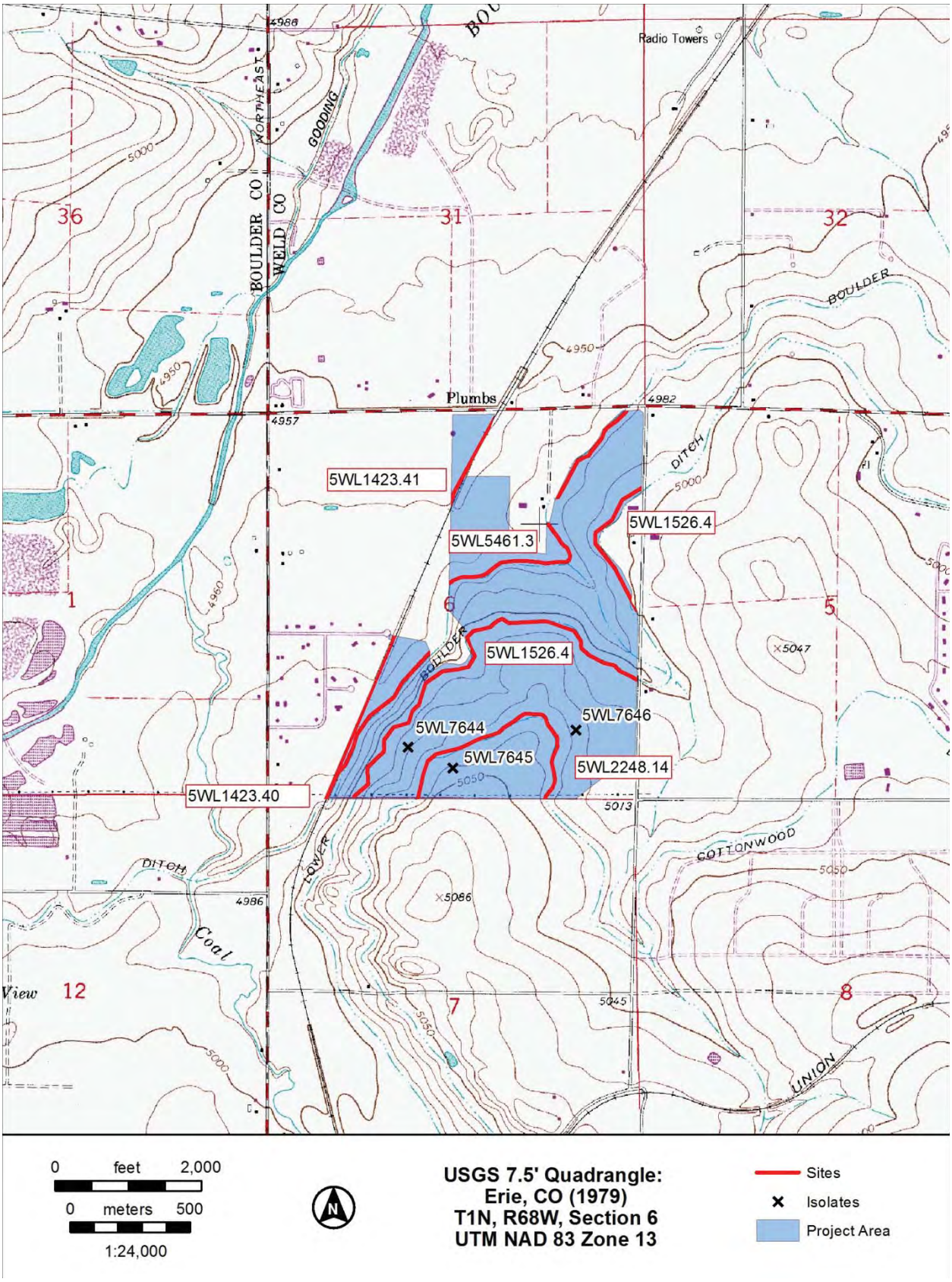
☐ No features

13. **Cultural Affiliation and Justification**: Unknown
14. **Time Period and Justification**: Unknown
15. **Relevant environmental information (e.g., elevation, topography, soils, vegetation, nearby water source)**:
    The depression is located in a field with mature wheat, on a gentle northwestern slope, between two historic irrigation ditches. The soil is a medium brown sandy loam.
16. **Is this isolate located in a cultural landscape?** ☐ Yes ☑ No
    If yes, describe:
17. **Why is this isolated find not eligible for the National Register?**

    The depression is of unknown age and origin and contains no artifacts. This feature possesses no further information potential.

18. **Additional Information (e.g., narrative, drawings, photographs, sketch map; attach extra pages if desired)**:
    continued from #4 above
    and do not represent a locus of interpretable patterned human behavior.

19. **Artifacts Collected?** ☐ Yes ☑ No
    If yes, provide repository information:
20. **Report Title and Project Number**: Class III Cultural Resource Survey of the Proposed Andalusia Residential Development, Weld County, Colorado
21. **Recorder and Affiliation**: R. Schwendler, James Enterprises, Inc.
    Date: 06/24/2014


5WL1423.41
5WL5461.3
5WL1526.4
5WL1526.4
5WL7644
5WL7646
5WL7645
5WL2248.14
5WL1423.40
Radio Towers
Plumbs
BOULDER CO
WELD CO
NORTHEAST
GOODING
DITCH
BOULDER
LOWER
COTTONWOOD
UNION
Coal
View
36
31
32
1
6
5
12
7
8
0 feet 2,000
0 meters 500
1:24,000
USGS 7.5' Quadrangle:
Erie, CO (1979)
T1N, R68W, Section 6
UTM NAD 83 Zone 13
Sites
Isolates
Project Area

COLORADO CULTURAL RESOURCE SURVEY

Archaeological Isolated Find/Feature Form

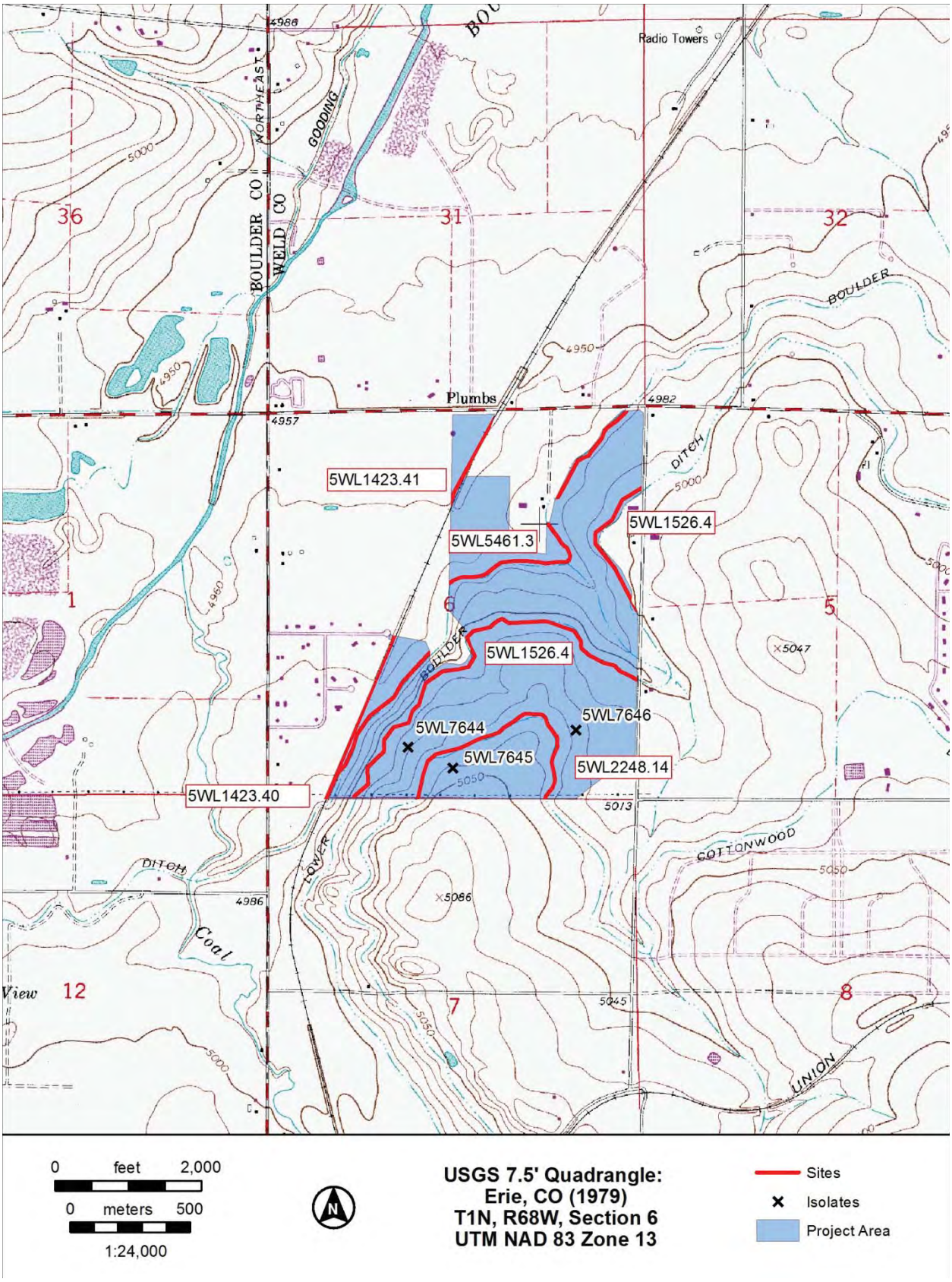
OAHP 1408
Rev. 11/10

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1. **Site Number**: 5WL7645
2. **Temporary Resource Number**: RS2
3. **County**: Weld
4. **Recorder's Definition of Isolated Find**: One or very few artifacts not representing patterned behavior or multiple artifacts that lack context and integrity of location (continued #18 below)
5. **PM** 6th **Township** 1N **Range** 68W **Section** 6 SE ¼ SW ¼
   If section is irregular, explain alignment method: alignment based on southwest section corner
6. **USGS Quad**: Erie, CO (1979)
7. **Elevation**: 5085 ft.
8. **UTM Coordinates**: Datum used ☐ NAD 27 ☑ NAD 83 ☐ WGS 84 Other:
   Zone: 13; 496048 mE 4435991 mN
9. **UTM Source**: ☑ Corrected GPS/rectified survey (<5m error) ☐ Uncorrected GPS ☐ Map template
   Other (explain):
10. **Landowner**: Private
11. **Describe Artifact(s) and their distribution**:
    This IF is a displaced historic artifact scatter within a plowed field. The artifacts manifest in a north-bending arc-shaped distribution, which is likely the result of displacement from agricultural activities. (continued on pg 2)
    ☐ No artifacts
12. **Describe Feature (include dimensions)**:
    ☑ No features
13. **Cultural Affiliation and Justification**: Presumably Euroamerican as this has been the dominant culture in this location.
14. **Time Period and Justification**: 1860-1960 based on artifact types (aqua glass and plastic) and historic occupation of the area.
15. **Relevant environmental information (e.g., elevation, topography, soils, vegetation, nearby water source)**:
    The artifact scatter is located in a young wheat field on a gentle hill slope with a northern aspect, south of a historic irrigation ditch. The soil is a medium brown sandy loam.
16. **Is this isolate located in a cultural landscape?** ☐ Yes ☑ No
    If yes, describe:
17. **Why is this isolated find not eligible for the National Register?**
    This artifact scatter is located in an active agricultural field and has been displaced as a result; therefore, this isolated find lacks integrity, especially location. The artifacts recorded are not diagnostic and the information potential has been exhausted.
18. **Additional Information (e.g., narrative, drawings, photographs, sketch map; attach extra pages if desired)**:
    continued from #4 above
    and do not represent a locus of interpretable patterned human behavior.
19. **Artifacts Collected?** ☐ Yes ☑ No
    If yes, provide repository information:
20. **Report Title and Project Number**: Class III Cultural Resource Survey of the Proposed Andalusia Residential Development, Weld County, Colorado
21. **Recorder and Affiliation**: R. Schwendler, James Enterprises, Inc.
    Date: 06/24/2014

11 continued from page 1

The scatter is dispersed and consists of five brick fragments, two china ware fragments, a light blue plastic cap or bottle base, one sandstone flagstone fragment, two aqua bottle glass pieces, one clear unknown glass piece, two stoneware jug fragments, and one zinc fastener or machinery part. The artifact scatter measures approximately 115 feet (35 m) north-south by 115 feet (35 m) east-west. No evidence of a structure, dump, or other feature or concentrated area of artifacts could be found although a deep pit filled with sediment, trees, and other vegetal debris is located about 131 feet (40 m) southeast of the IF.


Radio Towers
Plumbs
BOULDER CO
WELD CO
NORTHEAST
GOODING
BOULDER
DITCH
LOWER
COTTONWOOD
UNION
Coal
View
36
31
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5WL1423.41
5WL1526.4
5WL5461.3
5WL1526.4
5WL7644
5WL7646
5WL7645
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5WL1423.40
0 feet 2,000
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USGS 7.5' Quadrangle:
Erie, CO (1979)
T1N, R68W, Section 6
UTM NAD 83 Zone 13
Sites
Isolates
Project Area

COLORADO CULTURAL RESOURCE SURVEY

Archaeological Isolated Find/Feature Form

OAHP 1408
Rev. 11/10

This form is not to be used for phenomena that are eligible for the National Register or are part of the built environment. To be ***only*** used for phenomena that meet the requirements of the recorder's definition as provided below. A map at 1:24,000 scale with IF clearly plotted must be attached.

1. **Site Number**: 5WL7646
2. **Temporary Resource Number**: RS3
3. **County**: Weld
4. **Recorder's Definition of Isolated Find**: One or very few artifacts not representing patterned behavior or multiple artifacts that lack context and integrity of location (continued #18 below)
5. **PM** 6th **Township** 1N **Range** 68W **Section** 6 SE ¼ SE ¼
   If section is irregular, explain alignment method: alignment based on southwest section corner
6. **USGS Quad**: Erie, CO (1979)
7. **Elevation**: 5040 ft.
8. **UTM Coordinates**: Datum used ☐ NAD 27 ☑ NAD 83 ☐ WGS 84 Other:
   Zone: 13; 496562 mE 4436149 mN
9. **UTM Source**: ☑ Corrected GPS/rectified survey (<5m error) ☐ Uncorrected GPS ☐ Map template
   Other (explain):
10. **Landowner**: Private
11. **Describe Artifact(s) and their distribution**:

    This IF is a section of collapsed terra cotta irrigation pipe exposed in an open hole within a field containing young alfalfa. The pipe is 12 inches (30.5 cm) in diameter, runs east-west, (Continued on page 2)

    ☐ No artifacts
12. **Describe Feature (include dimensions)**:

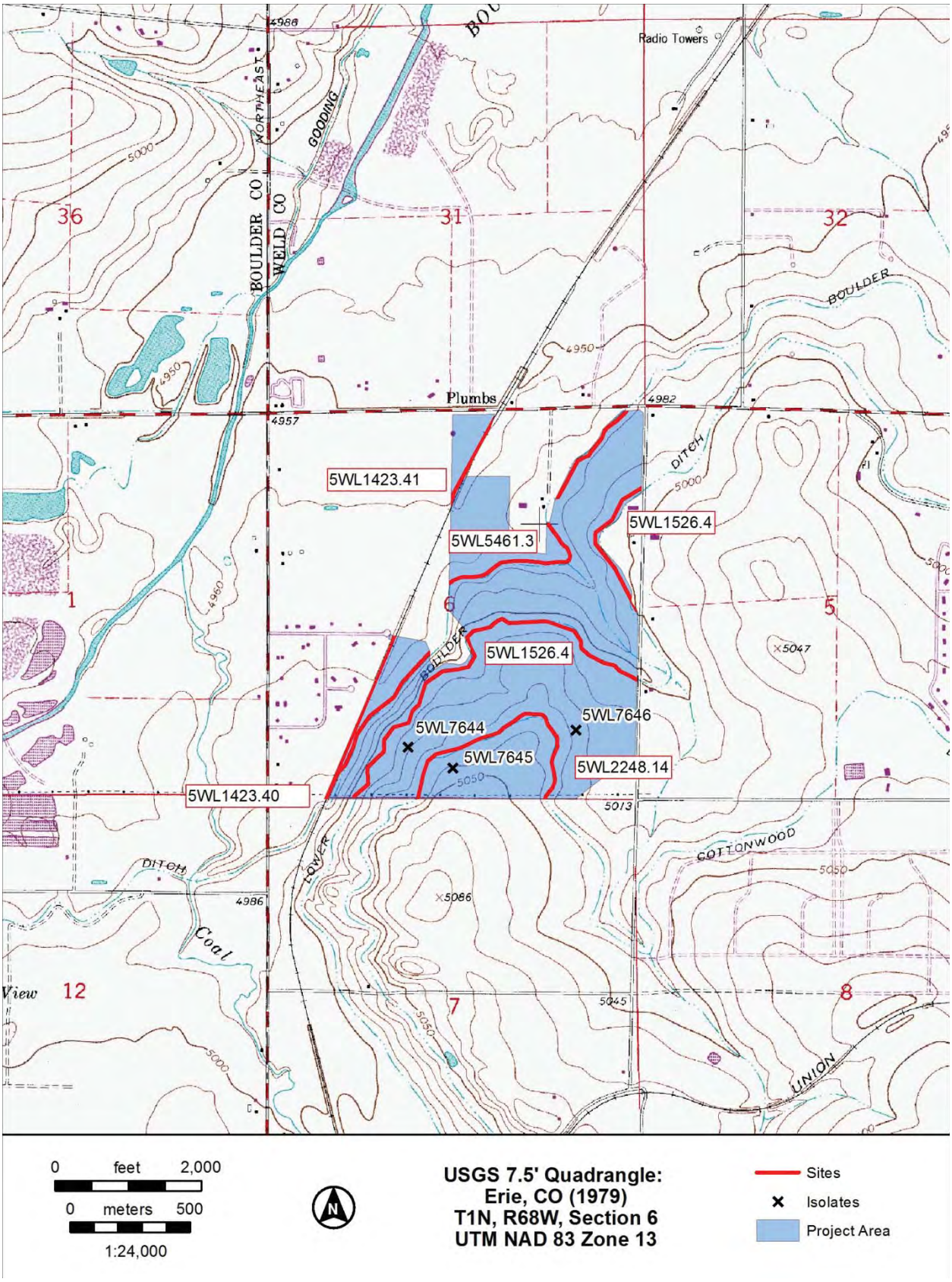
    ☑ No features
13. **Cultural Affiliation and Justification**: Presumably Euroamerican as this has been the dominant culture in this location.
14. **Time Period and Justification**: 1860-1960, based on settlement of the area
15. **Relevant environmental information (e.g., elevation, topography, soils, vegetation, nearby water source)**:

    The exposed pipe is located in a young alfalfa field with a gentle east slope, east of a historic irrigation ditch. The soil is a medium brown sandy loam.
16. **Is this isolate located in a cultural landscape?** ☐ Yes ☑ No
    If yes, describe:
17. **Why is this isolated find not eligible for the National Register?**

    This isolated find does not meet any of the NRHP criteria. Further investigation of this isolated find is unlikely to yield additional or important information about the history of the area.
18. **Additional Information (e.g., narrative, drawings, photographs, sketch map; attach extra pages if desired)**:

    continued from #4 above
    and do not represent a locus of interpretable patterned human behavior.
19. **Artifacts Collected?** ☐ Yes ☑ No
    If yes, provide repository information:
20. **Report Title and Project Number**: Class III Cultural Resource Survey of the Proposed Andalusia Residential Development, Weld County, Colorado
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11 continued from page 1
and is buried about 1 foot (0.3 m) below the ground surface. The open hole exposing the pipe measures about 3 × 4 feet (0.9 × 1.2 m) and may have been an access point for the pipe or a sink hole that formed when the pipe collapsed.


5WL1423.41
5WL5461.3
5WL1526.4
5WL1526.4
5WL7644
5WL7646
5WL7645
5WL2248.14
5WL1423.40
Radio Towers
Plumbs
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NORTHEAST
GOODING
DITCH
BOULDER
LOWER
DITCH
COTTONWOOD
UNION
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View
36
31
32
1
6
5
12
7
8
0 feet 2,000
0 meters 500
1:24,000
USGS 7.5' Quadrangle:
Erie, CO (1979)
T1N, R68W, Section 6
UTM NAD 83 Zone 13
Sites
Isolates
Project Area

Ecological Resource Consultants, Inc.
2820 Wilderness Place Suite A Boulder CO 80301

March 26, 2021

Care of:
Corey Elliot
ME Erie, LLC
7353 S. Alton Way Ste. A-100
Centennial, CO 80112
coreye@e5xmanagement.com, 303 770-9111

RE: Tree Inventory – Andalusia Project – Tree Inventory, Erie, Colorado

Ecological Resource Consultants, Inc. (ERC) conducted an inventory of existing trees on the Site, located on the southwest of the intersection of Highway 52 and County Road 3 in Erie, Colorado (ERC Project Number 1000-2102). The purpose of the inventory was to locate and identify the species of trees present, measure the trunk diameter at breast height (dbh), measure the drip line, and evaluate the general health of the trees identified on and near the subject Site in accordance with Chapter 6 Section 10.6.2 of the Town of Erie Development Code.

General Site Description
The Site is approximately 313 acres in size and presently comprises agricultural fields, ditches, and open space. The north side of the Site is bound by Highway 52, the west side is bound by open space and residential development, the south by agricultural fields, and the east County Road 3.

Method
ERC performed the tree inventory on March 15, 16, 19, and 24, 2021. Weather was cold with clear skies and the trees had reproductive structures present. ERC inventoried each tree with a diameter of 6 inches and over by identifying the species, measuring the trunk diameter at breast height (dbh) (at approximately 54 inches above the ground) using a 20-foot diameter tape, measuring the drip line (measured as a radius from the trunk to the end of the outermost branch on the tree crown), and evaluating the general condition of each tree. Trees and shrubs with a dbh less than 6 inches were not included in the survey.

All trees inventoried were categorized into one of five groups: excellent, good, fair, poor, or very poor. The tree condition categories are defined as follows:

<u>Excellent</u>
- Healthy, vigorous tree.
- No apparent signs of insect, disease or mechanical injury.
- No corrective work required.
- Form representative of the species.

Good
- Better than average vigor.
- Little corrective work needed.
- Not quite perfect form.

Fair
- Average condition and vigor for the area.
- May be in need of some corrective pruning or repair.
- May lack desirable form characteristics of the species.
- May show minor insect injury, disease, or physiological problem.

Poor
- General state of decline.
- May show severe mechanical, insect or disease damage.
- Death not imminent.
- May require major repair or renovation.

Very Poor
- Includes "poor" above but is more extreme in that no amount of repair or renovation will lead to a desirable and sustainable tree. Costs would exceed any benefit.

Specific tree information is provided in the enclosed table titled **Table 1.- Existing On-Site Tree Inventory.** A Tree Inventory Map was prepared by ERC on base mapping provided by the client and is enclosed as **Figure 1.-Tree Inventory.** The mapping depicts the location of each tree and provides an identification number that corresponds to the tree described in the *Existing On-Site Tree Inventory* table. Tree species and health were verified by a licensed Certified Arborist on March 24, 2021.

Summary of Results

In total, 452 individual trees, composed of 8 separate species, were identified within the Site. The species include Siberian elm (*Ulmus pumila*), silver maple (*Acer saccharinum*), boxelder maple (*Acer negundo*), crack willow (*Salix fragilis*), plains cottonwood (*Populus deltoides*), Russian olive (*Elaeagnus angustifolia*), honey locust (*Gleditsia triacanthos*), and black locust (*Robinia pseudoacacia*). Trees on the Site are generally located within low lying depressions and adjacent to drainages. Generally, trees located within the landscape areas show no signs of regular maintenance. The condition of 445 of the trees was determined to be good. One (1) tree located on the Site was categorized as fair (i.e., undesirable form, minor insect injury or disease). Three (3) trees were considered to be in poor condition and three (3) trees were considered to be very poor. It is recommended that these trees be removed. Location of these trees can be seen in **Figure 1.- Tree Inventory**.

Native species (as listed by the US Department of Agriculture (USDA) PLANTS Database for Boulder County and Colorado) present on the Site include plains cottonwood, boxelder maple, black locust, and honey locust. Non-native species present on the site include Siberian elm, silver maple, Russian olive, and crack willow. During any future land use changes, landscape plans should utilize native, Boulder County approved tree species and remove or manage undesirable tree species.

Report completed by:

Ecological Resource Consultants, Inc.



Matthew Boyer, Ecologist



David J. Blauch, V.P., Senior Ecologist



Chris Becker, Certified Arborist (Contractor License # RM-0753A)
Schulhoff Tree and Lawn Care, Inc.
14200 W. 32nd Av
Golden, CO 80401
(303) 279-1910

Table 1. Andalusia Tree Inventory

ID#	Common Name	Scientific Name	DBH (in)	Drip Line (ft)	Condition	Comments or Recommendations
1	Box elder	*Acer negundo*	10.5	10.5	Good	Native to Colorado
2	Russian olive	*Elaeagnus angustifolia*	4.5	5	Good	Non-native to Colorado
3	Russian olive	*Elaeagnus angustifolia*	8	8	Good	Non-native to Colorado
4	Russian olive	*Elaeagnus angustifolia*	4	5	Good	Non-native to Colorado
5	Russian olive	*Elaeagnus angustifolia*	13	20	Good	Non-native to Colorado
6	Russian olive	*Elaeagnus angustifolia*	7.5	8	Good	Non-native to Colorado
7	Russian olive	*Elaeagnus angustifolia*	6	10	Good	Non-native to Colorado
8	Russian olive	*Elaeagnus angustifolia*	20	15	Good	Non-native to Colorado
9	Russian olive	*Elaeagnus angustifolia*	17.5	10	Good	Non-native to Colorado
10	Russian olive	*Elaeagnus angustifolia*	11	15	Good	Non-native to Colorado
11	Russian olive	*Elaeagnus angustifolia*	11	15	Good	Non-native to Colorado
12	Russian olive	*Elaeagnus angustifolia*	16	20	Good	Non-native to Colorado
13	Russian olive	*Elaeagnus angustifolia*	5	5	Good	Non-native to Colorado
14	Russian olive	*Elaeagnus angustifolia*	8.5	6	Good	Non-native to Colorado
15	Russian olive	*Elaeagnus angustifolia*	24	20	Good	Non-native to Colorado
16	Russian olive	*Elaeagnus angustifolia*	11	8	Good	Non-native to Colorado
17	Russian olive	*Elaeagnus angustifolia*	14	15	Good	Non-native to Colorado
18	Russian olive	*Elaeagnus angustifolia*	6.5	5	Good	Non-native to Colorado
19	Russian olive	*Elaeagnus angustifolia*	20.5	20	Good	Non-native to Colorado
20	Russian olive	*Elaeagnus angustifolia*	21	20	Good	Non-native to Colorado
21	Russian olive	*Elaeagnus angustifolia*	10.5	10	Good	Non-native to Colorado
22	Russian olive	*Elaeagnus angustifolia*	18	15	Good	Non-native to Colorado
23	Russian olive	*Elaeagnus angustifolia*	7.5	5	Good	Non-native to Colorado
24	Russian olive	*Elaeagnus angustifolia*	19	20	Good	Non-native to Colorado
25	Russian olive	*Elaeagnus angustifolia*	14.5	15	Good	Non-native to Colorado
26	Russian olive	*Elaeagnus angustifolia*	19	25	Good	Non-native to Colorado
27	Russian olive	*Elaeagnus angustifolia*	6	8	Good	Non-native to Colorado
28	Russian olive	*Elaeagnus angustifolia*	30.5	25	Good	Non-native to Colorado
29	Black locust	*Robinia pseudoacaia*	5.5	5	Good	Native to Colorado
30	Russian olive	*Elaeagnus angustifolia*	5	5	Good	Non-native to Colorado
31	Russian olive	*Elaeagnus angustifolia*	9	12	Good	Non-native to Colorado
32	Russian olive	*Elaeagnus angustifolia*	14	8	Good	Non-native to Colorado
33	Russian olive	*Elaeagnus angustifolia*	10.5	12	Good	Non-native to Colorado
34	Russian olive	*Elaeagnus angustifolia*	10	10	Good	Non-native to Colorado
35	Russian olive	*Elaeagnus angustifolia*	8.5	8	Good	Non-native to Colorado

36	Russian olive	*Elaeagnus angustifolia*	7	7	Good	Non-native to Colorado
37	Russian olive	*Elaeagnus angustifolia*	8	10	Good	Non-native to Colorado
38	Russian olive	*Elaeagnus angustifolia*	6.5	7	Good	Non-native to Colorado
39	Russian olive	*Elaeagnus angustifolia*	9	8	Good	Non-native to Colorado
40	Russian olive	*Elaeagnus angustifolia*	5.5	5	Good	Non-native to Colorado
41	Russian olive	*Elaeagnus angustifolia*	7.5	8	Good	Non-native to Colorado
42	Russian olive	*Elaeagnus angustifolia*	11.5	12	Good	Non-native to Colorado
43	Russian olive	*Elaeagnus angustifolia*	18	20	Good	Non-native to Colorado
44	Russian olive	*Elaeagnus angustifolia*	18.5	20	Good	Non-native to Colorado
45	Russian olive	*Elaeagnus angustifolia*	10	15	Good	Non-native to Colorado
46	Russian olive	*Elaeagnus angustifolia*	34.5	40	Good	Non-native to Colorado
47	Russian olive	*Elaeagnus angustifolia*	10.5	7	Good	Non-native to Colorado
48	Russian olive	*Elaeagnus angustifolia*	12	12	Good	Non-native to Colorado
49	Russian olive	*Elaeagnus angustifolia*	12.5	8	Good	Non-native to Colorado
50	Russian olive	*Elaeagnus angustifolia*	18.5	12	Good	Non-native to Colorado
51	Russian olive	*Elaeagnus angustifolia*	16	25	Good	Non-native to Colorado
52	Russian olive	*Elaeagnus angustifolia*	15.5	10	Good	Non-native to Colorado
53	Russian olive	*Elaeagnus angustifolia*	10	8	Good	Non-native to Colorado
54	Russian olive	*Elaeagnus angustifolia*	8	10	Good	Non-native to Colorado
55	Russian olive	*Elaeagnus angustifolia*	12	10	Good	Non-native to Colorado
56	Russian olive	*Elaeagnus angustifolia*	10.5	8	Good	Non-native to Colorado
57	Russian olive	*Elaeagnus angustifolia*	14	15	Good	Non-native to Colorado
58	Russian olive	*Elaeagnus angustifolia*	6.5	5	Good	Non-native to Colorado
59	Russian olive	*Elaeagnus angustifolia*	27.5	15	Good	Non-native to Colorado
60	Russian olive	*Elaeagnus angustifolia*	10	8	Good	Non-native to Colorado
61	Russian olive	*Elaeagnus angustifolia*	15	14	Good	Non-native to Colorado
62	Russian olive	*Elaeagnus angustifolia*	10.5	10	Good	Non-native to Colorado
63	Russian olive	*Elaeagnus angustifolia*	8.5	12	Good	Non-native to Colorado
64	Russian olive	*Elaeagnus angustifolia*	9.5	10	Good	Non-native to Colorado
65	Russian olive	*Elaeagnus angustifolia*	9	10	Good	Non-native to Colorado
66	Russian olive	*Elaeagnus angustifolia*	12.5	15	Good	Non-native to Colorado
67	Russian olive	*Elaeagnus angustifolia*	9	10	Good	Non-native to Colorado
68	Russian olive	*Elaeagnus angustifolia*	9.5	8	Good	Non-native to Colorado
69	Russian olive	*Elaeagnus angustifolia*	8	8	Good	Non-native to Colorado
70	Russian olive	*Elaeagnus angustifolia*	8.5	7	Good	Non-native to Colorado
71	Russian olive	*Elaeagnus angustifolia*	17.5	25	Good	Non-native to Colorado
72	Russian olive	*Elaeagnus angustifolia*	21	15	Good	Non-native to Colorado
73	Russian olive	*Elaeagnus angustifolia*	7.5	10	Good	Non-native to Colorado

74	Russian olive	*Elaeagnus angustifolia*	19.5	20	Good	Non-native to Colorado
75	Russian olive	*Elaeagnus angustifolia*	10	10	Good	Non-native to Colorado
76	Russian olive	*Elaeagnus angustifolia*	7	8	Good	Non-native to Colorado
77	Russian olive	*Elaeagnus angustifolia*	21.5	25	Good	Non-native to Colorado
78	Russian olive	*Elaeagnus angustifolia*	9	8	Good	Non-native to Colorado
79	Russian olive	*Elaeagnus angustifolia*	20.5	20	Good	Non-native to Colorado
80	Crack Willow	*Salix fragilis*	23.5	20	Good	Non-native to Colorado
81	Russian olive	*Elaeagnus angustifolia*	7.5	12	Good	Non-native to Colorado
82	Plains cottonwood	*Populus deltoides*	32.5	15	Good	Native to Colorado
83	Plains cottonwood	*Populus deltoides*	33.5	10	Good	Native to Colorado
84	Russian olive	*Elaeagnus angustifolia*	9.5	20	Good	Non-native to Colorado
85	Russian olive	*Elaeagnus angustifolia*	14.5	15	Good	Non-native to Colorado
86	Russian olive	*Elaeagnus angustifolia*	18	15	Good	Non-native to Colorado
87	Russian olive	*Elaeagnus angustifolia*	8.5	8.5	Good	Non-native to Colorado
88	Russian olive	*Elaeagnus angustifolia*	15.5	12	Good	Non-native to Colorado
89	Plains cottonwood	*Populus deltoides*	27.5	30	Good	Native to Colorado
90	Russian olive	*Elaeagnus angustifolia*	13.5	10	Good	Non-native to Colorado
91	Plains cottonwood	*Populus deltoides*	15	18	Good	Native to Colorado
92	Russian olive	*Elaeagnus angustifolia*	8	8	Good	Non-native to Colorado
93	Russian olive	*Elaeagnus angustifolia*	16.5	20	Good	Non-native to Colorado
94	Russian olive	*Elaeagnus angustifolia*	8	12	Good	Non-native to Colorado
95	Russian olive	*Elaeagnus angustifolia*	8.5	12	Good	Non-native to Colorado
96	Plains cottonwood	*Populus deltoides*	14.5	14	Good	Native to Colorado
97	Russian olive	*Elaeagnus angustifolia*	7.5	10	Good	Non-native to Colorado
98	Russian olive	*Elaeagnus angustifolia*	4.5	5	Good	Non-native to Colorado
99	Russian olive	*Elaeagnus angustifolia*	5.5	5	Good	Non-native to Colorado
100	Russian olive	*Elaeagnus angustifolia*	10	10	Good	Non-native to Colorado
101	Russian olive	*Elaeagnus angustifolia*	5	5	Good	Non-native to Colorado
102	Russian olive	*Elaeagnus angustifolia*	6.5	5	Good	Non-native to Colorado
103	Russian olive	*Elaeagnus angustifolia*	5	5	Good	Non-native to Colorado
104	Russian olive	*Elaeagnus angustifolia*	7.5	8	Good	Non-native to Colorado
105	Russian olive	*Elaeagnus angustifolia*	6	5	Good	Non-native to Colorado
106	Russian olive	*Elaeagnus angustifolia*	4	5	Good	Non-native to Colorado
107	Russian olive	*Elaeagnus angustifolia*	9	5	Good	Non-native to Colorado
108	Russian olive	*Elaeagnus angustifolia*	25	25	Good	Non-native to Colorado
109	Russian olive	*Elaeagnus angustifolia*	18	20	Good	Non-native to Colorado

110	Russian olive	*Elaeagnus angustifolia*	12.5	10	Good	Non-native to Colorado
111	Russian olive	*Elaeagnus angustifolia*	7.5	10	Good	Non-native to Colorado
112	Russian olive	*Elaeagnus angustifolia*	6	12	Good	Non-native to Colorado
113	Russian olive	*Elaeagnus angustifolia*	34	35	Dead	Non-native to Colorado
114	Russian olive	*Elaeagnus angustifolia*	16	12	Good	Non-native to Colorado
115	Russian olive	*Elaeagnus angustifolia*	15.5	10	Good	Non-native to Colorado
116	Russian olive	*Elaeagnus angustifolia*	4	10	Good	Non-native to Colorado
117	Russian olive	*Elaeagnus angustifolia*	36	27	Good	Non-native to Colorado
118	Russian olive	*Elaeagnus angustifolia*	31.5	30	Good	Non-native to Colorado
119	Russian olive	*Elaeagnus angustifolia*	32	35	Good	Non-native to Colorado
120	Russian olive	*Elaeagnus angustifolia*	9	15	Good	Non-native to Colorado
121	Russian olive	*Elaeagnus angustifolia*	11	18	Good	Non-native to Colorado
122	Russian olive	*Elaeagnus angustifolia*	29	15	Good	Non-native to Colorado
123	Russian olive	*Elaeagnus angustifolia*	12	15	Good	Non-native to Colorado
124	Russian olive	*Elaeagnus angustifolia*	15.5	15	Good	Non-native to Colorado
125	Russian olive	*Elaeagnus angustifolia*	11	20	Good	Non-native to Colorado
126	Russian olive	*Elaeagnus angustifolia*	19.5	15	Good	Non-native to Colorado
127	Russian olive	*Elaeagnus angustifolia*	13	12	Good	Non-native to Colorado
128	Russian olive	*Elaeagnus angustifolia*	12.5	10	Good	Non-native to Colorado
129	Russian olive	*Elaeagnus angustifolia*	22	25	Good	Non-native to Colorado
130	Russian olive	*Elaeagnus angustifolia*	5.5	5	Good	Non-native to Colorado
131	Russian olive	*Elaeagnus angustifolia*	14.5	18	Good	Non-native to Colorado
132	Russian olive	*Elaeagnus angustifolia*	7.5	8	Good	Non-native to Colorado
133	Russian olive	*Elaeagnus angustifolia*	9.5	10	Good	Non-native to Colorado
134	Russian olive	*Elaeagnus angustifolia*	18.5	15	Good	Non-native to Colorado
135	Russian olive	*Elaeagnus angustifolia*	10.5	12	Good	Non-native to Colorado
136	Russian olive	*Elaeagnus angustifolia*	22.5	15	Good	Non-native to Colorado
137	Russian olive	*Elaeagnus angustifolia*	10	10	Good	Non-native to Colorado
138	Russian olive	*Elaeagnus angustifolia*	12	17	Good	Non-native to Colorado
139	Russian olive	*Elaeagnus angustifolia*	23.5	25	Good	Non-native to Colorado
140	Russian olive	*Elaeagnus angustifolia*	20.5	30	Good	Non-native to Colorado
141	Russian olive	*Elaeagnus angustifolia*	22.5	30	Good	Non-native to Colorado
142	Russian olive	*Elaeagnus angustifolia*	12.5	15	Good	Non-native to Colorado
143	Russian olive	*Elaeagnus angustifolia*	25	20	Good	Non-native to Colorado
144	Russian olive	*Elaeagnus angustifolia*	11.5	10	Good	Non-native to Colorado
145	Russian olive	*Elaeagnus angustifolia*	41.5	30	Good	Non-native to Colorado
146	Russian olive	*Elaeagnus angustifolia*	24.5	30	Good	Non-native to Colorado
147	Plains cottonwood	*Populus deltoides*	66.5	60	Good	Native to Colorado

148	Russian olive	*Elaeagnus angustifolia*	6.5	15	Good	Non-native to Colorado
149	Russian olive	*Elaeagnus angustifolia*	18.5	30	Good	Non-native to Colorado
150	Russian olive	*Elaeagnus angustifolia*	23	35	Good	Non-native to Colorado
151	Honey locust	*Gleditsia triacanthos*	17.5	10	Good	Native to Colorado
152	Plains cottonwood	*Populus deltoides*	36	40	Good	Native to Colorado
153	Plains cottonwood	*Populus deltoides*	35.5	40	Good	Native to Colorado
154	Russian olive	*Elaeagnus angustifolia*	7.5	10	Good	Non-native to Colorado
155	Russian olive	*Elaeagnus angustifolia*	7.5	15	Good	Non-native to Colorado
156	Russian olive	*Elaeagnus angustifolia*	4.5	5	Good	Non-native to Colorado
157	Plains cottonwood	*Populus deltoides*	6	5	Good	Native to Colorado
158	Russian olive	*Elaeagnus angustifolia*	13	5	Poor	Non-native to Colorado
159	Plains cottonwood	*Populus deltoides*	44	45	Good	Native to Colorado
160	Plains cottonwood	*Populus deltoides*	26	0	Poor	Native to Colorado
161	Russian olive	*Elaeagnus angustifolia*	6.5	8	Dead	Non-native to Colorado
162	Russian olive	*Elaeagnus angustifolia*	7.5	8	Good	Non-native to Colorado
163	Plains cottonwood	*Populus deltoides*	6.5	7	Good	Native to Colorado
164	Russian olive	*Elaeagnus angustifolia*	7	8	Good	Non-native to Colorado
165	Russian olive	*Elaeagnus angustifolia*	5	8	Good	Non-native to Colorado
166	Russian olive	*Elaeagnus angustifolia*	8	7	Good	Non-native to Colorado
167	Plains cottonwood	*Populus deltoides*	5	5	Good	Native to Colorado
168	Russian olive	*Elaeagnus angustifolia*	4.5	5	Good	Non-native to Colorado
169	Russian olive	*Elaeagnus angustifolia*	7.5	15	Good	Non-native to Colorado
170	Russian olive	*Elaeagnus angustifolia*	17	20	Good	Non-native to Colorado
171	Russian olive	*Elaeagnus angustifolia*	15.5	15	Good	Non-native to Colorado
172	Russian olive	*Elaeagnus angustifolia*	9.5	12	Good	Non-native to Colorado
173	Russian olive	*Elaeagnus angustifolia*	13	15	Good	Non-native to Colorado
174	Russian olive	*Elaeagnus angustifolia*	11.5	15	Good	Non-native to Colorado
175	Russian olive	*Elaeagnus angustifolia*	12	10	Good	Non-native to Colorado
176	Russian olive	*Elaeagnus angustifolia*	6.5	12	Good	Non-native to Colorado
177	Russian olive	*Elaeagnus angustifolia*	7	12	Good	Non-native to Colorado
178	Russian olive	*Elaeagnus angustifolia*	4.5	7	Good	Non-native to Colorado
179	Russian olive	*Elaeagnus angustifolia*	4	7	Good	Non-native to Colorado
180	Russian olive	*Elaeagnus angustifolia*	6.5	8	Good	Non-native to Colorado
181	Russian olive	*Elaeagnus angustifolia*	10.5	15	Good	Non-native to Colorado
182	Russian olive	*Elaeagnus angustifolia*	15.5	12	Good	Non-native to Colorado

183	Russian olive	*Elaeagnus angustifolia*	8	10	Good	Non-native to Colorado
184	Russian olive	*Elaeagnus angustifolia*	6.5	8	Good	Non-native to Colorado
185	Russian olive	*Elaeagnus angustifolia*	10	12	Good	Non-native to Colorado
186	Russian olive	*Elaeagnus angustifolia*	11.5	14	Good	Non-native to Colorado
187	Russian olive	*Elaeagnus angustifolia*	7	8	Good	Non-native to Colorado
188	Russian olive	*Elaeagnus angustifolia*	5	8	Good	Non-native to Colorado
189	Russian olive	*Elaeagnus angustifolia*	8	10	Good	Non-native to Colorado
190	Russian olive	*Elaeagnus angustifolia*	4.5	5	Good	Non-native to Colorado
191	Russian olive	*Elaeagnus angustifolia*	8	6	Good	Non-native to Colorado
192	Russian olive	*Elaeagnus angustifolia*	10	6	Good	Non-native to Colorado
193	Russian olive	*Elaeagnus angustifolia*	8.5	10	Good	Non-native to Colorado
194	Russian olive	*Elaeagnus angustifolia*	5	4	Dead	Non-native to Colorado
195	Russian olive	*Elaeagnus angustifolia*	17	15	Good	Non-native to Colorado
196	Russian olive	*Elaeagnus angustifolia*	6.5	10	Good	Non-native to Colorado
197	Russian olive	*Elaeagnus angustifolia*	9	14	Good	Non-native to Colorado
198	Russian olive	*Elaeagnus angustifolia*	16.5	15	Good	Non-native to Colorado
199	Russian olive	*Elaeagnus angustifolia*	14.5	15	Good	Non-native to Colorado
200	Russian olive	*Elaeagnus angustifolia*	9	17	Good	Non-native to Colorado
201	Russian olive	*Elaeagnus angustifolia*	6.5	10	Good	Non-native to Colorado
202	Russian olive	*Elaeagnus angustifolia*	24	28	Good	Non-native to Colorado
203	Russian olive	*Elaeagnus angustifolia*	21.5	25	Good	Non-native to Colorado
204	Russian olive	*Elaeagnus angustifolia*	11.5	10	Good	Non-native to Colorado
205	Russian olive	*Elaeagnus angustifolia*	7.5	8	Good	Non-native to Colorado
206	Russian olive	*Elaeagnus angustifolia*	12	14	Good	Non-native to Colorado
207	Russian olive	*Elaeagnus angustifolia*	13	12	Good	Non-native to Colorado
208	Russian olive	*Elaeagnus angustifolia*	7.5	8	Good	Non-native to Colorado
209	Russian olive	*Elaeagnus angustifolia*	28.5	20	Good	Non-native to Colorado
210	Russian olive	*Elaeagnus angustifolia*	5.5	7	Good	Non-native to Colorado
211	Russian olive	*Elaeagnus angustifolia*	16	12	Good	Non-native to Colorado
212	Russian olive	*Elaeagnus angustifolia*	17	25	Good	Non-native to Colorado
213	Russian olive	*Elaeagnus angustifolia*	14.5	12	Good	Non-native to Colorado
214	Russian olive	*Elaeagnus angustifolia*	17	17	Good	Non-native to Colorado
215	Russian olive	*Elaeagnus angustifolia*	4.5	5	Good	Non-native to Colorado
216	Russian olive	*Elaeagnus angustifolia*	6.5	7	Good	Non-native to Colorado
217	Russian olive	*Elaeagnus angustifolia*	8	8	Good	Non-native to Colorado
218	Russian olive	*Elaeagnus angustifolia*	9	10	Good	Non-native to Colorado
219	Russian olive	*Elaeagnus angustifolia*	9	8	Good	Non-native to Colorado
220	Russian olive	*Elaeagnus angustifolia*	5	6	Good	Non-native to Colorado

221	Russian olive	*Elaeagnus angustifolia*	8.5	10	Good	Non-native to Colorado
222	Russian olive	*Elaeagnus angustifolia*	40.5	25	Good	Non-native to Colorado
223	Russian olive	*Elaeagnus angustifolia*	6.5	8	Good	Non-native to Colorado
224	Russian olive	*Elaeagnus angustifolia*	8	8	Good	Non-native to Colorado
225	Russian olive	*Elaeagnus angustifolia*	4.5	5	Good	Non-native to Colorado
226	Russian olive	*Elaeagnus angustifolia*	11	10	Good	Non-native to Colorado
227	Russian olive	*Elaeagnus angustifolia*	5.5	5	Good	Non-native to Colorado
228	Russian olive	*Elaeagnus angustifolia*	15.5	14	Good	Non-native to Colorado
229	Russian olive	*Elaeagnus angustifolia*	6	5	Good	Non-native to Colorado
230	Russian olive	*Elaeagnus angustifolia*	16.5	12	Good	Non-native to Colorado
231	Russian olive	*Elaeagnus angustifolia*	5.5	5	Good	Non-native to Colorado
232	Russian olive	*Elaeagnus angustifolia*	15	12	Good	Non-native to Colorado
233	Russian olive	*Elaeagnus angustifolia*	11.5	15	Good	Non-native to Colorado
234	Russian olive	*Elaeagnus angustifolia*	4.5	5	Good	Non-native to Colorado
235	Russian olive	*Elaeagnus angustifolia*	14.5	12	Good	Non-native to Colorado
236	Russian olive	*Elaeagnus angustifolia*	4	5	Poor	Non-native to Colorado
237	Russian olive	*Elaeagnus angustifolia*	12	10	Good	Non-native to Colorado
238	Russian olive	*Elaeagnus angustifolia*	8.5	8	Good	Non-native to Colorado
239	Russian olive	*Elaeagnus angustifolia*	9.5	12	Good	Non-native to Colorado
240	Russian olive	*Elaeagnus angustifolia*	7.5	8	Good	Non-native to Colorado
241	Russian olive	*Elaeagnus angustifolia*	6	7	Good	Non-native to Colorado
242	Russian olive	*Elaeagnus angustifolia*	10.5	9	Good	Non-native to Colorado
243	Russian olive	*Elaeagnus angustifolia*	5	5	Good	Non-native to Colorado
244	Russian olive	*Elaeagnus angustifolia*	9.5	8	Good	Non-native to Colorado
245	Russian olive	*Elaeagnus angustifolia*	10	12	Good	Non-native to Colorado
246	Russian olive	*Elaeagnus angustifolia*	6	8	Good	Non-native to Colorado
247	Russian olive	*Elaeagnus angustifolia*	5	6	Good	Non-native to Colorado
248	Russian olive	*Elaeagnus angustifolia*	6.5	5	Good	Non-native to Colorado
249	Russian olive	*Elaeagnus angustifolia*	7	8	Good	Non-native to Colorado
250	Russian olive	*Elaeagnus angustifolia*	14.5	12	Good	Non-native to Colorado
251	Russian olive	*Elaeagnus angustifolia*	20	18	Good	Non-native to Colorado
252	Russian olive	*Elaeagnus angustifolia*	7.5	7	Good	Non-native to Colorado
253	Russian olive	*Elaeagnus angustifolia*	50.5	7	Good	Non-native to Colorado
254	Russian olive	*Elaeagnus angustifolia*	5	5	Good	Non-native to Colorado
255	Russian olive	*Elaeagnus angustifolia*	6	6	Good	Non-native to Colorado
256	Russian olive	*Elaeagnus angustifolia*	6.5	7	Good	Non-native to Colorado
257	Russian olive	*Elaeagnus angustifolia*	6	6	Good	Non-native to Colorado
258	Plains cottonwood	*Populus deltoides*	7	10	Good	Native to Colorado

259	Plains cottonwood	*Populus deltoides*	6.5	5	Good	Native to Colorado
260	Plains cottonwood	*Populus deltoides*	17	5	Good	Native to Colorado
261	Russian olive	*Elaeagnus angustifolia*	4.5	10	Good	Non-native to Colorado
262	Russian olive	*Elaeagnus angustifolia*	6	15	Good	Non-native to Colorado
263	Russian olive	*Elaeagnus angustifolia*	11.5	8	Good	Non-native to Colorado
264	Russian olive	*Elaeagnus angustifolia*	10	8	Good	Non-native to Colorado
265	Russian olive	*Elaeagnus angustifolia*	6	10	Good	Non-native to Colorado
266	Russian olive	*Elaeagnus angustifolia*	9.5	10	Good	Non-native to Colorado
267	Russian olive	*Elaeagnus angustifolia*	11	10	Good	Non-native to Colorado
268	Russian olive	*Elaeagnus angustifolia*	7	7	Good	Non-native to Colorado
269	Russian olive	*Elaeagnus angustifolia*	8	9	Good	Non-native to Colorado
270	Russian olive	*Elaeagnus angustifolia*	10	12	Good	Non-native to Colorado
271	Russian olive	*Elaeagnus angustifolia*	15.5	15	Good	Non-native to Colorado
272	Russian olive	*Elaeagnus angustifolia*	16.5	15	Good	Non-native to Colorado
273	Russian olive	*Elaeagnus angustifolia*	6.5	8	Good	Non-native to Colorado
274	Russian olive	*Elaeagnus angustifolia*	8.5	8	Good	Non-native to Colorado
275	Russian olive	*Elaeagnus angustifolia*	7	9	Good	Non-native to Colorado
276	Russian olive	*Elaeagnus angustifolia*	13	18	Good	Non-native to Colorado
277	Russian olive	*Elaeagnus angustifolia*	8.5	12	Good	Non-native to Colorado
278	Russian olive	*Elaeagnus angustifolia*	4	5	Good	Non-native to Colorado
279	Russian olive	*Elaeagnus angustifolia*	6.5	10	Good	Non-native to Colorado
280	Russian olive	*Elaeagnus angustifolia*	5	8	Good	Non-native to Colorado
281	Russian olive	*Elaeagnus angustifolia*	8	10	Good	Non-native to Colorado
282	Russian olive	*Elaeagnus angustifolia*	10.5	12	Good	Non-native to Colorado
283	Russian olive	*Elaeagnus angustifolia*	6	7	Good	Non-native to Colorado
284	Russian olive	*Elaeagnus angustifolia*	11.5	10	Good	Non-native to Colorado
285	Russian olive	*Elaeagnus angustifolia*	8	5	Good	Non-native to Colorado
286	Russian olive	*Elaeagnus angustifolia*	10	5	Good	Non-native to Colorado
287	Russian olive	*Elaeagnus angustifolia*	5.5	5	Good	Non-native to Colorado
288	Plains cottonwood	*Populus deltoides*	8	8	Fair	Native to Colorado
289	Russian olive	*Elaeagnus angustifolia*	8.5	10	Good	Non-native to Colorado
290	Plains cottonwood	*Populus deltoides*	4	5	Good	Native to Colorado
291	Plains cottonwood	*Populus deltoides*	8	10	Good	Native to Colorado
292	Plains cottonwood	*Populus deltoides*	7	10	Good	Native to Colorado
293	Plains cottonwood	*Populus deltoides*	10	15	Good	Native to Colorado

294	Plains cottonwood	*Populus deltoides*	15	14	Good	Native to Colorado
295	Plains cottonwood	*Populus deltoides*	4	8	Good	Native to Colorado
296	Plains cottonwood	*Populus deltoides*	6	8	Good	Native to Colorado
297	Plains cottonwood	*Populus deltoides*	7	6	Good	Native to Colorado
298	Plains cottonwood	*Populus deltoides*	44	65	Good	Native to Colorado
299	Russian olive	*Elaeagnus angustifolia*	35	45	Good	Non-native to Colorado
300	Russian olive	*Elaeagnus angustifolia*	26	30	Good	Non-native to Colorado
301	Russian olive	*Elaeagnus angustifolia*	38.5	28	Good	Non-native to Colorado
302	Russian olive	*Elaeagnus angustifolia*	24.5	30	Good	Non-native to Colorado
303	Russian olive	*Elaeagnus angustifolia*	29	30	Good	Non-native to Colorado
304	Russian olive	*Elaeagnus angustifolia*	28	25	Good	Non-native to Colorado
305	Russian olive	*Elaeagnus angustifolia*	16.5	18	Good	Non-native to Colorado
306	Russian olive	*Elaeagnus angustifolia*	8	15	Good	Non-native to Colorado
307	Russian olive	*Elaeagnus angustifolia*	18	20	Good	Non-native to Colorado
308	Russian olive	*Elaeagnus angustifolia*	7.5	10	Good	Non-native to Colorado
309	Russian olive	*Elaeagnus angustifolia*	9	12	Good	Non-native to Colorado
310	Russian olive	*Elaeagnus angustifolia*	9.5	12	Good	Non-native to Colorado
311	Russian olive	*Elaeagnus angustifolia*	11.5	15	Good	Non-native to Colorado
312	Russian olive	*Elaeagnus angustifolia*	25.5	20	Good	Non-native to Colorado
313	Russian olive	*Elaeagnus angustifolia*	8	10	Good	Non-native to Colorado
314	Russian olive	*Elaeagnus angustifolia*	9	10	Good	Non-native to Colorado
315	Russian olive	*Elaeagnus angustifolia*	4	5	Good	Non-native to Colorado
316	Russian olive	*Elaeagnus angustifolia*	14.5	15	Good	Non-native to Colorado
317	Russian olive	*Elaeagnus angustifolia*	12.5	15	Good	Non-native to Colorado
318	Russian olive	*Elaeagnus angustifolia*	11.5	10	Good	Non-native to Colorado
319	Russian olive	*Elaeagnus angustifolia*	15	24	Good	Non-native to Colorado
320	Russian olive	*Elaeagnus angustifolia*	9.5	8	Good	Non-native to Colorado
321	Russian olive	*Elaeagnus angustifolia*	9.5	12	Good	Non-native to Colorado
322	Russian olive	*Elaeagnus angustifolia*	6.5	8	Good	Non-native to Colorado
323	Russian olive	*Elaeagnus angustifolia*	4	5	Good	Non-native to Colorado
324	Russian olive	*Elaeagnus angustifolia*	4.5	5	Good	Non-native to Colorado
325	Russian olive	*Elaeagnus angustifolia*	8.5	12	Good	Non-native to Colorado
326	Russian olive	*Elaeagnus angustifolia*	5	5	Good	Non-native to Colorado
327	Russian olive	*Elaeagnus angustifolia*	5.5	8	Good	Non-native to Colorado
328	Russian olive	*Elaeagnus angustifolia*	10.5	10	Good	Non-native to Colorado
329	Silver maple	*Acer saccharinum*	15.5	18	Good	Non-native to Colorado

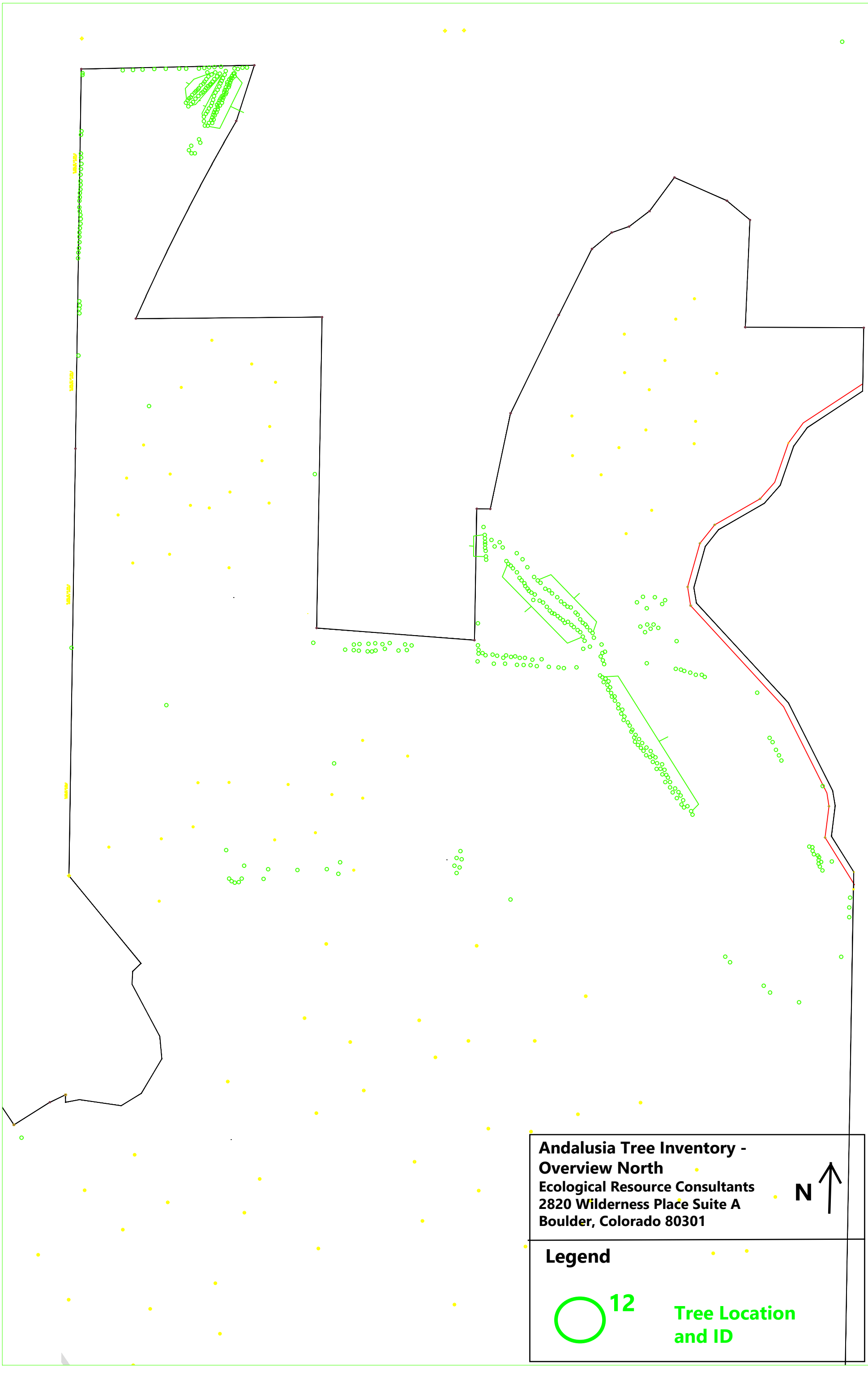
330	Russian olive	*Elaeagnus angustifolia*	5.5	5	Good	Non-native to Colorado
331	Russian olive	*Elaeagnus angustifolia*	24.5	25	Good	Non-native to Colorado
332	Plains cottonwood	*Populus deltoides*	42	40	Good	Native to Colorado
333	Plains cottonwood	*Populus deltoides*	10	15	Good	Native to Colorado
334	Plains cottonwood	*Populus deltoides*	8	15	Good	Native to Colorado
335	Plains cottonwood	*Populus deltoides*	13	15	Good	Native to Colorado
336	Plains cottonwood	*Populus deltoides*	81	85	Good	Native to Colorado
337	Plains cottonwood	*Populus deltoides*	15	18	Good	Native to Colorado
338	Plains cottonwood	*Populus deltoides*	12	15	Good	Native to Colorado
339	Plains cottonwood	*Populus deltoides*	11	15	Good	Native to Colorado
340	Plains cottonwood	*Populus deltoides*	4.5	5	Good	Native to Colorado
341	Russian olive	*Elaeagnus angustifolia*	8	8	Good	Non-native to Colorado
342	Plains cottonwood	*Populus deltoides*	5	5	Good	Native to Colorado
343	Plains cottonwood	*Populus deltoides*	9	12	Good	Native to Colorado
344	Plains cottonwood	*Populus deltoides*	4.5	7	Good	Native to Colorado
345	Plains cottonwood	*Populus deltoides*	65	48	Good	Native to Colorado
346	Russian olive	*Elaeagnus angustifolia*	12	12	Good	Non-native to Colorado
347	Russian olive	*Elaeagnus angustifolia*	29.5	20	Good	Non-native to Colorado
348	Russian olive	*Elaeagnus angustifolia*	31	20	Good	Non-native to Colorado
349	Russian olive	*Elaeagnus angustifolia*	30.5	31	Good	Non-native to Colorado
350	Russian olive	*Elaeagnus angustifolia*	8	9	Good	Non-native to Colorado
351	Russian olive	*Elaeagnus angustifolia*	16.5	15	Good	Non-native to Colorado
352	Russian olive	*Elaeagnus angustifolia*	7.5	12	Good	Non-native to Colorado
353	Russian olive	*Elaeagnus angustifolia*	11	10	Good	Non-native to Colorado
354	Russian olive	*Elaeagnus angustifolia*	17.5	20	Good	Non-native to Colorado
355	Russian olive	*Elaeagnus angustifolia*	6	8	Good	Non-native to Colorado
356	Russian olive	*Elaeagnus angustifolia*	21	25	Good	Non-native to Colorado
357	Russian olive	*Elaeagnus angustifolia*	8	9	Good	Non-native to Colorado
358	Russian olive	*Elaeagnus angustifolia*	13.5	18	Good	Non-native to Colorado
359	Russian olive	*Elaeagnus angustifolia*	18	20	Good	Non-native to Colorado
360	Russian olive	*Elaeagnus angustifolia*	16.5	15	Good	Non-native to Colorado

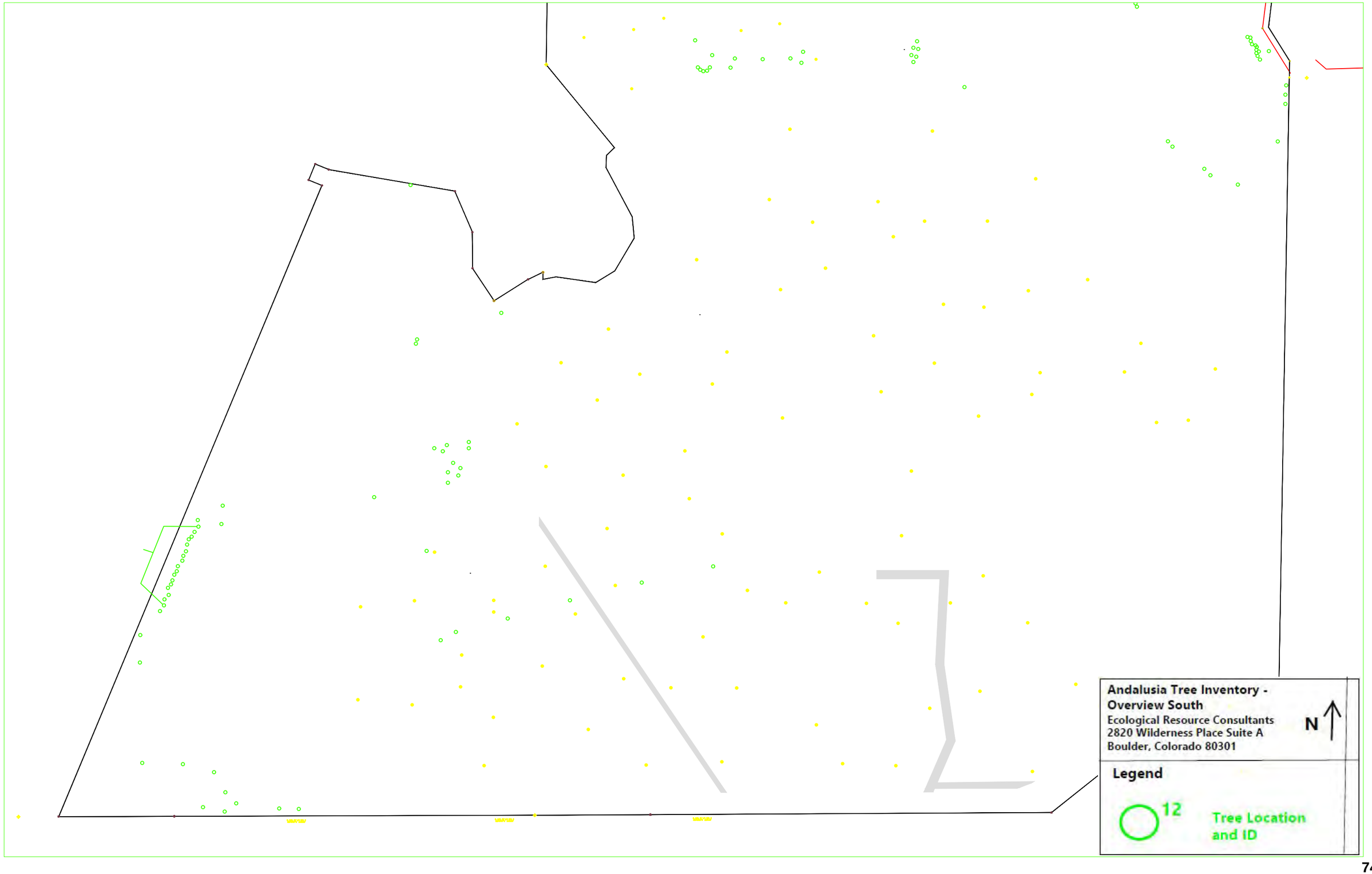
361	Russian olive	*Elaeagnus angustifolia*	9	12	Good	Non-native to Colorado
362	Russian olive	*Elaeagnus angustifolia*	38	34	Good	Non-native to Colorado
363	Russian olive	*Elaeagnus angustifolia*	13	14	Good	Non-native to Colorado
364	Russian olive	*Elaeagnus angustifolia*	12.5	15	Good	Non-native to Colorado
365	Russian olive	*Elaeagnus angustifolia*	8.5	9	Good	Non-native to Colorado
366	Russian olive	*Elaeagnus angustifolia*	20	28	Good	Non-native to Colorado
367	Russian olive	*Elaeagnus angustifolia*	7.5	15	Good	Non-native to Colorado
368	Russian olive	*Elaeagnus angustifolia*	5	7	Good	Non-native to Colorado
369	Russian olive	*Elaeagnus angustifolia*	13.5	12	Good	Non-native to Colorado
370	Russian olive	*Elaeagnus angustifolia*	15	15	Good	Non-native to Colorado
371	Russian olive	*Elaeagnus angustifolia*	12	15	Good	Non-native to Colorado
372	Russian olive	*Elaeagnus angustifolia*	10.5	10	Good	Non-native to Colorado
373	Russian olive	*Elaeagnus angustifolia*	14.5	18	Good	Non-native to Colorado
374	Russian olive	*Elaeagnus angustifolia*	9.5	10	Good	Non-native to Colorado
375	Russian olive	*Elaeagnus angustifolia*	8	10	Good	Non-native to Colorado
376	Russian olive	*Elaeagnus angustifolia*	11.5	12	Good	Non-native to Colorado
377	Siberian elm	*Ulmus pumila*	18	20	Good	Non-native to Colorado
378	Russian olive	*Elaeagnus angustifolia*	9	10	Good	Non-native to Colorado
379	Russian olive	*Elaeagnus angustifolia*	19	25	Good	Non-native to Colorado
380	Russian olive	*Elaeagnus angustifolia*	18	18	Good	Non-native to Colorado
381	Russian olive	*Elaeagnus angustifolia*	28.5	28	Good	Non-native to Colorado
382	Russian olive	*Elaeagnus angustifolia*	20	20	Good	Non-native to Colorado
383	Russian olive	*Elaeagnus angustifolia*	29	25	Good	Non-native to Colorado
384	Russian olive	*Elaeagnus angustifolia*	26.5	28	Good	Non-native to Colorado
385	Russian olive	*Elaeagnus angustifolia*	32.5	35	Good	Non-native to Colorado
386	Russian olive	*Elaeagnus angustifolia*	9	10	Good	Non-native to Colorado
387	Russian olive	*Elaeagnus angustifolia*	32	25	Good	Non-native to Colorado
388	Russian olive	*Elaeagnus angustifolia*	6.5	8	Good	Non-native to Colorado
389	Russian olive	*Elaeagnus angustifolia*	43.5	35	Good	Non-native to Colorado
390	Russian olive	*Elaeagnus angustifolia*	48	30	Good	Non-native to Colorado
391	Russian olive	*Elaeagnus angustifolia*	52.5	35	Good	Non-native to Colorado
392	Russian olive	*Elaeagnus angustifolia*	58	25	Good	Non-native to Colorado
393	Russian olive	*Elaeagnus angustifolia*	38	20	Good	Non-native to Colorado
394	Russian olive	*Elaeagnus angustifolia*	42	20	Good	Non-native to Colorado
395	Russian olive	*Elaeagnus angustifolia*	40.5	30	Good	Non-native to Colorado
396	Russian olive	*Elaeagnus angustifolia*	20.5	18	Good	Non-native to Colorado
397	Russian olive	*Elaeagnus angustifolia*	8	6	Good	Non-native to Colorado
398	Russian olive	*Elaeagnus angustifolia*	17.5	15	Good	Non-native to Colorado

399	Plains cottonwood	*Populus deltoides*	52	35	Good	Native to Colorado
400	Plains cottonwood	*Populus deltoides*	29	25	Good	Native to Colorado
401	Plains cottonwood	*Populus deltoides*	39	30	Good	Native to Colorado
402	Russian olive	*Elaeagnus angustifolia*	6.5	8	Good	Non-native to Colorado
403	Russian olive	*Elaeagnus angustifolia*	5	6	Good	Non-native to Colorado
404	Russian olive	*Elaeagnus angustifolia*	7.5	10	Good	Non-native to Colorado
405	Russian olive	*Elaeagnus angustifolia*	14.5	15	Good	Non-native to Colorado
406	Russian olive	*Elaeagnus angustifolia*	22	25	Good	Non-native to Colorado
407	Plains cottonwood	*Populus deltoides*	65	25	Good	Native to Colorado
408	Plains cottonwood	*Populus deltoides*	36	25	Good	Native to Colorado
409	Plains cottonwood	*Populus deltoides*	72.5	25	Good	Native to Colorado
410	Russian olive	*Elaeagnus angustifolia*	33	30	Good	Non-native to Colorado
411	Russian olive	*Elaeagnus angustifolia*	28	20	Good	Non-native to Colorado
412	Russian olive	*Elaeagnus angustifolia*	13.5	25	Good	Non-native to Colorado
413	Plains cottonwood	*Populus deltoides*	63	45	Good	Native to Colorado
414	Plains cottonwood	*Populus deltoides*	53.5	50	Good	Non-native to Colorado
415	Russian olive	*Elaeagnus angustifolia*	15.5	15	Good	Non-native to Colorado
416	Russian olive	*Elaeagnus angustifolia*	12.5	12	Good	Non-native to Colorado
417	Russian olive	*Elaeagnus angustifolia*	13.5	12	Good	Non-native to Colorado
418	Russian olive	*Elaeagnus angustifolia*	45.5	40	Good	Non-native to Colorado
419	Russian olive	*Elaeagnus angustifolia*	13.5	20	Good	Non-native to Colorado
420	Russian olive	*Elaeagnus angustifolia*	33	40	Good	Non-native to Colorado
421	Russian olive	*Elaeagnus angustifolia*	16.5	15	Good	Non-native to Colorado
422	Russian olive	*Elaeagnus angustifolia*	11.5	12	Good	Non-native to Colorado
423	Russian olive	*Elaeagnus angustifolia*	22.5	25	Good	Non-native to Colorado
424	Russian olive	*Elaeagnus angustifolia*	37.5	35	Good	Non-native to Colorado
425	Russian olive	*Elaeagnus angustifolia*	25	24	Good	Non-native to Colorado
426	Russian olive	*Elaeagnus angustifolia*	18	24	Good	Non-native to Colorado
427	Russian olive	*Elaeagnus angustifolia*	23.5	24	Good	Non-native to Colorado
428	Russian olive	*Elaeagnus angustifolia*	35.5	35	Good	Non-native to Colorado
429	Russian olive	*Elaeagnus angustifolia*	27.5	25	Good	Non-native to Colorado
430	Russian olive	*Elaeagnus angustifolia*	19.5	12	Good	Non-native to Colorado
431	Russian olive	*Elaeagnus angustifolia*	34.5	38	Good	Non-native to Colorado
432	Russian olive	*Elaeagnus angustifolia*	12.5	15	Good	Non-native to Colorado

433	Russian olive	*Elaeagnus angustifolia*	18.5	24	Good	Non-native to Colorado
434	Russian olive	*Elaeagnus angustifolia*	9.5	10	Good	Non-native to Colorado
435	Russian olive	*Elaeagnus angustifolia*	8	12	Good	Non-native to Colorado
436	Russian olive	*Elaeagnus angustifolia*	24.5	25	Good	Non-native to Colorado
437	Russian olive	*Elaeagnus angustifolia*	22	25	Good	Non-native to Colorado
438	Russian olive	*Elaeagnus angustifolia*	28.5	28	Good	Non-native to Colorado
439	Plains cottonwood	*Populus deltoides*	45	40	Good	Native to Colorado
440	Russian olive	*Elaeagnus angustifolia*	24	25	Good	Non-native to Colorado
441	Russian olive	*Elaeagnus angustifolia*	22.5	25	Good	Non-native to Colorado
442	Russian olive	*Elaeagnus angustifolia*	19.5	25	Good	Non-native to Colorado
443	Russian olive	*Elaeagnus angustifolia*	25	20	Good	Non-native to Colorado
444	Plains cottonwood	*Populus deltoides*	83.5	70	Good	Native to Colorado
445	Russian olive	*Elaeagnus angustifolia*	41.5	50	Good	Non-native to Colorado
446	Russian olive	*Elaeagnus angustifolia*	29.5	35	Good	Non-native to Colorado
447	Plains cottonwood	*Populus deltoides*	102.5	80	Good	Native to Colorado
448	Plains cottonwood	*Populus deltoides*	78	65	Good	Native to Colorado
449	Plains cottonwood	*Populus deltoides*	94.5	75	Good	Native to Colorado
450	Plains cottonwood	*Populus deltoides*	25	20	Good	Native to Colorado
451	Plains cottonwood	*Populus deltoides*	68	60	Good	Native to Colorado
452	Plains cottonwood	*Populus deltoides*	64.5	60	Good	Native to Colorado

-ID# refers to tree identification and location information provided in Figure 1.
-Drip line is measured as a radius from the trunk to the end of the outermost branch of the tree crown
-DBH refers to diameter at breast height measured at 54 inches above ground


Andalusia Tree Inventory -
Overview North
Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301
N
Legend
12
Tree Location
and ID


Andalusia Tree Inventory -
Overview South
Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301
N
Legend
12
Tree Location
and ID

EX. PERMANENT EASEMENT
BK. 1643 PG. 428

NT OF BEGINNING

26' EX. RIGHT OF WAY
REC. NO.

108 106 104 102 100 99 98 97 4 3 2 1

109 107 105 103 101 96 95 64 5

110

82-94

81 65-79

80 49-63

6-46

48

EX. NON-EXCLUSIVE ACCESS
& PIPELINE EASEMENT
REC. NO. 3615408

47

(TURAL)

117

118

111

116 112

119 115 113

120 114

121

EX. 50' PIPELINE EASEMENT
PANHANDLE EASTERN PIPELINE
REC. NO. 1835053

122

W. LINE, NE 1/4 SEC. 6
S00°52'52"W 2744.67'

123

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147

NE 1/4
SEC. 6

UNPLATTE

(D

(TURAL)

ING:
GRICULTURAL)

NW 1/4
SEC. 6

EX. NON-EXCLUSIVE ACCESS
& PIPELINE EASEMENT
REC. NO. 3615408

W. LINE, NE 1/4 SEC. 6
S00°52'52"W 2744.67'

NPLATTED

① ② ③

Andalusia Tree Inventory - Northwest Section

Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301

N

Legend

12 Tree Location and ID

CEN 1/4 COR. SEC. 6
FOUND NO. 6 REBAR WITH
2" ALUMINUM CAP
ILLEGIBLE

UNPLATTED

ZONING:
A (AGRICULTURAL)

SE 1/4
SEC. 6

EX. EASEMENT FOR LOWER
BOULDER IRRIGATION CANAL
BK 1443, PG. 175

398
392
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SE 1/4
SEC. 6

EX. EASEMENT FOR LOWER
BOULDER IRRIGATION CANAL
BK 1443, PG. 175

ZONING:
A (AGRICULTURAL)

UNPLATTED

EX. 60' INGRESS, EGRESS
& UTILITY
EASEMENT
REC. NO. 3220110

Andalusia Tree Inventory -
West Northwest Section
Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301

N

Legend

12 Tree Location and ID

Andalusia Tree Inventory -
West Central Section
Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301

N

Legend

12 Tree Location and ID

EX. NON-EXCLUSIVE ACCESS & UTILITIES EASEMENT REC. NO. 4379300

EX. NON-EX UTILITI REC. N

EX. NON-EXCLUSIVE AC UTILITIES EASEMEN REC. NO. 437930

W 1/4
EC. 6

W. LINE, NE 1/4 SEC. 6
S00°32'52"W 2744.67'

LATTED

EX. NON-EXCLUSIVE ACCESS & PIPELINE EASEMENT REC. NO. 3615408

150

EX. GAS EASEMENT WIDTH VARIES REC. NO. 3548911

151

NE 1/4
SEC. 6

EX. NON-EXCLUSIVE ACCESS & PIPELINE EASEMENT REC. NO. 3615408

412

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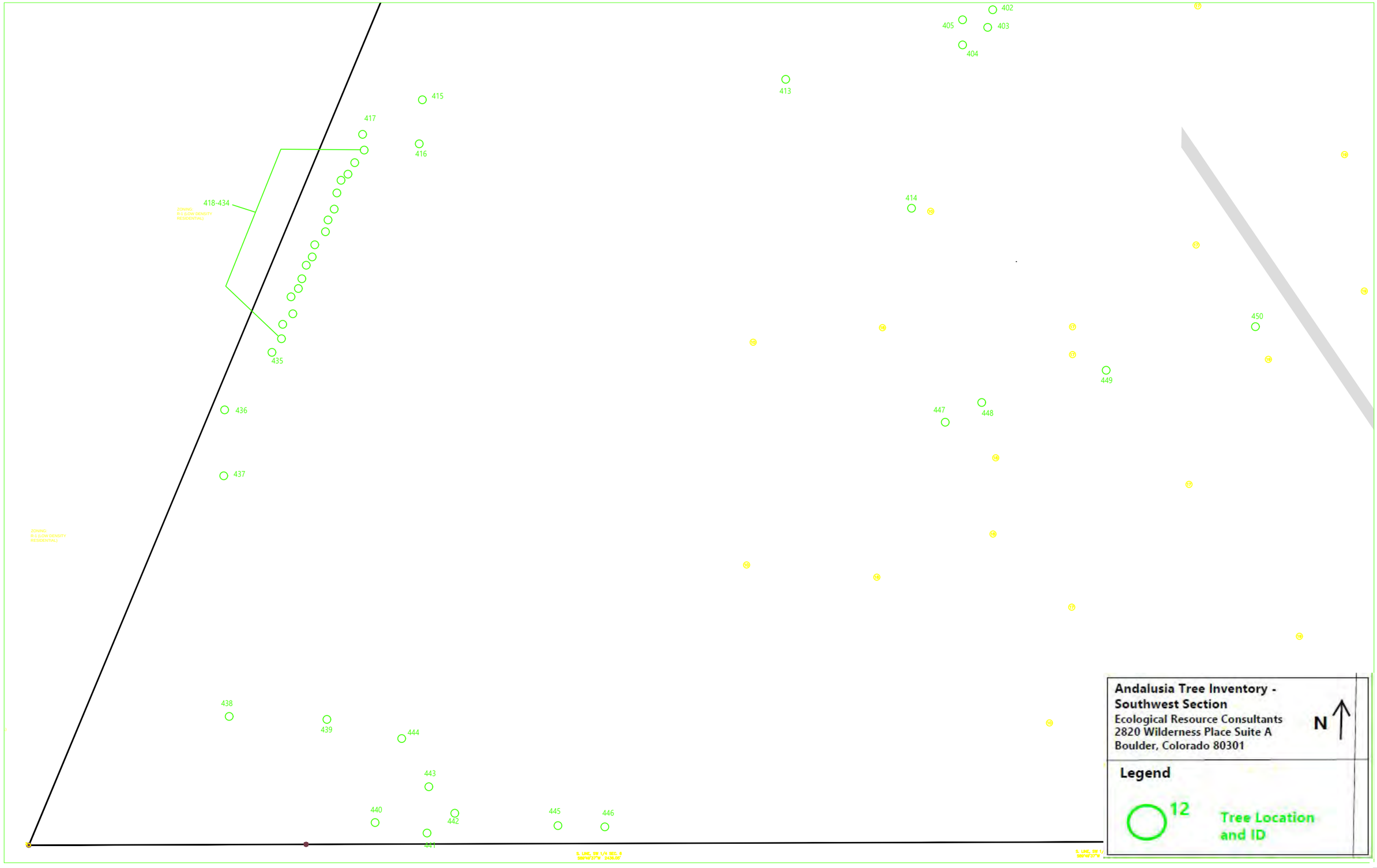
413

Andalusia Tree Inventory -
West Southwest Section
Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301

N

Legend

12 Tree Location and ID


402
405
403
404
413
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418-434
ZONING:
R-1 (LOW DENSITY
RESIDENTIAL)
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441
S. LINE, SW 1/4 SEC. 6
S89°49'37"W 2436.05'
Andalusia Tree Inventory -
Southwest Section
Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301
N
Legend
12
Tree Location
and ID

Andalusia Tree Inventory - South Central Section

Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301

N

Legend

12 Tree Location and ID

450

451

452

S. LINE, SE 1/4 SEC. 8
S89°42'29"W 2627.43'

750

SE 1/4
SEC. 6

SE 1/4
SEC. 6

25

Andalusia Tree Inventory - Southeast Section

Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301

N

Legend

12 Tree Location and ID

Andalusia Tree Inventory -
East Southeast Section
Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301

N

Legend

12 Tree Location and ID

SPRING HILL MINOR SUBDIVISION
REC. NO. 4610088

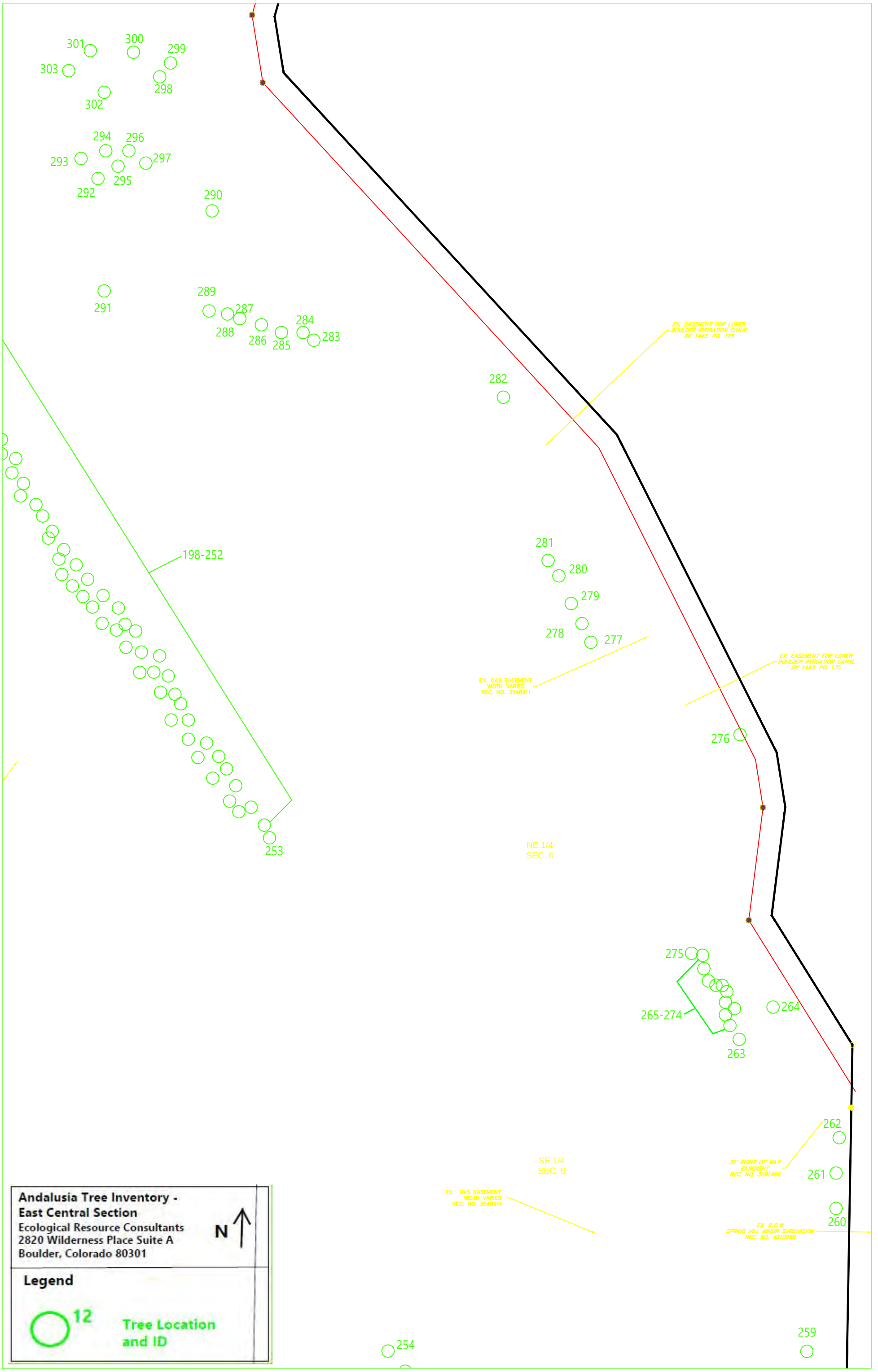
254
255
256
257
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259

SE 1/4
SEC. 6

11
13

EX. 10' RIGHT OF WAY EASEMENT
UNION RURAL ELECTRIC
RE. NO. 1718924

VARYING WIDTH R.O.W.
REC. NO. 3493478
DEDICATED TO
WELD COUNTY


301
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198-252
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265-274
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254
EX. EASEMENT FOR LOWER BOULDER IRRIGATION CANAL BK 1443, PG. 175
EX. EASEMENT FOR LOWER BOULDER IRRIGATION CANAL BK 1443, PG. 175
EX. GAS EASEMENT WIDTH VARIES REC. NO. 3548911
NE 1/4 SEC. 6
SE 1/4 SEC. 6
30' RIGHT OF WAY EASEMENT REC. NO. 3091469
EX. GAS EASEMENT WIDTH VARIES REC. NO. 3548911
EX. R.O.W. SPRING HILL MINOR SUBDIVISION REC. NO. 4610088
Andalusia Tree Inventory - East Central Section
Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301
N
Legend
12
Tree Location and ID

Andalusia Tree Inventory -
East Northeast Section
Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301

N

Legend

12 Tree Location and ID

EX. 40' R.O.W. RESERVATION FOR WELD COUNTY RD 3 REC. NO. 3286322

TRACT A
SPRING HILL MINOR SUBDIVISION
REC. NO. 4610088
(NOT A PART)

NE 1/4
SEC. 6

EX. EASEMENT FOR LOWER BOULDER IRRIGATION CANAL BK. 1443 PG. 175

UNPLATTED

NOT A PART OF THIS SUBDIVISION

301 300 299 303 298 302 294 296 293 297 295

377

NW 1/4
SEC. 5

UNPLATTED

ZONING:
A (AGRICULTURAL)

NW 1/4
SEC. 5

UNPLATTED

ZONING:
A (AGRICULTURAL)

20' R.O.W.
REC. NO. 3493478
DEDICATED TO
WELD COUNTY

EX. 40' R.O.W. RESERVATION
FOR WELD COUNTY RD 3
REC. NO. 3286322

TRACT A
SPRING HILL MINOR
SUBDIVISION
REC. NO. 4610088
(NOT A PART)

Andalusia Tree Inventory - Northeast Section

Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301

N

Legend

12 Tree Location and ID

Andalusia Tree Inventory -
North Central Section
Ecological Resource Consultants
2820 Wilderness Place Suite A
Boulder, Colorado 80301

N

Legend

12 Tree Location and ID

NE 1/4 SEC. 6
UNPLATTED

EX. GAS EASEMENT NORTH YARDS REC. NO. 3040911

EX. NON-EXCLUSIVE ACCESS & UTILITIES EASEMENT REC. NO. 4370000

149 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198-252 253 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312-329 330 331 332 333 334 335 336 337-343 344 345 346 347 348-375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398

Ecological Resource Consultants, Inc.
5672 Juhls Drive ~ Boulder, CO ~ 80301 ~ (303) 679-4820

SCREENING REPORT

FOR

FEDERAL-STATE LISTED THREATENED AND ENDANGERED SPECIES AND GENERAL WILDLIFE

FOR

ANDALUSIA SITE

WELD COUNTY, COLORADO

JULY 10, 2018

Prepared For:

EJE, LLC
7353 S. Alton Way Ste. A-100
Centennial, CO 80112
Contact: Matt Janke
Phone: (303) 770-9111
Email: MJanke@E5XManagement.com

ERC Project #1000-1802

Screening Report
for
Federal-State Listed Threatened and Endangered Species and General Wildlife

Andalusia Site
Weld County, Colorado

July 10, 2018

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1.0 INTRODUCTION

Ecological Resource Consultants, Inc. (ERC) has prepared this report at the request of the property representative, EJE, LLC. The approximately 317 acre property referred to herein as the Andalusia Site (survey area) is located in the Town of Erie, Weld County, Colorado. The survey area is under consideration for potential future land use changes which will likely alter a majority of the current survey area landscape, therefore this report has been prepared to specifically identify potential federal and state listed threatened and endangered species and/or habitat that could exist on or immediately surrounding the survey area. In addition, this report provides a cursory screening of general wildlife use characteristics and existing vegetation community types.

This report has been prepared in accordance with the Migratory Bird Treaty Act (MBTA), Endangered Species Act (ESA) and Colorado Parks and Wildlife (CPW) Colorado Statute Title 33.

2.0 GENERAL SURVEY AREA DESCRIPTION

The survey area is located on the west side of County Road 3 directly southwest of the intersection with Highway 52 in the Town of Erie, Weld County, Colorado in the *Firestone Lake – Saint Vrain Creek* watershed (HUC 101900050709). More specifically, the survey area is located in **Section 6, Township 1 North, Range 68 West**, in Weld County **(latitude 40.079217° north, longitude -105.042058° west).** From the intersection of Interstate 25 and Highway 52, the survey area can be accessed by heading west on Highway 52 for approximately 3.5 miles, then the survey area is accessible by a gravel farm road on the south side of Highway 52 which connects with other dirt/gravel farm and oil and gas access roads that can be used to access interior portions of the survey area. Refer to **Figure 1** and **Figure 2** for a location map and a US Geological Survey (USGS) topographic map of the survey area.

The survey area comprises approximately 317 acres and has an average elevation of 5,000 feet above mean sea level. The survey area is predominantly comprised of upland agricultural lands currently planted with wheat row crops, hayfields, and fallow areas used as cattle pasture. The central portion of the survey area has been recently disturbed by construction of a sewer line for nearby residential development and is now devoid of vegetation. Topography across the survey area is relatively flat with a topographic high point in the southern portion, mainly sloping downward towards the north, and slightly downward to the east and west. The eastern central portion of the survey area comprises a topographic depression that comprises palustrine emergent (PEM) wetland habitat, the interior portion exhibits a cattail marsh habitat and the outer perimeter is PEM wet meadow habitat. The northwest portion of the survey area comprises similar PEM wet meadow habitat including two linear topographic depressions that were inundated during the field inspection and enclosed by overstory canopy tree cover. The southwest portion of the survey area comprises a large PEM wet meadow habitat typical of the survey area as well as a separate palustrine scrub-shrub (PSS) wetland habitat situated in a closed topographic depression.

In addition, three man-made, earthen lined, irrigation ditches mapped on USGS topographic mapping as Cottonwood Extension Ditch, Lower Boulder Ditch, and Boulder and Weld County Ditch bisect the southern and central portions of the survey area and also form portions of the north and east survey area boundaries. All the ditches generally flow from the south and west to the north and east through the survey area and contained surface water flows ranging from 1 to 3 feet during the field inspection.

Two primary land use class/vegetation cover types exist within the survey area in accordance with the Southwest Regional Gap Analysis land cover dataset. Upland habitats are primarily characterized as Cultivated Cropland and wetland habitats/irrigation ditches are characterized as Western Great Plains

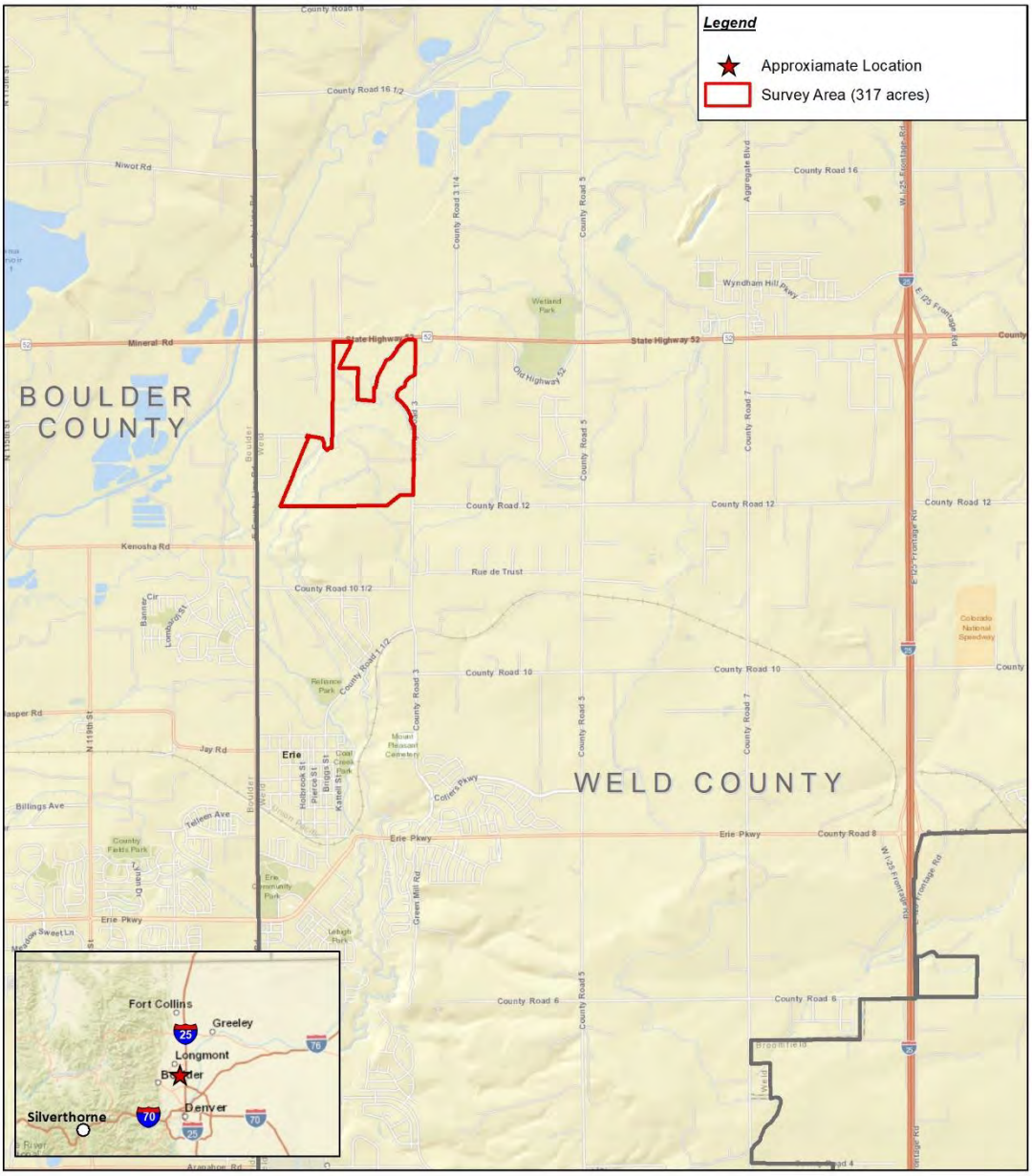
Floodplain (however this cover type has been highly altered and is not considered natural within the survey area) (SWReGAP 2011). In general, the vegetation communities characterized within the survey area are somewhat based on natural vegetation associations in the region (NatureServe 2018); however, have been disturbed by historic and current land use practices thus represent somewhat degraded forms of these communities. A summary of habitat types within the survey area is provided as follows.

Cultivated Cropland

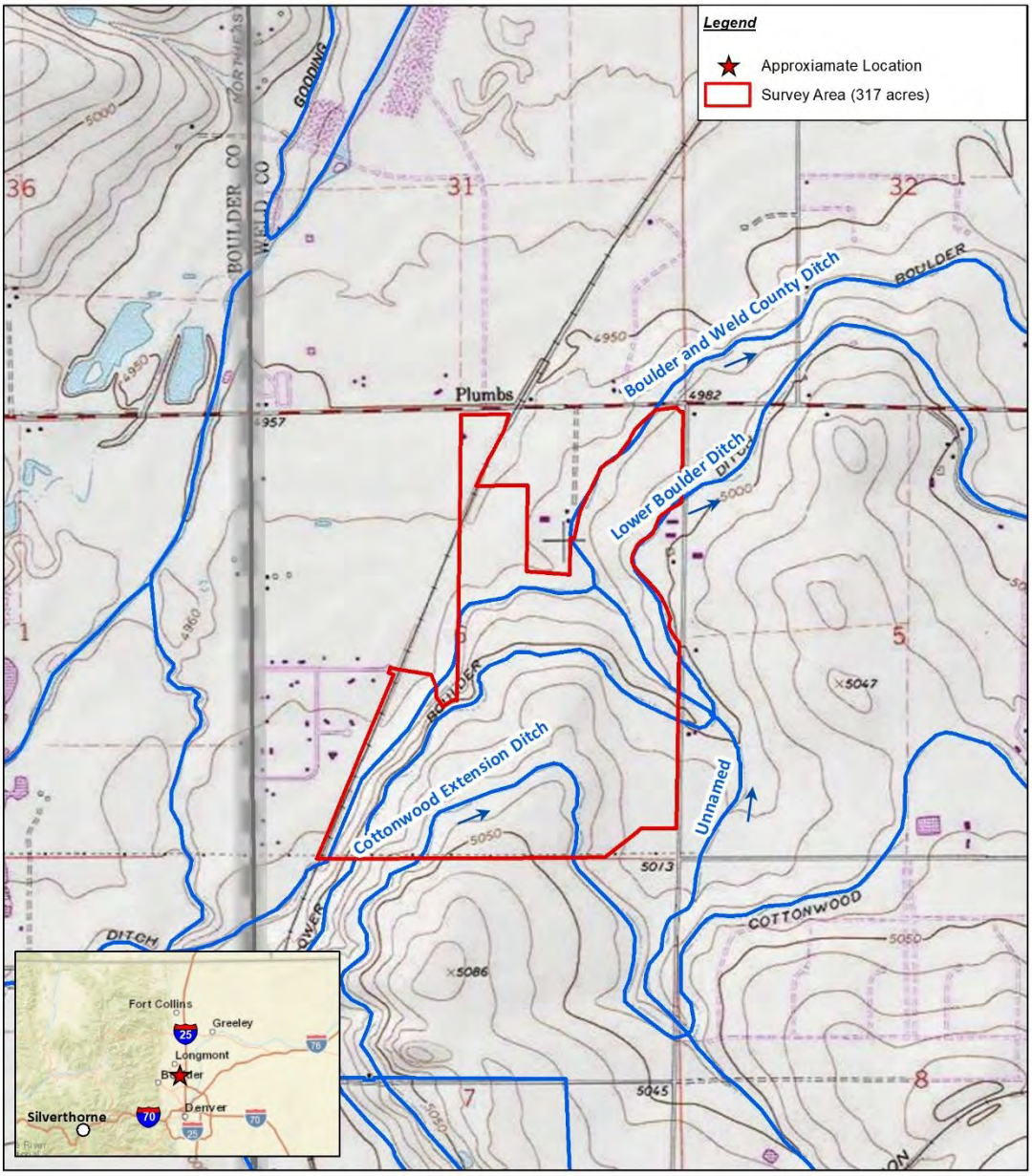
The cultivated cropland community is characterized as non-natural system which includes lands used for the production of annual crops where crop vegetation accounts for greater than 20 percent of the total vegetation and where the land is actively tilled (SWReGAP 2011). This class also includes all land being actively tilled. This vegetation community across the survey area is dominated by species such as common wheat (*Triticum aestivum*) (planted this growing season), alfalfa (*Medicago sativa*), smooth brome (*Bromus inermis*), western wheatgrass (*Pascopyrum smithii*), meadow false rye grass (*Schedonorus pratensis*), and cheatgrass (*Bromus tectorum*) intermixed with a variety of ruderal herbaceous species. Vegetative cover across the survey area generally ranges from 90-100% cover, with the remaining cover comprising exposed surface soil. Generally, most of the vegetation within the survey area appears to be regularly mowed, grazed, and/or disturbed by farming activities. One area through the central portion of the survey area has been recently disturbed for the construction of a sewer line and gravel roads, which is currently devoid of vegetation. Overall, upland habitats within the survey area are mainly herbaceous vegetated agricultural lands in various stages of production and use (wheat/hay crops or pasture).

Western Great Plains Floodplain

The Western Great Plains Floodplain community is found in the floodplains of medium and large rivers of the western Great Plains. Alluvial soils and periodic, intermediate flooding (every 5-25 years) typify this system. Dominant communities within this system range from floodplain forests to wet meadows to gravel/sand flats; however, they are linked by underlying soils and flooding regime. These areas are often subjected to heavy grazing and/or agriculture and can be heavily degraded (SWReGAP 2011). Within the survey area this community generally includes the PEM wet meadow habitats/cattail marsh habitat, PSS wetland habitat, and the irrigation ditches. It should be noted that the areas identified as this cover type within the survey area have been highly altered, are not directly connected to active floodplains and therefore are not considered natural. This vegetation community within the survey area is dominated by species such as broadleaf cattail (*Typha latifolia*), reed canary grass (*Phalaris arundinacea*), Nebraska sedge (*Carex nebrascensis*), clustered field sedge (*Carex praegracilis*), Baltic rush (*Juncus balticus*), woolly sedge (*Carex pellita*), with some sparse communities of narrowleaf willow (*Salix exigua*). Few stands of mature Russian olive (*Elaeagnus angustifolia*), and eastern cottonwood (*Populus deltoides*) are located sporadically throughout the survey area, mainly located in the vicinity of the irrigation ditches and/or wetland habitat. The PEM wet meadow and PSS habitats contain a temporarily flooded water regime. All irrigation ditches identified within the survey area contained surface water flows ranging from 1 to 3 feet during the field evaluation and appear to be regularly maintained by cutting/mowing of vegetation on the ditch banks and/or ditch burning techniques.



Prepared By: ERC *5672 Juhls Drive* *Boulder, CO 80301* *(303) 679-4820* *ERC #1000-1802*	**FIGURE 1.** **LOCATION MAP** **ANDALUSIA SITE** **WELD COUNTY, COLORADO**	0 0.5 1 Miles



Prepared By:

ERC

5672 Juhls Drive
Boulder, CO 80301
(303) 679-4820

ERC #1000-1802

FIGURE 2.
USGS TOPOGRAPHIC MAP

ANDALUSIA SITE
WELD COUNTY, COLORADO

Refer to **Photos 1-12** below for typical characteristics within the survey area. The overall survey area characteristics and vegetation communities are depicted on the aerial photograph provided as **Figure 3**.



Photo 1. Example of the PEM wet meadow habitat in the northeast portion of the survey area. A tree row comprising two linear PEM topographic depressions can be seen in the background.



Photo 2. View south of two linear topographic depressions comprising PEM wetland habitat in the northeast portion of the survey area. The depressions were inundated at the time of the field inspection which is evident in this photo.

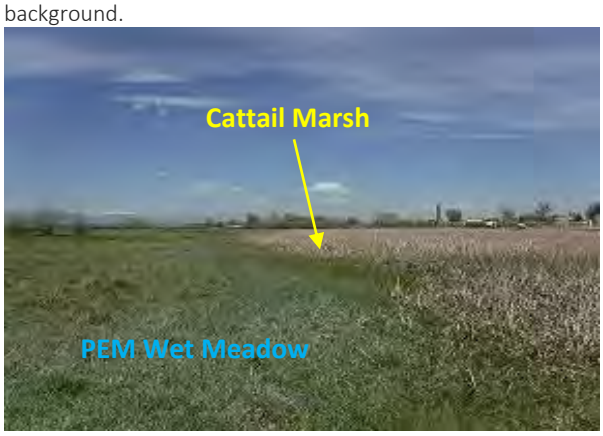


Photo 3. View north from the eastern central portion of the survey area showing PEM wetland habitat comprising a cattail marsh and surrounding PEM wet meadow habitat.

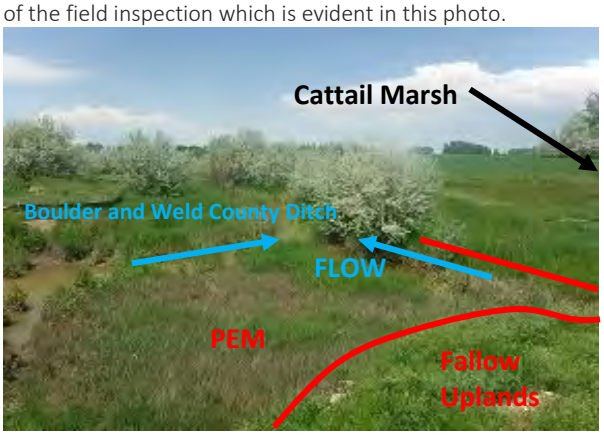


Photo 4. View north at Boulder and Weld County Ditch in the central portion of the survey area. This is the area where the cattail marsh (not pictured) drains into the ditch, and the confluence comprises PEM wetland habitat as shown above.



Photo 5. View south at PSS wetland habitat in the southwest corner of the survey area. The PSS habitat is situated in a closed topographic depression and is a relatively unique habitat in an otherwise agricultural landscape.

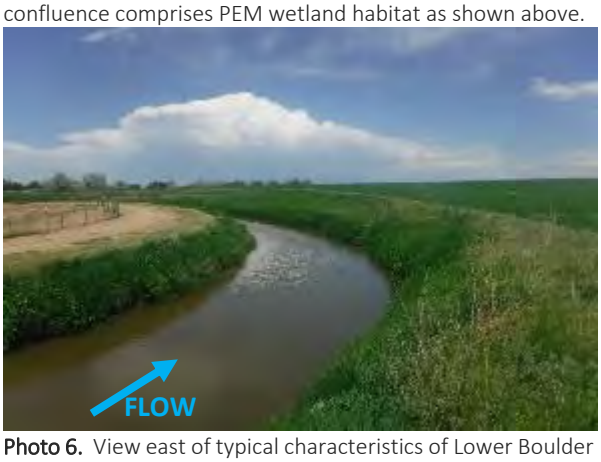


Photo 6. View east of typical characteristics of Lower Boulder Ditch within the central portion of the survey area. Lower Boulder Ditch was the widest (approx. 20 ft) and deepest (3 to 4 feet) ditch mapped within the survey area.



Photo 7. View east of Boulder and Weld County Ditch within the survey area. The ditch comprises mostly herbaceous vegetation along the banks with little tree/shrub cover which is evident in this photo.



Photo 8. View south of Cottonwood Extension Ditch within the survey area. This ditch contained herbaceous vegetation within the ditch bottom and the banks appeared to be regularly burned to remove vegetation which is evident in this photo.



Photo 9. View north of Cultivated Cropland vegetation community consisting entirely of planted wheat row crops in the northeast portion of the survey area.



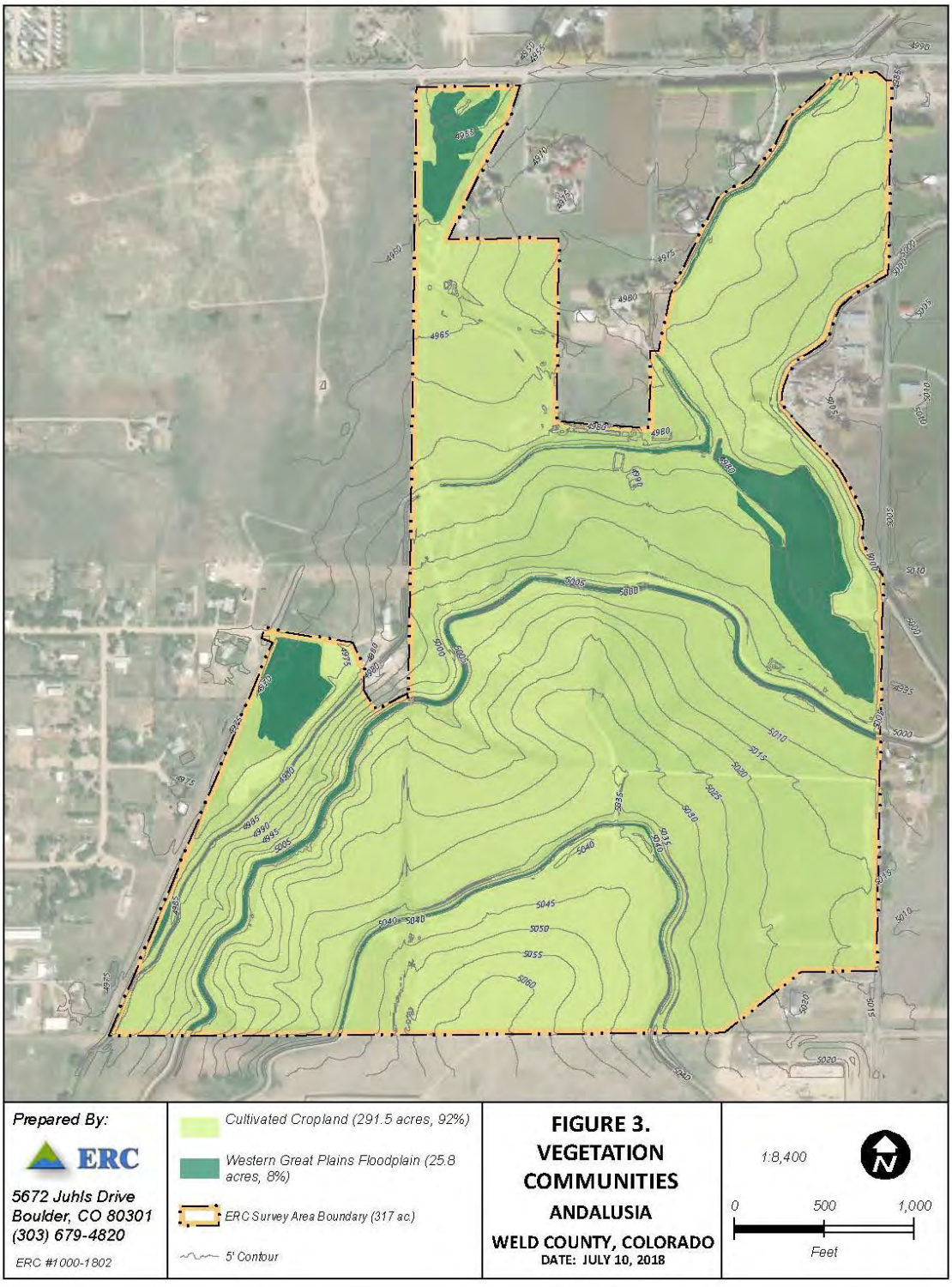
Photo 10. View northwest at uplands within the central portion of the survey area comprising cattle pasture dominated by smooth brome herbaceous vegetation.



Photo 11. View west at hay fields within the southern portion of the survey area. This photo is representative of the uplands across the entire southern portion of the survey area.



Photo 12. View of recently disturbed area in the central portion of the survey area for construction of a sewer line and gravel roads (right). Agricultural fields planted with wheat row crops can be seen at the left of the photo.


Prepared By:
ERC
5672 Juhls Drive
Boulder, CO 80301
(303) 679-4820
ERC #1000-1802
Cultivated Cropland (291.5 acres, 92%)
Western Great Plains Floodplain (25.8 acres, 8%)
ERC Survey Area Boundary (317 ac.)
5' Contour
FIGURE 3.
VEGETATION
COMMUNITIES
ANDALUSIA
WELD COUNTY, COLORADO
DATE: JULY 10, 2018
1:8,400
N
0
500
1,000
Feet

3.0 SCREENING METHODOLOGY

ERC conducted a literature review as part of initial data collection for preparation of this report. Among others, ERC reviewed the available literature sources including; CPW information and the US Fish and Wildlife Service (USFWS) Federal Register.

A field inspection was subsequently conducted on May 7, 8 9, 10, 11, 22, and 23, 2018 to identify and document the presence of natural vegetation communities, general wildlife use and potential for threatened and endangered species/habitat. Upon review of all available resources, including literature and field inspections, ERC provides the following determination for the survey area.

4.0 GENERAL WILDLIFE HABITAT (NON-REGULATED)

Wildlife utilizes the general landscape in a multitude of ways and uses a variety of habitats as areas of permanent inhabitance, seasonal inhabitance, breeding grounds, migratory routes, for foraging purposes, or as temporary shelter. Potential wildlife habitat includes agricultural land (wheat and hay fields), fallow uplands (pasture), herbaceous and scrub-shrub wetland communities, and irrigation ditches.

Historic and current land use associated with agricultural practices have restricted and/or degraded the development of any significant natural vegetation communities within a majority the survey area, which limits the overall quality of potential wildlife habitat. The predominant habitat type which occupies 92% of the survey area is characterized by the Cultivated Cropland community which comprises agricultural land currently used for the agricultural production of wheat row crops and/or hay that is regularly mowed. Fallow uplands occupy a portion of this community generally along the perimeter of the cultivated fields, pasture areas, and around the perimeters of wetland habitats and irrigation ditches. This vegetation type which is dominated by non-native or weedy species is not typically considered of high ecological value to wildlife; however, agricultural lands can have beneficial values to certain wildlife species. These areas at a minimum are considered “open space” providing limited foraging and hunting grounds, refuge and limited areas for nesting (Kingery 1998). Such lands often serve as a buffer between natural areas, providing food, cover, nesting and open-space habitat which allow movement and exchange of plant and animal populations. In addition, there are few mature stands of trees/shrubs and some dense herbaceous vegetation located sporadically within the fallow uplands and in the vicinity of the wetland habitats and irrigation ditches. Overstory canopy trees and midstory shrubs, situated near an agricultural landscape, can provide potential roosting and nesting habitat for visiting and residential raptors and smaller migratory birds. The agricultural land which is present across the survey area has largely replaced the native shortgrass prairie habitat which would have been present in this region. Herbaceous non-native species, ruderal native species, and planted row crop vegetation which permeate the vegetation communities generally do not provide quality habitat for most wildlife. In general, agriculture practices have altered the structure, function, community composition, and habitat value of land within a majority of the survey area; however, some areas do provide a variety of important wildlife habitat values in an otherwise agricultural landscape. Within the survey area, significant limitations for wildlife use exist due to land use activities such as regular mowing, habitat fragmentation from fences and roadways, and noise disturbances from oil and gas production equipment within the survey area and in areas adjacent to the survey area.

The Western Great Plains Floodplain habitat within the survey area occupies a smaller percentage (8%) within the eastern central portion, northwest portion, southwest portion, and generally in the immediate vicinity of the irrigation ditches. Wetlands and irrigation ditches can provide a variety of wildlife habitat features such as cover, forage or nesting habitat, and can act as a movement corridor for various small to

mid-size mammals, amphibians, birds, and reptiles. The general structural characteristics of the wetland habitats and irrigation ditches including a seasonal water source and dense emergent vegetation does create a relatively unique habitat in an otherwise arid and agricultural landscape. Portions of the wetland habitats and the irrigation ditch channels appear to be inundated for at least some portion of the growing season which provides added wildlife benefits and habitat variety within the survey area; however, irrigation ditches are typically dry for portions of the year which severely limits habitat value for wildlife that requires a year-round water source such as certain amphibians and reptiles. Hydrology within the PEM wet meadow habitats and PSS wetland habitat appears to be partially supported by a high groundwater table; however, later in the growing season, the water table likely lies below the surface indicating these areas likely do not exhibit surface water throughout the year further limiting habitat value for wildlife that requires a year-round water source. Within the survey area, some limitations for wildlife use exist due to habitat fragmentation from roadways, fences, restricted culverts, and noise disturbances; however, overall wetland habitat of the survey area provides a variety of important wildlife habitat values.

Some local wildlife species that may use this habitat within the survey area includes coyote (*Canis latrans*), red fox (*Vulpes vulpes*), rabbit (*Lepus sp*.), cottontail (*Sylvilagus sp.*), raccoon (*Procyon lotor*), black tailed prairie dog (*Cynomys ludovicianus*), white-tailed deer (*Odocoileus virginianus*), deer mouse (*Peromyscus maniculatus*), meadow vole (*Microtus pennsylvanicus*), red-winged blackbird (*Agelaius phoeniceus*), mourning dove (*Zenaida macroura*), killdeer (*Charadrius vociferous*), western meadowlark (*Sturnella neglecta*), barn owl (*Tyto alba*), hawks (*Buteo sp*.), and garter snake (*Thamnophis sp.*).

- Generally, there are features within the survey area and the surrounding area that provide general habitat for local songbirds, raptors, and small to mid-size mammals; however, the majority of habitat on the survey area (approximately 92%) comprises cultivated cropland which is highly degraded from a wildlife perspective by historic and current land use practices. Within the survey area, the Western Great Plains Floodplain habitat occupies a smaller percentage of the survey area (8%) but still provides a variety of important wildlife habitat values.

5.0 MIGRATORY BIRD TREATY ACT

Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 730-712). The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase barter, or offer for sale, purchase, or barter any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations. In Colorado, all birds except for the European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*) and rock pigeon (*Columba livia*) are protected under the MBTA. A total of 523 migratory bird species are known to occur in the Mountain-Prairie Region (USFWS Region 6, Montana, Wyoming, Utah, North Dakota, South Dakota, Nebraska, Kansas and Colorado); 320 of the 523 migratory bird species are known to breed in USFWS Region 6.

Migratory birds likely exist within the survey area. The Western Great Plains Floodplain and Cultivated Cropland habitats exhibit few overstory canopy trees/midstory shrubs within the survey area that provide at the very least, potential nesting and foraging habitat for migratory birds. Several red-winged blackbird (*Agelaius phoeniceus*), black-billed magpie (*Pica hudsonia*), and killdeer (*Charadrius vociferous*) individuals were directly observed on the survey area during the field inspection. Such birds are protected under the MBTA, and killing or possession of these birds (or their parts and nests) is prohibited under the MBTA. The migratory birds observed likely utilize the survey area primarily for foraging and seasonal nesting.

- Based upon literature review and an onsite assessment of the survey area, ERC has determined that some migratory birds likely utilize the survey area. These birds are protected under the MBTA and killing or possession of these birds is prohibited. Future land use changes that may occur on the survey area which remove the more permanent vegetation should first ensure that active nests are not disturbed. Generally, the active nesting season for most migratory birds in this region of Colorado occurs between April 1 and August 31. No active nests were observed within the survey area during the field inspection.

- In addition, raptor nest sites are further protected by the CPW. The CPW has established recommended buffer zones and seasonal activity restrictions for a variety of Colorado raptors. While no active nests were observed and no CPW mapped buffer zones are located within the survey area (CPW 2017a), raptors could potentially establish nesting in the vicinity of the survey area. Future land use changes should ensure that no active raptor nest sites have established generally (depending on species) within a ½ mile of the survey area. A nest survey can be conducted in the vicinity of the survey area prior to any disturbance in order to verify the presence/absence of active raptor nest sites.

6.0 SPECIES PROTECTED UNDER THE ENDANGERED SPECIES ACT OF 1973

The ESA of 1973 was enacted by the United States to conserve endangered and threatened species and the ecosystems that they depend on. Under the ESA, species may be listed as either "endangered" or "threatened"; both designations are protected by law. The ESA is administered by the USFWS. The USFWS has developed project specific species lists, available online by request, identifying threatened, endangered, and proposed species, designated critical habitat, and candidate species protected under the ESA that may occur within the boundary of the proposed project and/or may be affected by the proposed project (USFWS 2018) (Tracking Number: 06E24000-2018-SLI-1100). The species list for the survey area has identified a total of 9 threatened or endangered species within the survey area.

Species Not Present

The following federally listed threatened and endangered species are identified to occur within Weld County. However, these species are not known to exist within the specific vicinity of the survey area and/or have specific habitat requirements (i.e., elevation range) that are not common in the vicinity of the survey area.

Common Name	Scientific Name	Status*	Determination
Mexican spotted owl	*Strix occidentalis lucida*	FT	NO EFFECT

*Status key:
FT – Federally listed as threatened

- The survey area does not contain the specific habitat characteristics necessary to support the species listed above. These species and/or critical habitat is not present within the survey area. Therefore the project will have no effect on the species, their habitats, or proposed or designated critical habitat.

Water Depletions Species

The USFWS under the ESA has determined that water depletions in the South Platte River Basin are considered an adverse effect to the listed species identified below. The survey area is considered to be located within the South Platte River Basin.

Common Name	Scientific Name	Status*	Determination
Least tern	*Sternula antillarium*	FE	NOT PRESENT, NO EFFECT^
Pallid sturgeon	*Scaphirhycchus albus*	FE	NOT PRESENT, NO EFFECT^
Piping plover	*Charadrius melodus*	FT	NOT PRESENT, NO EFFECT^
Western prairie fringed orchid	*Platanthera praeclara*	FT	NOT PRESENT, NO EFFECT^
Whooping crane	*Grus Americana*	FE	NOT PRESENT, NO EFFECT^

*Status key:
FT – Federally listed as threatened
FE – Federally listed as endangered
^Proposed project (i.e., residential development-supplied by municipal water) is considered non-water dependent therefore no effect to water depletions species.

Any water related project conducted in the Platte River Basin that has a federal nexus; such as federal funding or a federal permits (i.e., Clean Water Act (CWA) Section 404 Permit), is subject to ESA Section 7 Consultation with the USFWS. The consultation is a mandate for water depletion projects that may affect threatened and endangered species that rely on the South Platte River.

- The survey area does not contain the specific habitat characteristics necessary to support the species listed above. These species and/or critical habitat is not present within the survey area. Therefore the project will have no effect on these listed species, their habitats, or proposed or designated critical habitat.
- Any future project which may be water related or determined to be a water depletion to the South Platte River Basin may potentially be considered an adverse effect to these species. Generally non-water dependent projects such as residential developments (which are supplied by municipal water) are not considered water depletions and therefore would have no effect on these species.

Species Potentially within Range

The following federally listed threatened and endangered species are identified to occur or historically occur within Weld County (USFWS 2018). The survey area is located within the potential known range for these species to occur. Further analysis was conducted to determine if the species or habitat has the potential to exist within the survey area considering site-specific conditions and characteristics. A brief explanation is provided as to the species life cycle, habitat requirements and potential occurrence within the survey area. The survey area is not within designated critical habitat of any federally listed species.

Common Name	Scientific Name	Status*	Determination
Colorado butterfly plant	*Gaura neomexicana var. coloradensis*	FT	NO EFFECT
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	FT	NO EFFECT
Ute Ladies'-tresses orchid	*Spiranthes diluvialis*	FT	NO EFFECT

*Status key:
FT – Federally listed as threatened

COLORADO BUTTERFLY PLANT (GAURA NEOMEXICANA VAR. COLORADENSIS)

The Colorado butterfly plant is listed as federally threatened under the ESA. This plant species is a short-lived, perennial herb endemic to moist soils in mesic or wet meadows of floodplain areas in southeastern Wyoming, north central Colorado, and extreme western Nebraska. This early to mid-seral stage species occurs primarily in habitats created and maintained by streams active within their floodplains, with vegetation that is relatively open and not overly dense or overgrown. The conversion of natural wet

meadows and natural riparian corridors to agricultural land and urban development is the primary threat to the continued existence of the species (Federal Register 2000).

- The upland agricultural land, densely vegetated herbaceous wetland habitats, irrigation ditches, and lack of streams with active floodplains within the survey area does not provide typical habitat conducive to this species. Neither individuals nor potential habitat for the Colorado butterfly plant were observed on or immediately surrounding the survey area. The survey area is not located within designated critical habitat for this species (Federal Register 2005). This species and/or critical habitat is not present within the survey area. Therefore the project will have no effect on the Colorado butterfly plant, its habitat, or proposed or designated critical habitat.

PREBLE'S MEADOW JUMPING MOUSE (ZAPUS HUDSONIUS PREBLEI)

On May 13, 1998 the US Fish and Wildlife Service issued a final rule to list the Preble's meadow jumping mouse (PMJM) as a federally threatened species under the ESA. PMJM range extends from southwestern Wyoming through eastern Colorado generally below 7,600 feet. Armstrong et al. (1997) described typical PMJM habitats as "well-developed plains riparian vegetation with relatively undisturbed grassland and a water source in close proximity." Also noted was a preference for "dense herbaceous vegetation consisting of a variety of grasses, forbs and thick shrubs" (USFWS 1999). This species is known to regularly travel into adjacent uplands to feed and hibernate. The PMJM hibernates in an underground burrow from September to May. PMJM bears two to three litters per year, averaging five young per litter, in a grass-lined nest. In general, PMJM surveys are recommended for areas with suitable habitat in Weld County below 7,600 feet and within 300 feet of vegetated irrigation canals, ditches, and wetlands. Areas that are highly disturbed or modified (including landscaped lots and paved areas) or wetland areas dominated by cattails are excluded from this recommendation.

No populations of the PMJM are known to occur within the vicinity of the survey area (UDFCD 2010). Further, the survey area and immediate vicinity is not designated (or proposed) as Critical Mouse Habitat by the USFWS (USFWS 2017a). The USFWS Mouse Block Clearance Map for the Denver Metro Area (USFWS 2010) which identifies areas exempt from further review for PMJM habitat, shows the survey area occurs outside the Block Clearance Zone.

- No PMJM individuals were observed on or surrounding the survey area. The majority of the survey area is comprised of agricultural land that is regularly mowed and/or grazed thus does not provide habitat suitable for this species. The USFWS states that sites where wetlands are entirely composed of dense stands of cattails are exempt from trapping survey. The wetland habitat, irrigation ditches, and adjacent fallow uplands within the survey area do exhibit a limited amount of dense herbaceous vegetation that could be considered potential habitat. However, the majority of the wetland habitats are largely dominated by cattails, routinely mowed, and/or are weedy pasture lands that are generally isolated by agricultural lands. In addition, the irrigation ditches appear to be regularly maintained by removing vegetation along the banks which would not be considered suitable habitat conducive to the PMJM. This species and/or critical habitat is not present within the survey area. Therefore the project will have no effect on the PMJM, its habitat, or proposed or designated critical habitat.

UTE LADIES'-TRESSES (SPIRANTHES DILUVIALIS)

The Ute ladies-tresses is listed as federally threatened under the ESA. The Ute ladies-tresses occurs in seasonally moist soils and wet meadows near springs, lakes, or perennial streams and their associated

floodplains below 6,500 feet in elevation in certain areas of Utah, Colorado, Idaho, Wyoming, and Nevada. Typical sites include early successional riparian habitats such as point bars, sand bars, and low lying gravelly, sandy, or cobbly edges. They seem to require "permanent subirrigation", conditions where the water table is close to the surface, but they are not tolerant of permanent standing water. Typical habitat is open and sparsely vegetated, populations decline if trees and shrubs invade the habitat. They do not compete well with aggressive species such as reed canary grass or monocultures of cattails.

- The densely vegetated wetland habitat and irrigation ditches within the survey area are dominated by dense cattail vegetation and/or monocultures of other emergent species which is not typical habitat conducive to the Ute ladies-tresses. No Ute ladies-tresses or suitable habitat was identified within the survey area. This species and/or critical habitat is not present within the survey area. Therefore the project will have no effect on the Ute ladies-tresses, its habitat, or proposed or designated critical habitat.

7.0 STATE THREATENED AND ENDANGERED SPECIES

Species identified as state threatened or endangered are protected by the CPW under Colorado Statute Title 33. State regulations prohibit "*any person to take, possess, transport, export, process, sell or offer for sale, or ship and for any common or contract carrier to knowingly transport or receive for shipment*" any species or subspecies listed as state endangered or threatened. The CPW also has identified State Species of Special Concern, which are species or subspecies of native wildlife that are currently vulnerable in their Colorado range and have the potential to become threatened or endangered (CPW 2010). Species of Special Concern are not protected under State regulations but the 'take' of individuals and disturbance of their habitat is strongly discouraged.

All state listed species were screened as potential inhabitants of the survey area based on general habitat requirements and CPW Species Profiles (CPW 2017b). ERC evaluated the species listed by CPW as threatened or endangered that could potentially exist within the survey area. All animal species listed above as threatened or endangered by the USFWS are also listed by the CPW as threatened or endangered, respectively, therefore were not duplicated below.

Species Not Present

The following listed threatened and endangered species are identified to occur within the state (CPW 2017b). However, these species are not known to exist within the specific vicinity of the survey area and/or have specific habitat requirements (i.e., elevation range) that are not common in the vicinity of the survey area (CPW 2017b and USFWS 2017).

Common Name	Scientific Name	Status*
Boreal toad	*Bufo boreas boreas*	SE
Southwestern willow flycatcher	*Empidonax traillii extimus*	SE
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	ST
Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	SE
Arkansas darter	*Etheostoma cragini*	ST
Bonytail	*Gila elegans*	SE
Razorback sucker	*Xyrauchen texanus*	SE
Humpback chub	*Gila cypha*	ST
Colorado pikeminnow	*Ptychocheilus lucius*	ST

Common Name	Scientific Name	Status*
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	ST
Rio grande sucker	*Catostomus plebeius*	SE
Lake chub	*Couesius plumbeus*	SE
Plains minnow	*Hybognathus placitus*	SE
Suckermouth minnow	*Phenacobius mirabilis*	SE
Northern redbelly dace	*Phoxinus eos*	SE
Southern redbelly dace	*Phoxinus erythrogaster*	SE
Brassy minnow	*Hybognathus hankinsoni*	ST
Common shiner	*Luxilus cornutus*	ST
Gray wolf	*Canis lupus*	SE
Grizzly bear	*Ursus arctos*	SE
Lynx	*Lynx canadensis*	SE
Wolverine	*Gulo gulo*	SE
Kit fox	*Vulpes macrotis*	SE
River otter	*Lontra canadensis*	ST

*Status key:
ST – State listed as threatened
SE – State listed as endangered

- The survey area does not contain the specific habitat characteristics necessary to support the species listed above. These species and/or critical habitat is not present within the survey area. Therefore the project will have no effect on the species, their habitats, or proposed or designated critical habitat.

Species Potentially within Range

The following state listed threatened and endangered species are identified to occur or historically occur within Weld County. The survey area is located within the potential known range for these species. Further analysis was conducted to determine if the species or habitat has the potential to exist on the survey area considering site-specific conditions and characteristics. A brief explanation is provided as to the species life cycle, habitat requirements and potential occurrence within the survey area.

Common Name	Scientific Name	Status*
Burrowing owl	*Athene cunicularia*	ST
Black-footed ferret	*Mustela nigripes*	SE

*Status key:
ST – State listed as threatened
SE – State listed as endangered

BURROWING OWL (ATHENE CUNICULARIA)

The burrowing owl (Owl) is listed as a state threatened species in Colorado. The Owl is small (length of 24 centimeters), long-legged, boldly spotted, and barred with brown and white. The Owl is a breeding species across the plains of eastern Colorado however rarely winters in the state. Nesting habitat is abandoned burrows, especially prairie dog colonies, located in grasslands, mountain parks, well-drained steppes, deserts, prairies and agricultural lands from late March through October. The Owl can usually be observed on low perches such as fence posts, dirt mounds or the ground. Clutch size of this Owl averages six to seven and incubation lasts up to 30 days. The owlets usually run and forage at 4 weeks and fly at 6 weeks. Primary threats to existence of this species are habitat loss due to intensive agriculture,

habitat degradation and fragmentation due to control of burrowing mammals and predation by cats and dogs.

- No Owl individuals were observed on or surrounding the survey area. The survey area is located within the overall range of the black-tailed prairie dog; however, no colonies were observed within the survey area. Much of the agricultural land within the survey area is regularly mowed or tilled further limiting the potential use of the survey area by this species. Any future land use changes within the survey area should not adversely affect the continued existence or potential habitat of this species.

BLACK-FOOTED FERRET (MUSTELA NIGRIPES)

The black-footed ferret (BFF) *(Mustela nigripes)* is a medium-sized mustelid (a member of the weasel family). The BFF is the only ferret species native to the Americas. Its historical range spanned much of western North America's intermountain and prairie grasslands, extending from Canada to Mexico. Historically, BFF habitat coincided with habitats of black-tailed prairie dog *(C. ludovicianus)*, Gunnison's prairie dog *(C. gunnisoni)*, and white-tailed prairie dog *(C. leucurus)*. Prairie dogs make up more than 90% of the BFF's diet. BFF's are limited to open habitat, the same habitat used by prairie dogs: grasslands, steppe, and shrub steppe. It depends largely on prairie dogs: ferrets prey on prairie dogs and utilize their burrows for shelter and denning (Hillman and Clark, 1980). It has been estimated that about 40-60 hectares of prairie dog colony are needed to support one ferret (Belant and Biggins 2008). BFF's once numbered in the tens of thousands, but due to a combination of human-induced threats they were believed to be extinct twice in the 20th century. As of 2015, BFFs have been reintroduced in the wild at 24 sites across 8 states, Canada, and Mexico.

- No BFF individuals were observed on or surrounding the survey area. The survey area is located within the overall range of the black-tailed prairie dog; however, no colonies were observed within the survey area. Further, the survey area occurs within the block clearance zone for black-footed ferret surveys (USFWS 2009). Any future land use changes within the survey area should not adversely affect the continued existence or potential habitat of this species.

8.0 SUMMARY

ERC has conducted this screening for federal and state listed threatened and endangered species and general wildlife for the approximately 317 acre survey area. The following provides key items identified as part of this report:

1. Two primary land use class/vegetation cover types exist within the survey area. Upland habitats are primarily characterized as Cultivated Cropland and wetland habitats/irrigation ditches are characterized as Western Great Plains Floodplain (altered). Historic land use for agricultural practices has led to degradation of the native vegetation community.
2. Generally, there are features on the survey area and the surrounding area that provide general habitat for local songbirds, raptors, and small to mid-size mammals. However, habitat within the survey area is somewhat degraded and of lower ecological value from a wildlife perspective due to historic and current land use for agriculture, which has restricted overall growth and establishment of vegetation.
3. Based upon literature review and field evaluation of the survey area, ERC has determined that some migratory birds likely utilize the survey area to a limited degree. These birds are protected under the MBTA, and killing or possession of these birds is prohibited. Generally, the active nesting season for

most migratory birds in this region of Colorado occurs between April 1 and August 31. Any future land use changes that may occur within the survey area that remove more permanent vegetation during the active nesting season should first ensure that active nests are not disturbed. A nest survey can be conducted prior to vegetation removal that may occur during this time frame.

- In addition, raptor nest sites are further protected by the CPW. The CPW has established recommended buffer zones and seasonal activity restrictions for a variety of Colorado raptors. While no active nests were observed and no CPW mapped buffer zones are located within the survey area (CPW 2017a), raptors could potentially establish nesting in the vicinity of the survey area. Future land use changes should ensure that no active raptor nest sites have established generally (depending on species) within a ½ mile of the survey area. A nest survey can be conducted in the vicinity of the survey area prior to any disturbance in order to verify the presence/absence of active raptor nest sites.

4. No federally listed threatened and endangered species and/or habitat protected under the ESA were identified within the survey area. The survey area is not within designated critical habitat of any federally listed species. The vegetation communities and features within the survey area were investigated as potential habitat for federally listed species. Potential threatened and endangered species habitat was found to lack one or more habitat components critical for the federally listed species likely to occur in the area. Furthermore, connectivity to known populations was limited due to geographic, hydrologic, and other habitat constraints. Therefore the project will have no effect on federal listed species, their habitats, or proposed or designated critical habitat.
5. Any future project which may be water related or determined to be a water depletion to the South Platte River Basin may potentially be considered an adverse effect to water depletion species. Generally non-water dependent projects such as residential developments (which are supplied by municipal water) are not considered water depletions and therefore would have no effect on these species.
6. No State listed threatened or endangered species and/or habitat protected under CPW under Colorado Statute Title 33 were identified within the survey area. The vegetation communities within the survey area were investigated as potential habitat for state listed species. Potential threatened and endangered species habitat was found to lack one or more habitat components critical for the state listed species likely to occur in the area. Furthermore, connectivity to known populations was limited due to geographic, hydrologic, and other habitat constraints. No other individuals or habitat for state listed threatened and endangered species would likely be impacted by any future land use changes.

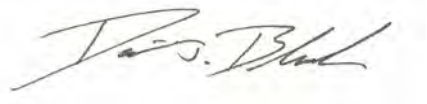
This report has been prepared by:

ECOLOGICAL RESOURCE CONSULTANTS, INC.



Kyle Medash, Ecologist

Reviewed and approved by:



David J. Blauch, V.P., Senior Ecologist

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SPRING HILL

MASTER UTILITY REPORT

Prepared for:

ME Erie, LLC
7353 South Alton Way
Centennial, Colorado 80112
Phone: (303) 770-9111
Contact: Matt Janke

Prepared by Engineer:
Westwood Professional Services, Inc.
Contact: Brian Wilson, P.E.
10333 E. Dry Creek Road, Suite 240
Englewood, CO 80112
(720) 482-9526

Submitted To:
Town of Erie, Colorado

DECEMBER, 2021

10333 E. Dry Creek Road, Suite 240
Englewood, Colorado 80112
cvlinc.net westwoodps.com
720.482.9526

Spring Hill

UTILITY REPORT

Town of Erie, Colorado

Prepared for:

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Phone: (720) 482-9526

December, 2021

Town Acceptance

This report has been reviewed and found to be in general compliance with the Town of Erie Standards and Specifications for Design and Construction and other Town requirements. THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUANTITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.

Accepted by: _____ _____
Town Engineer Date

If during the construction process or at any time within one year following the acceptance by the TOWN of the completed improvements, any deficiencies or errors are discovered in the construction plans, specifications, drainage reports, or the actual constructed improvements, the TOWN shall have the right to require the developer to make any and all corrections which may be deemed necessary by the TOWN.

Table of Contents

I) SITE LOCATION & DESCRIPTION

II) WATER DISTRIBUTION SYSTEM

III) SANITARY COLLECTION SYSTEM

IV) CONCLUSIONS

V) REFERENCES

VI) APPENDICES

I. SITE DESCRIPTION

The Spring Hill property is located in the East half of Section 6, Township 1 North, Range 68 West of the 6th Principal Meridian, Weld County, Colorado. The overall site is bounded on the North by Highway 52 and large lot County residential parcels. The site is bounded on the East by Weld County Road 3 and large lot County residential parcels, Highview Ranch Planned Unit Development (PUD), on the west by the Broomfield Becky property, and on the south by the Morgan Hill Subdivision. The Spring Hill project is a planned single family residential subdivision, with a mixture of parks and open space. The project will be built in five filings.

Filing 1 is 14.4 acres and does not include any lots but will primarily contain the major roads that run through the site. These roads include both major connections to County Road 3. The large park will also be built in filing 1.

Filing 2 is a 19.7 acre residential subdivision located in the Town of Erie and bounded by County Road 3 to the east, Westview Estates Subdivision to the west, and Morgan Hill to the south. A large part of this filing is bisected by the major Road being constructed in filing 1.

Filing 3 is a 12.8 acre residential subdivision located in the Town of Erie and is located in the center of the site.

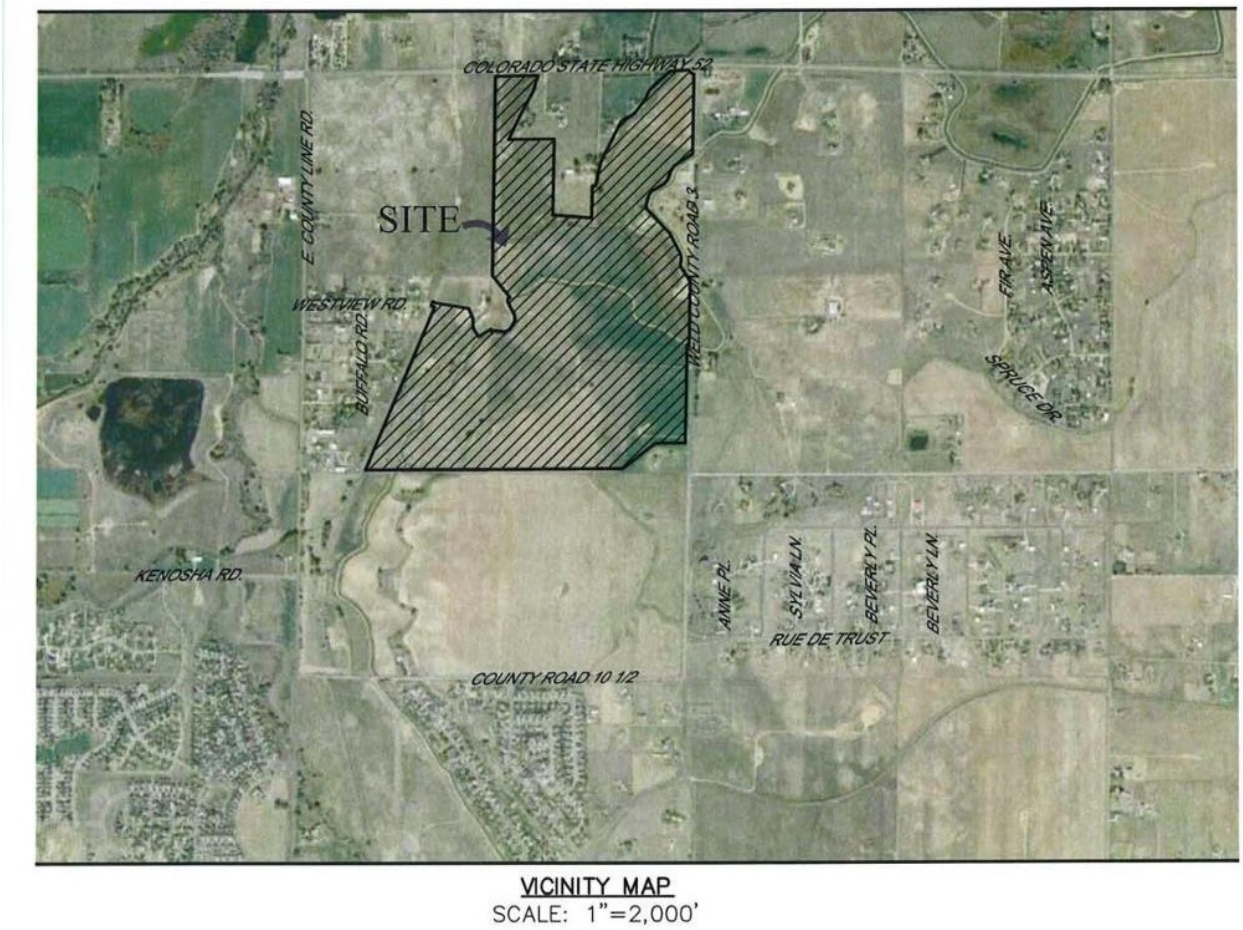
Filing 4 is a 16.1 acre residential subdivision located in the Town of Erie and is located in the north west area of the site. There is an existing 30’ easement for an existing sanitary sewer line that runs from the east to the northwest of this filing. There is also a channel running just to the west of this filing that wraps around to the south of filing 4 and crosses over the just inside the filing 4 boundary.

Filing 5 is a 3.9 acre residential subdivision located in the Town of Erie and is located in the north east area of the site.

The project consists of the development of 418 home sites in filing 2, 68 home sites in filing 3, 76 home sites in filing 4, and 70 home sites in filing 5 for a total of 632 residential units. It also includes the roadways and utility infrastructure to support them, which includes water, sanitary sewer, and storm sewer.

Non-potable water in the form of an irrigation system will also be included as part of the Spring Hill project. Design information about this system and the proposed connections will be included as part of the final utility construction drawings.

Figure: Vicinity Map



VICINITY MAP
SCALE: 1"=2,000'

II. WATER DISTIBUTION SYSTEM

The water distribution system for this development will be tied into four existing water mains, one to the northwest, one to the northeast, one to the southeast, and one to the south. This will provide a looped system for redundancy and consistent supply and quality.

The northwest connection is located at the south end of Highway 52. The waterline will be installed along Street S on the site.

The southeast connection is located at County Road 3 just to the east of the site. The waterline will be installed from this connection point to the west along Street B on to the site.

The northeast connection is located at County Road 3 just to the east of the site. The waterline will be installed from this connection point along Street V.
The southern connection is located south of the site at County line Road and CR 10 1/2. The line being tied into is a 24" existing line

The water system is modeled from the town of Erie Standards and Specifications. This places the average demand at 140 gallons per capita per day. This demand was multiplied by an estimated 2.89 people per unit which was obtained from the 2006 Town of Erie Water and Wastewater Master Plan. Multiplying the demand by people per unit gives an average demand per unit of 0.271 gallons per minute. The max day demand was modeled as 2.6 times the average demand. The max hour demand was modeled as 2.0 times the average demand. The site demands as well as two existing dwelling units were included in the water model.

Four scenarios were modeled, average day, max day, max hour day, and fire flow analysis, Fire flow demands were modeled with max day flows and at the gallons per minute rate indicated in the standard specifications at each fire flow node modeled.

WATER MODEL SUMMARY – NO FIRE FLOW				
SCENARIO	**MIN PRESSURE**	**MIN PRESSURE AT NODE**	**MAX ONSITE PRESSURE**	**MAX PRESSURE AT NODE**
AVERAGE DAY	53.6	J-13	72.6	J-86
MAX DAY	52.7	J-13	71.8	J-86
MAX HOUR	51.9	J-13	71.2	J-86

MINIMUM SYSTEM PRESSURES WITH FIRE FLOW				
SCENARIO	**FIRE FLOW AT NODE**	**RESIDUAL AT FIRE FLOW NODE**	**NODE WITH MIN SYSTEM PRESSURE**	**MIN SYSTEM PRESSURE**
FIRE FLOW NORTH	J-10	40.6	J-10	40.6
FIRE FLOW SOUTH	J-78	58.2	J-75	52.7

Assumptions for Model:
140 GPCD
2.89 People per unit
MD/AD = 2.6
MH/AD = 2.0
Hazen Williams for 8” and 10” pipe c = 120
Hazen Williams for 16” pipe c = 120
Mannings n = 0.011
Darcy-Weisenbach E = 0.0009

III. SANITARY COLLECTION SYSTEM

The sanitary collection system for this development will be tied into an existing sanitary main in three locations. The connections will serve the entire project. All proposed sanitary sewer lines will be 8” PVC.

The sanitary system is designed from the town of Erie Standards and Specifications. This places the average residential flow at 90 gallons per capita per day. This flow was multiplied by an estimated 2.79 people per unit to an average flow per unit of 251.1 gallons per day. The peaking factor was calculated using the following equation taken from the Erie Standards and Specifications.

$PF = 2.6 * (Q_{max\text{-}day})^{-0.16}$ (where $Q_{max\text{-}day}$ = max daily flow in CFS) and $2<PF<4$

	SANITARY FLOWS						
PIPE	NUMBER OF UNITS	AVERAGE FLOW (MGD)	CALCULATED PEAKING FACTOR	PEAKING FACTOR	PEAK FLOW (MGD)	PIPE CAPACITY (MGD)	VELOCITY (FPS)
NORTH EAST 8” PVC	69	0.0210	7.33	5	0.105	0.57 @ 50% CAPACITY	2.49
SOUTH EAST 8” PVC	161	0.0465	6.40	5	0.2325	0.57 @ 50% CAPACITY	2.49
SOUTH 8” PVC	401	0.10475	5.58	5	.52375	0.57 @ 50% CAPACITY	2.49

IV. CONCLUSIONS

Based on the findings of this report, the proposed infrastructure will support the requirements of the proposed development per the town of Erie Standards and Specifications. The Appendix contains the WaterGEMS and Sewer flow results, and layout exhibit.

V. REFERENCES

Standards and Specifications, Town of Erie, Colorado, www.erieco.gov

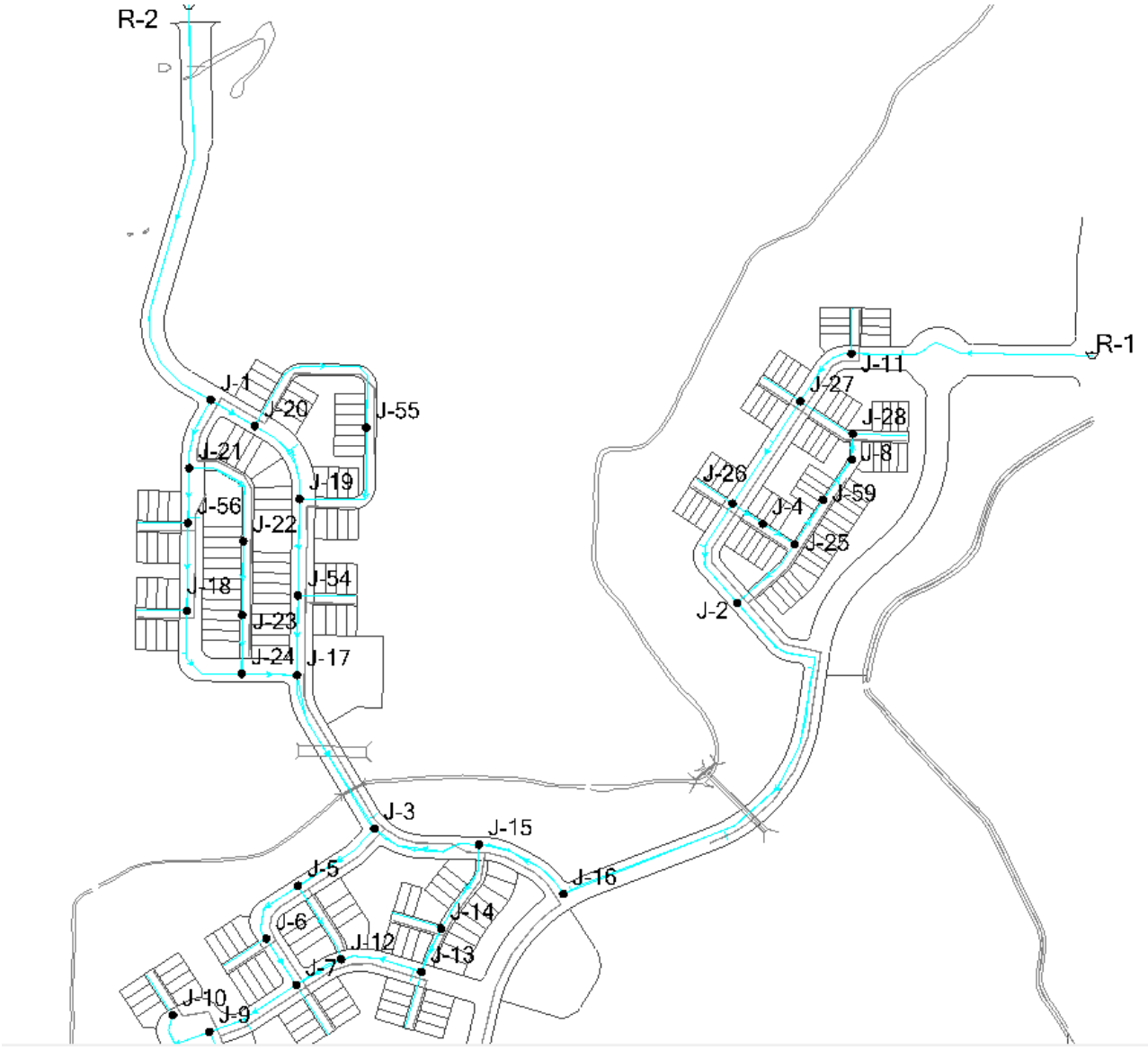
VI. APPENDIX

A. **APPENDIX A – WATER SYSTEM CALCULATIONS**
B. **APPENDIX B – SANITARY SYSTEM CALCULATIONS**
C. **APPENDIX C – WATER DESIGN REQUIREMENTS (TOWN OF ERIE)**
D. **APPENDIX D – SANITARY DESIGN REQUIREMENTS (TOWN OF ERIE)**

WATER SYSTEM DEMAND

WATER SYSTEM SCHEMATIC

SPRING HILL NORTH WATER MODEL LAYOUT



SPRING HILL SOUTH WATER MODEL LAYOUT



AVERAGE DAY

Spring Hill
Active Scenario: AVERAGE DAY
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-4	J-5	J-6	192	8.0	PVC	120.0	0.54	-84.85	0.000
P-5	J-6	J-7	144	8.0	PVC	120.0	0.56	-87.02	0.000
P-8	J-9	J-10	180	8.0	PVC	120.0	0.01	2.17	0.000
P-11	J-12	J-5	224	8.0	PVC	120.0	0.84	131.54	0.000
P-12	J-12	J-13	216	8.0	PVC	120.0	1.44	-225.07	0.001
P-13	J-13	J-14	124	8.0	PVC	120.0	1.45	-227.78	0.001
P-15	J-3	J-15	293	8.0	PVC	120.0	2.65	-415.92	0.004
P-16	J-15	J-14	248	8.0	PVC	120.0	1.47	230.49	0.001
P-17	J-15	J-16	265	8.0	PVC	120.0	4.14	-648.59	0.010
P-27	J-26	J-27	321	8.0	PVC	120.0	4.23	-663.23	0.010
P-28(1)	R-1	J-11	645	8.0	PVC	120.0	4.26	667.57	0.010
P-28(2)	J-11	J-27	193	8.0	PVC	120.0	4.25	665.40	0.010
P-29	R-2	J-1	1,120	8.0	PVC	120.0	3.89	-609.52	0.008
P-30	R-3	J-29	452	8.0	PVC	120.0	7.54	-1,180.98	0.029
P-31	J-30	J-31	258	8.0	PVC	120.0	2.52	-394.80	0.004
P-32	J-32	J-33	435	8.0	PVC	120.0	2.59	-405.38	0.004
P-33	J-33	J-34	150	8.0	PVC	120.0	1.32	-206.31	0.001
P-34	J-35	J-36	347	8.0	PVC	120.0	0.31	-48.25	0.000
P-35	J-37	J-33	324	8.0	PVC	120.0	1.28	201.24	0.001
P-36	J-38	J-39	208	8.0	PVC	120.0	2.10	328.76	0.003
P-37	J-29	J-39	475	8.0	PVC	120.0	5.08	-795.67	0.014
P-38	J-36	J-40	289	8.0	PVC	120.0	1.55	-243.51	0.002
P-39	J-41	J-38	336	8.0	PVC	120.0	2.22	348.03	0.003
P-40	J-41	J-42	155	8.0	PVC	120.0	2.20	-345.46	0.003
P-41	J-42	J-43	280	8.0	PVC	120.0	0.10	16.36	0.000
P-42	J-43	J-40	328	8.0	PVC	120.0	1.46	229.40	0.001
P-43	J-35	J-44	288	8.0	PVC	120.0	1.07	-167.28	0.001
P-44	J-44	J-45	304	8.0	PVC	120.0	0.75	-116.84	0.000
P-45	J-45	J-46	280	8.0	PVC	120.0	0.83	-129.70	0.000
P-46	J-46	J-40	280	8.0	PVC	120.0	0.13	20.49	0.000
P-47	J-48	J-49	280	8.0	PVC	120.0	0.43	-66.72	0.000
P-48	J-50	J-51	280	8.0	PVC	120.0	2.86	-447.46	0.005
P-49	J-51	J-52	280	8.0	PVC	120.0	3.05	478.57	0.005
P-50	J-53	J-39	260	8.0	PVC	120.0	2.98	466.91	0.005
P-51(2)	J-17	J-54	208	8.0	PVC	120.0	1.83	286.77	0.002
P-52(1)(1)	J-54	J-19	252	8.0	PVC	120.0	1.82	284.60	0.002
P-52(1)(2)	J-19	J-20	244	8.0	PVC	120.0	1.20	187.86	0.001
P-52(2)	J-20	J-1	134	8.0	PVC	120.0	1.78	278.64	0.002
P-54(1)	J-1	J-21	191	8.0	PVC	120.0	2.11	-330.89	0.003
P-54(2)	J-21	J-56	143	8.0	PVC	120.0	1.05	-165.28	0.001
P-55(1)	J-56	J-18	230	8.0	PVC	120.0	1.07	-167.45	0.001
P-60(1)	J-28	J-8	67	8.0	PVC	120.0	0.01	-2.17	0.000
P-60(2)	J-8	J-59	130	8.0	PVC	120.0	0.03	-4.61	0.000
P-61	J-59	J-25	137	8.0	PVC	120.0	0.04	-6.78	0.000
P-62	J-50	J-60	222	8.0	PVC	120.0	1.40	219.55	0.001

Spring Hill
Active Scenario: AVERAGE DAY
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-63	J-60	J-61	253	8.0	PVC	120.0	1.39	217.38	0.001
P-64	J-61	J-43	187	8.0	PVC	120.0	1.37	215.21	0.001
P-65	J-52	J-62	202	8.0	PVC	120.0	1.52	238.46	0.001
P-66	J-62	J-63	401	8.0	PVC	120.0	1.51	236.02	0.001
P-67	J-63	J-53	313	8.0	PVC	120.0	1.49	233.85	0.001
P-68	J-51	J-64	286	8.0	PVC	120.0	2.34	366.16	0.003
P-69	J-64	J-42	375	8.0	PVC	120.0	2.32	363.99	0.003
P-70	J-40	J-65	298	8.0	PVC	120.0	0.04	6.38	0.000
P-71	J-65	J-66	283	8.0	PVC	120.0	0.03	4.75	0.000
P-72	J-66	J-41	187	8.0	PVC	120.0	0.02	2.58	0.000
P-73	J-37	J-67	262	8.0	PVC	120.0	0.09	-13.85	0.000
P-74	J-67	J-68	190	8.0	PVC	120.0	0.10	-16.02	0.000
P-75	J-68	J-69	183	8.0	PVC	120.0	0.11	-17.64	0.000
P-76	J-69	J-38	203	8.0	PVC	120.0	0.12	-19.27	0.000
P-77	J-70	J-45	246	8.0	PVC	120.0	0.07	-10.69	0.000
P-78	J-71	J-70	181	8.0	PVC	120.0	0.05	-8.52	0.000
P-79	J-49	J-72	187	8.0	PVC	120.0	0.03	-4.18	0.000
P-79	J-24	J-23	154	8.0	PVC	120.0	1.10	172.12	0.001
P-80	J-72	J-71	299	8.0	PVC	120.0	0.04	-6.35	0.000
P-80	J-23	J-22	192	8.0	PVC	120.0	1.08	169.95	0.001
P-81	J-47	J-73	293	8.0	PVC	120.0	0.15	-22.97	0.000
P-82	J-73	J-74	365	8.0	PVC	120.0	0.16	-25.14	0.000
P-83	J-74	J-48	379	8.0	PVC	120.0	0.17	-27.31	0.000
P-84	J-49	J-75	250	8.0	PVC	120.0	0.41	-64.71	0.000
P-84(2)	J-20	J-55	525	8.0	PVC	120.0	0.59	-92.94	0.000
P-85	J-75	J-76	252	8.0	PVC	120.0	0.43	-66.88	0.000
P-85	J-24	J-17	144	8.0	PVC	120.0	2.19	-343.37	0.003
P-86	J-46	J-77	468	8.0	PVC	120.0	1.43	-223.57	0.001
P-86(1)	J-25	J-4	99	8.0	PVC	120.0	1.96	-307.29	0.002
P-86(2)	J-4	J-26	95	8.0	PVC	120.0	1.98	-309.74	0.002
P-87	J-77	J-50	493	8.0	PVC	120.0	1.44	-225.74	0.001
P-87	J-2	J-25	217	8.0	PVC	120.0	1.91	-298.89	0.002
P-88	J-78	J-32	314	8.0	PVC	120.0	1.06	-165.31	0.001
P-88	J-2	J-26	313	8.0	PVC	120.0	2.24	-351.33	0.003
P-89	J-31	J-79	191	8.0	PVC	120.0	1.03	-161.24	0.001
P-89	J-2	J-16	1,251	8.0	PVC	120.0	4.14	648.59	0.010
P-90	J-79	J-78	330	8.0	PVC	120.0	1.04	-163.14	0.001
P-90	J-3	J-5	251	8.0	PVC	120.0	1.37	-214.22	0.001
P-91	J-32	J-80	181	8.0	PVC	120.0	1.52	237.90	0.001
P-91	J-17	J-3	455	8.0	PVC	120.0	4.02	-630.14	0.009
P-92	J-80	J-31	239	8.0	PVC	120.0	1.50	235.73	0.001
P-92	J-7	J-9	259	8.0	PVC	120.0	0.03	4.34	0.000
P-93	J-48	J-81	195	8.0	PVC	120.0	0.24	37.25	0.000
P-93	J-55	J-19	361	8.0	PVC	120.0	0.60	-94.57	0.000
P-94	J-81	J-82	216	8.0	PVC	120.0	0.22	35.08	0.000

Spring Hill
Active Scenario: AVERAGE DAY
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-94	J-21	J-22	301	8.0	PVC	120.0	1.07	-167.78	0.001
P-95	J-82	J-47	150	8.0	PVC	120.0	0.21	32.91	0.000
P-95	J-18	J-24	286	8.0	PVC	120.0	1.08	-169.62	0.001
P-96	J-7	J-12	135	8.0	PVC	120.0	0.60	-93.53	0.000
P-98	J-84	J-30	183	8.0	PVC	120.0	2.50	-392.36	0.004
P-99	J-85	J-84	60	8.0	PVC	120.0	2.49	-390.73	0.004
P-100	J-29	J-86	388	8.0	PVC	120.0	2.47	-386.94	0.004
P-101	J-86	J-85	312	8.0	PVC	120.0	2.48	-388.56	0.004
P-102(1)	J-36	J-57	181	8.0	PVC	120.0	1.24	193.64	0.001
P-102(2)	J-57	J-87	151	8.0	PVC	120.0	1.22	191.74	0.001
P-103	J-87	J-37	244	8.0	PVC	120.0	1.21	189.57	0.001
P-104	J-53	J-88	638	8.0	PVC	120.0	1.50	-235.50	0.001
P-105	J-88	J-52	276	8.0	PVC	120.0	1.52	-237.67	0.001
P-106	J-34	J-89	201	8.0	PVC	120.0	1.33	-208.48	0.001
P-107	J-89	J-90	242	8.0	PVC	120.0	1.34	-210.65	0.001
P-108	J-90	J-35	170	8.0	PVC	120.0	1.36	-213.36	0.001
P-109	J-76	J-83	278	8.0	PVC	120.0	0.44	-69.05	0.000
P-110	J-83	J-46	169	8.0	PVC	120.0	0.45	-71.22	0.000
P-111	J-44	J-58	199	8.0	PVC	120.0	0.34	-52.62	0.000
P-112	J-58	J-47	389	8.0	PVC	120.0	0.34	-53.70	0.000
P-113	R-4	J-51	219	8.0	PVC	120.0	8.26	1,294.36	0.034

Spring Hill
Active Scenario: AVERAGE DAY
FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-1	4,964.71	0.00	65.7	5,116.48
J-2	4,983.63	1.63	66.6	5,137.66
J-3	4,986.00	0.00	58.9	5,122.03
J-4	4,985.16	2.44	66.3	5,138.39
J-5	4,983.80	2.17	59.9	5,122.34
J-6	4,984.30	2.17	59.7	5,122.38
J-7	4,988.58	2.17	57.9	5,122.42
J-8	4,990.92	2.44	63.7	5,138.15
J-9	4,986.70	2.17	58.7	5,122.42
J-10	4,988.00	2.17	58.2	5,122.42
J-11	4,990.49	2.17	66.3	5,143.72
J-12	4,991.58	0.00	56.6	5,122.45
J-13	4,996.71	2.71	54.5	5,122.74
J-14	4,994.67	2.71	55.5	5,122.91
J-15	4,989.15	2.17	58.0	5,123.26
J-16	4,991.65	0.00	58.0	5,125.78
J-17	4,974.14	0.00	62.2	5,117.94
J-18	4,970.03	2.17	63.7	5,117.29
J-19	4,968.72	2.17	64.1	5,116.98
J-20	4,966.03	2.17	65.2	5,116.75
J-21	4,966.42	2.17	65.2	5,117.01
J-22	4,969.77	2.17	63.8	5,117.24
J-23	4,971.61	2.17	63.1	5,117.39
J-24	4,972.46	1.63	62.8	5,117.52
J-25	4,987.00	1.63	65.4	5,138.15
J-26	4,984.04	2.17	66.9	5,138.62
J-27	4,988.16	2.17	66.5	5,141.79
J-28	4,991.60	2.17	63.4	5,138.15
J-29	5,012.06	1.63	70.7	5,175.48
J-30	5,016.00	2.44	70.5	5,178.96
J-31	5,018.50	2.17	69.8	5,179.93
J-32	5,025.69	2.17	67.0	5,180.55
J-33	5,023.49	2.17	68.7	5,182.28
J-34	5,019.30	2.17	70.6	5,182.45
J-35	5,023.56	2.17	69.1	5,183.18
J-36	5,026.60	1.63	67.8	5,183.21
J-37	5,032.11	2.17	65.1	5,182.63
J-38	5,029.83	0.00	66.1	5,182.64
J-39	5,022.22	0.00	69.2	5,182.08
J-40	5,031.17	0.00	66.0	5,183.65
J-41	5,041.78	0.00	61.4	5,183.65
J-42	5,043.98	2.17	60.6	5,184.11
J-43	5,038.09	2.17	63.2	5,184.11
J-44	5,026.34	2.17	68.0	5,183.40
J-45	5,030.65	2.17	66.1	5,183.52
J-46	5,035.69	2.17	64.0	5,183.66

Spring Hill
Active Scenario: AVERAGE DAY
FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-47	5,031.90	2.17	65.6	5,183.46
J-48	5,041.23	2.17	61.5	5,183.48
J-49	5,045.40	2.17	59.8	5,183.52
J-50	5,049.25	2.17	58.7	5,184.94
J-51	5,041.59	2.17	62.6	5,186.28
J-52	5,036.60	2.44	64.1	5,184.76
J-53	5,025.00	2.44	68.5	5,183.43
J-54	4,971.65	2.17	63.1	5,117.50
J-55	4,971.92	1.63	62.7	5,116.89
J-56	4,967.81	2.17	64.6	5,117.11
J-57	5,028.21	1.90	67.0	5,183.02
J-58	5,028.20	1.08	67.2	5,183.42
J-59	4,989.11	2.17	64.5	5,138.15
J-60	5,045.05	2.17	60.4	5,184.66
J-61	5,040.70	2.17	62.1	5,184.34
J-62	5,033.46	2.44	65.3	5,184.46
J-63	5,028.17	2.17	67.4	5,183.88
J-64	5,044.04	2.17	61.1	5,185.33
J-65	5,035.07	1.63	64.3	5,183.65
J-66	5,039.17	2.17	62.5	5,183.65
J-67	5,034.36	2.17	64.2	5,182.64
J-68	5,033.54	1.63	64.5	5,182.64
J-69	5,031.67	1.63	65.3	5,182.64
J-70	5,032.56	2.17	65.3	5,183.52
J-71	5,034.49	2.17	64.5	5,183.52
J-72	5,041.03	2.17	61.6	5,183.52
J-73	5,034.24	2.17	64.6	5,183.46
J-74	5,037.58	2.17	63.1	5,183.47
J-75	5,049.55	2.17	58.0	5,183.55
J-76	5,044.76	2.17	60.1	5,183.59
J-77	5,046.96	2.17	59.4	5,184.28
J-78	5,022.36	2.17	68.3	5,180.31
J-79	5,019.64	1.90	69.4	5,180.07
J-80	5,022.45	2.17	68.3	5,180.28
J-81	5,037.83	2.17	63.0	5,183.47
J-82	5,034.29	2.17	64.5	5,183.46
J-83	5,038.74	2.17	62.7	5,183.63
J-84	5,013.44	1.63	71.3	5,178.27
J-85	5,012.76	2.17	71.5	5,178.05
J-86	5,008.94	1.63	72.7	5,176.90
J-87	5,029.56	2.17	66.3	5,182.87
J-88	5,032.99	2.17	65.5	5,184.35
J-89	5,020.16	2.17	70.3	5,182.69
J-90	5,022.28	2.71	69.5	5,182.97

Spring Hill
Active Scenario: AVERAGE DAY
FlexTable: Reservoir Table

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
101	R-1	5,150.18	667.57	5,150.18
104	R-2	5,107.00	-609.52	5,107.00
107	R-3	5,162.45	-1,180.98	5,162.45
321	R-4	5,193.75	1,294.36	5,193.75

MAX DAY

Spring Hill
Active Scenario: MAX DAY
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-4	J-5	J-6	192	8.0	PVC	120.0	0.49	-76.44	0.000
P-5	J-6	J-7	144	8.0	PVC	120.0	0.52	-82.08	0.000
P-8	J-9	J-10	180	8.0	PVC	120.0	0.04	5.64	0.000
P-11	J-12	J-5	224	8.0	PVC	120.0	0.81	127.07	0.000
P-12	J-12	J-13	216	8.0	PVC	120.0	1.44	-226.08	0.001
P-13	J-13	J-14	124	8.0	PVC	120.0	1.49	-233.14	0.001
P-15	J-3	J-15	293	8.0	PVC	120.0	2.64	-413.84	0.004
P-16	J-15	J-14	248	8.0	PVC	120.0	1.53	240.19	0.002
P-17	J-15	J-16	265	8.0	PVC	120.0	4.21	-659.68	0.010
P-27	J-26	J-27	321	8.0	PVC	120.0	4.45	-697.76	0.011
P-28(1)	R-1	J-11	645	8.0	PVC	120.0	4.53	709.05	0.011
P-28(2)	J-11	J-27	193	8.0	PVC	120.0	4.49	703.41	0.011
P-29	R-2	J-1	1,120	8.0	PVC	120.0	3.56	-558.12	0.007
P-30	R-3	J-29	452	8.0	PVC	120.0	7.14	-1,118.77	0.026
P-31	J-30	J-31	258	8.0	PVC	120.0	2.39	-375.21	0.003
P-32	J-32	J-33	435	8.0	PVC	120.0	2.57	-402.72	0.004
P-33	J-33	J-34	150	8.0	PVC	120.0	1.26	-197.58	0.001
P-34	J-35	J-36	347	8.0	PVC	120.0	0.39	-61.25	0.000
P-35	J-37	J-33	324	8.0	PVC	120.0	1.35	210.77	0.001
P-36	J-38	J-39	208	8.0	PVC	120.0	1.86	290.73	0.002
P-37	J-29	J-39	475	8.0	PVC	120.0	4.90	-768.25	0.013
P-38	J-36	J-40	289	8.0	PVC	120.0	1.63	-255.20	0.002
P-39	J-41	J-38	336	8.0	PVC	120.0	2.18	342.11	0.003
P-40	J-41	J-42	155	8.0	PVC	120.0	2.36	-369.80	0.003
P-41	J-42	J-43	280	8.0	PVC	120.0	0.15	23.50	0.000
P-42	J-43	J-40	328	8.0	PVC	120.0	1.59	248.77	0.002
P-43	J-35	J-44	288	8.0	PVC	120.0	1.02	-160.32	0.001
P-44	J-44	J-45	304	8.0	PVC	120.0	0.79	-123.23	0.000
P-45	J-45	J-46	280	8.0	PVC	120.0	0.99	-155.49	0.001
P-46	J-46	J-40	280	8.0	PVC	120.0	0.07	-11.39	0.000
P-47	J-48	J-49	280	8.0	PVC	120.0	0.51	-79.40	0.000
P-48	J-50	J-51	280	8.0	PVC	120.0	3.16	-495.51	0.006
P-49	J-51	J-52	280	8.0	PVC	120.0	3.24	507.85	0.006
P-50	J-53	J-39	260	8.0	PVC	120.0	3.05	477.52	0.005
P-51(2)	J-17	J-54	208	8.0	PVC	120.0	1.76	276.24	0.002
P-52(1)(1)	J-54	J-19	252	8.0	PVC	120.0	1.73	270.60	0.002
P-52(1)(2)	J-19	J-20	244	8.0	PVC	120.0	1.12	175.18	0.001
P-52(2)	J-20	J-1	134	8.0	PVC	120.0	1.63	255.08	0.002
P-54(1)	J-1	J-21	191	8.0	PVC	120.0	1.93	-303.03	0.002
P-54(2)	J-21	J-56	143	8.0	PVC	120.0	0.97	-152.36	0.001
P-55(1)	J-56	J-18	230	8.0	PVC	120.0	1.01	-158.00	0.001
P-60(1)	J-28	J-8	67	8.0	PVC	120.0	0.04	-5.64	0.000
P-60(2)	J-8	J-59	130	8.0	PVC	120.0	0.08	-11.99	0.000
P-61	J-59	J-25	137	8.0	PVC	120.0	0.11	-17.63	0.000
P-62	J-50	J-60	222	8.0	PVC	120.0	1.55	242.20	0.002

Spring Hill
Active Scenario: MAX DAY
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-63	J-60	J-61	253	8.0	PVC	120.0	1.51	236.56	0.001
P-64	J-61	J-43	187	8.0	PVC	120.0	1.47	230.92	0.001
P-65	J-52	J-62	202	8.0	PVC	120.0	1.61	252.03	0.002
P-66	J-62	J-63	401	8.0	PVC	120.0	1.57	245.69	0.002
P-67	J-63	J-53	313	8.0	PVC	120.0	1.53	240.04	0.002
P-68	J-51	J-64	286	8.0	PVC	120.0	2.58	404.58	0.004
P-69	J-64	J-42	375	8.0	PVC	120.0	2.55	398.94	0.004
P-70	J-40	J-65	298	8.0	PVC	120.0	0.11	-17.82	0.000
P-71	J-65	J-66	283	8.0	PVC	120.0	0.14	-22.05	0.000
P-72	J-66	J-41	187	8.0	PVC	120.0	0.18	-27.69	0.000
P-73	J-37	J-67	262	8.0	PVC	120.0	0.24	-37.27	0.000
P-74	J-67	J-68	190	8.0	PVC	120.0	0.27	-42.91	0.000
P-75	J-68	J-69	183	8.0	PVC	120.0	0.30	-47.15	0.000
P-76	J-69	J-38	203	8.0	PVC	120.0	0.33	-51.38	0.000
P-77	J-70	J-45	246	8.0	PVC	120.0	0.17	-26.62	0.000
P-78	J-71	J-70	181	8.0	PVC	120.0	0.13	-20.97	0.000
P-79	J-49	J-72	187	8.0	PVC	120.0	0.06	-9.69	0.000
P-79	J-24	J-23	154	8.0	PVC	120.0	1.07	167.60	0.001
P-80	J-72	J-71	299	8.0	PVC	120.0	0.10	-15.33	0.000
P-80	J-23	J-22	192	8.0	PVC	120.0	1.03	161.96	0.001
P-81	J-47	J-73	293	8.0	PVC	120.0	0.13	-20.28	0.000
P-82	J-73	J-74	365	8.0	PVC	120.0	0.17	-25.93	0.000
P-83	J-74	J-48	379	8.0	PVC	120.0	0.20	-31.57	0.000
P-84	J-49	J-75	250	8.0	PVC	120.0	0.48	-75.35	0.000
P-84(2)	J-20	J-55	525	8.0	PVC	120.0	0.55	-85.55	0.000
P-85	J-75	J-76	252	8.0	PVC	120.0	0.52	-81.00	0.000
P-85	J-24	J-17	144	8.0	PVC	120.0	2.14	-335.48	0.003
P-86	J-46	J-77	468	8.0	PVC	120.0	1.54	-242.03	0.002
P-86(1)	J-25	J-4	99	8.0	PVC	120.0	2.06	-323.11	0.003
P-86(2)	J-4	J-26	95	8.0	PVC	120.0	2.10	-329.45	0.003
P-87	J-77	J-50	493	8.0	PVC	120.0	1.58	-247.67	0.002
P-87	J-2	J-25	217	8.0	PVC	120.0	1.92	-301.24	0.002
P-88	J-78	J-32	314	8.0	PVC	120.0	1.04	-163.67	0.001
P-88	J-2	J-26	313	8.0	PVC	120.0	2.31	-362.67	0.003
P-89	J-31	J-79	191	8.0	PVC	120.0	0.98	-153.09	0.001
P-89	J-2	J-16	1,251	8.0	PVC	120.0	4.21	659.68	0.010
P-90	J-79	J-78	330	8.0	PVC	120.0	1.01	-158.03	0.001
P-90	J-3	J-5	251	8.0	PVC	120.0	1.26	-197.87	0.001
P-91	J-32	J-80	181	8.0	PVC	120.0	1.49	233.41	0.001
P-91	J-17	J-3	455	8.0	PVC	120.0	3.90	-611.72	0.009
P-92	J-80	J-31	239	8.0	PVC	120.0	1.45	227.76	0.001
P-92	J-7	J-9	259	8.0	PVC	120.0	0.07	11.28	0.000
P-93	J-48	J-81	195	8.0	PVC	120.0	0.27	42.19	0.000
P-93	J-55	J-19	361	8.0	PVC	120.0	0.57	-89.78	0.000
P-94	J-81	J-82	216	8.0	PVC	120.0	0.23	36.55	0.000

Spring Hill
Active Scenario: MAX DAY
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-94	J-21	J-22	301	8.0	PVC	120.0	1.00	-156.32	0.001
P-95	J-82	J-47	150	8.0	PVC	120.0	0.20	30.91	0.000
P-95	J-18	J-24	286	8.0	PVC	120.0	1.04	-163.64	0.001
P-96	J-7	J-12	135	8.0	PVC	120.0	0.63	-99.01	0.000
P-98	J-84	J-30	183	8.0	PVC	120.0	2.35	-368.86	0.003
P-99	J-85	J-84	60	8.0	PVC	120.0	2.33	-364.63	0.003
P-100	J-29	J-86	388	8.0	PVC	120.0	2.26	-354.76	0.003
P-101	J-86	J-85	312	8.0	PVC	120.0	2.29	-358.99	0.003
P-102(1)	J-36	J-57	181	8.0	PVC	120.0	1.21	189.72	0.001
P-102(2)	J-57	J-87	151	8.0	PVC	120.0	1.18	184.79	0.001
P-103	J-87	J-37	244	8.0	PVC	120.0	1.14	179.14	0.001
P-104	J-53	J-88	638	8.0	PVC	120.0	1.56	-243.83	0.002
P-105	J-88	J-52	276	8.0	PVC	120.0	1.59	-249.47	0.002
P-106	J-34	J-89	201	8.0	PVC	120.0	1.30	-203.23	0.001
P-107	J-89	J-90	242	8.0	PVC	120.0	1.33	-208.87	0.001
P-108	J-90	J-35	170	8.0	PVC	120.0	1.38	-215.92	0.001
P-109	J-76	J-83	278	8.0	PVC	120.0	0.55	-86.64	0.000
P-110	J-83	J-46	169	8.0	PVC	120.0	0.59	-92.28	0.000
P-111	J-44	J-58	199	8.0	PVC	120.0	0.27	-42.73	0.000
P-112	J-58	J-47	389	8.0	PVC	120.0	0.29	-45.55	0.000
P-113	R-4	J-51	219	8.0	PVC	120.0	9.02	1,413.58	0.040

Spring Hill
Active Scenario: MAX DAY
FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-1	4,964.71	0.00	65.0	5,115.06
J-2	4,983.63	4.23	66.1	5,136.32
J-3	4,986.00	0.00	58.1	5,120.24
J-4	4,985.16	6.35	65.7	5,137.07
J-5	4,983.80	5.64	59.1	5,120.51
J-6	4,984.30	5.64	58.9	5,120.54
J-7	4,988.58	5.64	57.1	5,120.57
J-8	4,990.92	6.35	63.1	5,136.81
J-9	4,986.70	5.64	57.9	5,120.57
J-10	4,988.00	5.64	57.4	5,120.57
J-11	4,990.49	5.64	66.0	5,142.96
J-12	4,991.58	0.00	55.8	5,120.61
J-13	4,996.71	7.05	53.7	5,120.90
J-14	4,994.67	7.05	54.7	5,121.08
J-15	4,989.15	5.64	57.2	5,121.46
J-16	4,991.65	0.00	57.3	5,124.06
J-17	4,974.14	0.00	61.5	5,116.37
J-18	4,970.03	5.64	63.0	5,115.75
J-19	4,968.72	5.64	63.5	5,115.49
J-20	4,966.03	5.64	64.6	5,115.28
J-21	4,966.42	5.64	64.5	5,115.50
J-22	4,969.77	5.64	63.1	5,115.71
J-23	4,971.61	5.64	62.4	5,115.85
J-24	4,972.46	4.23	62.1	5,115.96
J-25	4,987.00	4.23	64.8	5,136.82
J-26	4,984.04	5.64	66.3	5,137.33
J-27	4,988.16	5.64	66.0	5,140.82
J-28	4,991.60	5.64	62.8	5,136.81
J-29	5,012.06	4.23	70.2	5,174.24
J-30	5,016.00	6.35	69.8	5,177.25
J-31	5,018.50	5.64	69.1	5,178.14
J-32	5,025.69	5.64	66.2	5,178.72
J-33	5,023.49	5.64	67.9	5,180.43
J-34	5,019.30	5.64	69.8	5,180.59
J-35	5,023.56	5.64	68.2	5,181.31
J-36	5,026.60	4.23	66.9	5,181.35
J-37	5,032.11	5.64	64.3	5,180.82
J-38	5,029.83	0.00	65.3	5,180.87
J-39	5,022.22	0.00	68.4	5,180.42
J-40	5,031.17	0.00	65.2	5,181.83
J-41	5,041.78	0.00	60.6	5,181.85
J-42	5,043.98	5.64	59.9	5,182.37
J-43	5,038.09	5.64	62.4	5,182.36
J-44	5,026.34	5.64	67.1	5,181.51
J-45	5,030.65	5.64	65.3	5,181.64
J-46	5,035.69	5.64	63.2	5,181.83

Spring Hill
Active Scenario: MAX DAY
FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-47	5,031.90	5.64	64.7	5,181.55
J-48	5,041.23	5.64	60.7	5,181.58
J-49	5,045.40	5.64	58.9	5,181.63
J-50	5,049.25	5.64	58.0	5,183.34
J-51	5,041.59	5.64	62.0	5,184.95
J-52	5,036.60	6.35	63.5	5,183.26
J-53	5,025.00	6.35	67.9	5,181.82
J-54	4,971.65	5.64	62.4	5,115.96
J-55	4,971.92	4.23	62.1	5,115.40
J-56	4,967.81	5.64	63.9	5,115.59
J-57	5,028.21	4.94	66.2	5,181.17
J-58	5,028.20	2.82	66.3	5,181.52
J-59	4,989.11	5.64	63.9	5,136.82
J-60	5,045.05	5.64	59.7	5,183.00
J-61	5,040.70	5.64	61.4	5,182.63
J-62	5,033.46	6.35	64.7	5,182.93
J-63	5,028.17	5.64	66.7	5,182.30
J-64	5,044.04	5.64	60.5	5,183.82
J-65	5,035.07	4.23	63.5	5,181.84
J-66	5,039.17	5.64	61.7	5,181.84
J-67	5,034.36	5.64	63.4	5,180.83
J-68	5,033.54	4.23	63.7	5,180.84
J-69	5,031.67	4.23	64.5	5,180.85
J-70	5,032.56	5.64	64.5	5,181.64
J-71	5,034.49	5.64	63.7	5,181.63
J-72	5,041.03	5.64	60.8	5,181.63
J-73	5,034.24	5.64	63.7	5,181.55
J-74	5,037.58	5.64	62.3	5,181.56
J-75	5,049.55	5.64	57.2	5,181.68
J-76	5,044.76	5.64	59.3	5,181.73
J-77	5,046.96	5.64	58.7	5,182.55
J-78	5,022.36	5.64	67.6	5,178.49
J-79	5,019.64	4.94	68.6	5,178.26
J-80	5,022.45	5.64	67.5	5,178.46
J-81	5,037.83	5.64	62.2	5,181.56
J-82	5,034.29	5.64	63.7	5,181.56
J-83	5,038.74	5.64	61.9	5,181.79
J-84	5,013.44	4.23	70.6	5,176.64
J-85	5,012.76	5.64	70.8	5,176.44
J-86	5,008.94	4.23	72.0	5,175.45
J-87	5,029.56	5.64	65.5	5,181.03
J-88	5,032.99	5.64	64.8	5,182.81
J-89	5,020.16	5.64	69.5	5,180.81
J-90	5,022.28	7.05	68.7	5,181.09

Spring Hill
Active Scenario: MAX DAY
FlexTable: Reservoir Table

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
101	R-1	5,150.18	709.05	5,150.18
104	R-2	5,107.00	-558.12	5,107.00
107	R-3	5,162.45	-1,118.77	5,162.45
321	R-4	5,193.75	1,413.58	5,193.75

MAX HOUR

Spring Hill
Active Scenario: MAX HOUR
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-4	J-5	J-6	192	8.0	PVC	120.0	0.51	-79.66	0.000
P-5	J-6	J-7	144	8.0	PVC	120.0	0.54	-84.00	0.000
P-8	J-9	J-10	180	8.0	PVC	120.0	0.03	4.34	0.000
P-11	J-12	J-5	224	8.0	PVC	120.0	0.82	128.78	0.000
P-12	J-12	J-13	216	8.0	PVC	120.0	1.44	-225.80	0.001
P-13	J-13	J-14	124	8.0	PVC	120.0	1.48	-231.23	0.001
P-15	J-3	J-15	293	8.0	PVC	120.0	2.65	-414.71	0.004
P-16	J-15	J-14	248	8.0	PVC	120.0	1.51	236.65	0.001
P-17	J-15	J-16	265	8.0	PVC	120.0	4.19	-655.70	0.010
P-27	J-26	J-27	321	8.0	PVC	120.0	4.37	-685.00	0.011
P-28(1)	R-1	J-11	645	8.0	PVC	120.0	4.43	693.68	0.011
P-28(2)	J-11	J-27	193	8.0	PVC	120.0	4.40	689.34	0.011
P-29	R-2	J-1	1,120	8.0	PVC	120.0	3.69	-577.58	0.008
P-30	R-3	J-29	452	8.0	PVC	120.0	7.29	-1,142.62	0.027
P-31	J-30	J-31	258	8.0	PVC	120.0	2.44	-382.85	0.004
P-32	J-32	J-33	435	8.0	PVC	120.0	2.58	-404.01	0.004
P-33	J-33	J-34	150	8.0	PVC	120.0	1.28	-200.99	0.001
P-34	J-35	J-36	347	8.0	PVC	120.0	0.36	-56.40	0.000
P-35	J-37	J-33	324	8.0	PVC	120.0	1.32	207.36	0.001
P-36	J-38	J-39	208	8.0	PVC	120.0	1.95	305.13	0.002
P-37	J-29	J-39	475	8.0	PVC	120.0	4.97	-778.77	0.013
P-38	J-36	J-40	289	8.0	PVC	120.0	1.60	-250.92	0.002
P-39	J-41	J-38	336	8.0	PVC	120.0	2.20	344.54	0.003
P-40	J-41	J-42	155	8.0	PVC	120.0	2.31	-361.36	0.003
P-41	J-42	J-43	280	8.0	PVC	120.0	0.13	20.35	0.000
P-42	J-43	J-40	328	8.0	PVC	120.0	1.54	241.19	0.002
P-43	J-35	J-44	288	8.0	PVC	120.0	1.04	-163.04	0.001
P-44	J-44	J-45	304	8.0	PVC	120.0	0.77	-120.70	0.000
P-45	J-45	J-46	280	8.0	PVC	120.0	0.93	-145.93	0.001
P-46	J-46	J-40	280	8.0	PVC	120.0	0.00	0.52	0.000
P-47	J-48	J-49	280	8.0	PVC	120.0	0.48	-74.89	0.000
P-48	J-50	J-51	280	8.0	PVC	120.0	3.05	-477.70	0.005
P-49	J-51	J-52	280	8.0	PVC	120.0	3.17	496.96	0.006
P-50	J-53	J-39	260	8.0	PVC	120.0	3.02	473.64	0.005
P-51(2)	J-17	J-54	208	8.0	PVC	120.0	1.79	280.27	0.002
P-52(1)(1)	J-54	J-19	252	8.0	PVC	120.0	1.76	275.93	0.002
P-52(1)(2)	J-19	J-20	244	8.0	PVC	120.0	1.15	179.99	0.001
P-52(2)	J-20	J-1	134	8.0	PVC	120.0	1.69	263.99	0.002
P-54(1)	J-1	J-21	191	8.0	PVC	120.0	2.00	-313.58	0.002
P-54(2)	J-21	J-56	143	8.0	PVC	120.0	1.00	-157.26	0.001
P-55(1)	J-56	J-18	230	8.0	PVC	120.0	1.03	-161.60	0.001
P-60(1)	J-28	J-8	67	8.0	PVC	120.0	0.03	-4.34	0.000
P-60(2)	J-8	J-59	130	8.0	PVC	120.0	0.06	-9.22	0.000
P-61	J-59	J-25	137	8.0	PVC	120.0	0.09	-13.56	0.000
P-62	J-50	J-60	222	8.0	PVC	120.0	1.49	233.85	0.001

Spring Hill
Active Scenario: MAX HOUR
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-63	J-60	J-61	253	8.0	PVC	120.0	1.46	229.51	0.001
P-64	J-61	J-43	187	8.0	PVC	120.0	1.44	225.17	0.001
P-65	J-52	J-62	202	8.0	PVC	120.0	1.58	246.99	0.002
P-66	J-62	J-63	401	8.0	PVC	120.0	1.55	242.11	0.002
P-67	J-63	J-53	313	8.0	PVC	120.0	1.52	237.77	0.001
P-68	J-51	J-64	286	8.0	PVC	120.0	2.49	390.39	0.004
P-69	J-64	J-42	375	8.0	PVC	120.0	2.46	386.05	0.004
P-70	J-40	J-65	298	8.0	PVC	120.0	0.06	-9.22	0.000
P-71	J-65	J-66	283	8.0	PVC	120.0	0.08	-12.48	0.000
P-72	J-66	J-41	187	8.0	PVC	120.0	0.11	-16.82	0.000
P-73	J-37	J-67	262	8.0	PVC	120.0	0.18	-28.56	0.000
P-74	J-67	J-68	190	8.0	PVC	120.0	0.21	-32.90	0.000
P-75	J-68	J-69	183	8.0	PVC	120.0	0.23	-36.16	0.000
P-76	J-69	J-38	203	8.0	PVC	120.0	0.25	-39.42	0.000
P-77	J-70	J-45	246	8.0	PVC	120.0	0.13	-20.89	0.000
P-78	J-71	J-70	181	8.0	PVC	120.0	0.11	-16.55	0.000
P-79	J-49	J-72	187	8.0	PVC	120.0	0.05	-7.87	0.000
P-79	J-24	J-23	154	8.0	PVC	120.0	1.08	169.35	0.001
P-80	J-72	J-71	299	8.0	PVC	120.0	0.08	-12.21	0.000
P-80	J-23	J-22	192	8.0	PVC	120.0	1.05	165.01	0.001
P-81	J-47	J-73	293	8.0	PVC	120.0	0.14	-21.40	0.000
P-82	J-73	J-74	365	8.0	PVC	120.0	0.16	-25.74	0.000
P-83	J-74	J-48	379	8.0	PVC	120.0	0.19	-30.08	0.000
P-84	J-49	J-75	250	8.0	PVC	120.0	0.46	-71.36	0.000
P-84(2)	J-20	J-55	525	8.0	PVC	120.0	0.56	-88.35	0.000
P-85	J-75	J-76	252	8.0	PVC	120.0	0.48	-75.70	0.000
P-85	J-24	J-17	144	8.0	PVC	120.0	2.16	-338.54	0.003
P-86	J-46	J-77	468	8.0	PVC	120.0	1.50	-235.17	0.001
P-86(1)	J-25	J-4	99	8.0	PVC	120.0	2.03	-317.27	0.003
P-86(2)	J-4	J-26	95	8.0	PVC	120.0	2.06	-322.15	0.003
P-87	J-77	J-50	493	8.0	PVC	120.0	1.53	-239.51	0.002
P-87	J-2	J-25	217	8.0	PVC	120.0	1.92	-300.45	0.002
P-88	J-78	J-32	314	8.0	PVC	120.0	1.05	-164.40	0.001
P-88	J-2	J-26	313	8.0	PVC	120.0	2.29	-358.50	0.003
P-89	J-31	J-79	191	8.0	PVC	120.0	1.00	-156.27	0.001
P-89	J-2	J-16	1,251	8.0	PVC	120.0	4.19	655.70	0.010
P-90	J-79	J-78	330	8.0	PVC	120.0	1.02	-160.06	0.001
P-90	J-3	J-5	251	8.0	PVC	120.0	1.30	-204.10	0.001
P-91	J-32	J-80	181	8.0	PVC	120.0	1.50	235.26	0.001
P-91	J-17	J-3	455	8.0	PVC	120.0	3.95	-618.81	0.009
P-92	J-80	J-31	239	8.0	PVC	120.0	1.47	230.92	0.001
P-92	J-7	J-9	259	8.0	PVC	120.0	0.06	8.68	0.000
P-93	J-48	J-81	195	8.0	PVC	120.0	0.26	40.47	0.000
P-93	J-55	J-19	361	8.0	PVC	120.0	0.58	-91.60	0.000
P-94	J-81	J-82	216	8.0	PVC	120.0	0.23	36.13	0.000

Spring Hill
Active Scenario: MAX HOUR
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-94	J-21	J-22	301	8.0	PVC	120.0	1.03	-160.67	0.001
P-95	J-82	J-47	150	8.0	PVC	120.0	0.20	31.79	0.000
P-95	J-18	J-24	286	8.0	PVC	120.0	1.06	-165.94	0.001
P-96	J-7	J-12	135	8.0	PVC	120.0	0.62	-97.02	0.000
P-98	J-84	J-30	183	8.0	PVC	120.0	2.41	-377.97	0.003
P-99	J-85	J-84	60	8.0	PVC	120.0	2.39	-374.71	0.003
P-100	J-29	J-86	388	8.0	PVC	120.0	2.34	-367.12	0.003
P-101	J-86	J-85	312	8.0	PVC	120.0	2.36	-370.37	0.003
P-102(1)	J-36	J-57	181	8.0	PVC	120.0	1.22	191.27	0.001
P-102(2)	J-57	J-87	151	8.0	PVC	120.0	1.20	187.47	0.001
P-103	J-87	J-37	244	8.0	PVC	120.0	1.17	183.13	0.001
P-104	J-53	J-88	638	8.0	PVC	120.0	1.54	-240.75	0.002
P-105	J-88	J-52	276	8.0	PVC	120.0	1.56	-245.09	0.002
P-106	J-34	J-89	201	8.0	PVC	120.0	1.31	-205.33	0.001
P-107	J-89	J-90	242	8.0	PVC	120.0	1.34	-209.67	0.001
P-108	J-90	J-35	170	8.0	PVC	120.0	1.37	-215.10	0.001
P-109	J-76	J-83	278	8.0	PVC	120.0	0.51	-80.04	0.000
P-110	J-83	J-46	169	8.0	PVC	120.0	0.54	-84.38	0.000
P-111	J-44	J-58	199	8.0	PVC	120.0	0.30	-46.68	0.000
P-112	J-58	J-47	389	8.0	PVC	120.0	0.31	-48.85	0.000
P-113	R-4	J-51	219	8.0	PVC	120.0	8.74	1,369.40	0.038

Spring Hill
Active Scenario: MAX HOUR
FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-1	4,964.71	0.00	65.3	5,115.58
J-2	4,983.63	3.26	66.3	5,136.82
J-3	4,986.00	0.00	58.4	5,120.91
J-4	4,985.16	4.88	65.9	5,137.57
J-5	4,983.80	4.34	59.4	5,121.19
J-6	4,984.30	4.34	59.2	5,121.23
J-7	4,988.58	4.34	57.4	5,121.26
J-8	4,990.92	4.88	63.3	5,137.32
J-9	4,986.70	4.34	58.2	5,121.26
J-10	4,988.00	4.34	57.7	5,121.26
J-11	4,990.49	4.34	66.1	5,143.24
J-12	4,991.58	0.00	56.1	5,121.29
J-13	4,996.71	5.43	54.0	5,121.59
J-14	4,994.67	5.43	55.0	5,121.76
J-15	4,989.15	4.34	57.5	5,122.13
J-16	4,991.65	0.00	57.6	5,124.70
J-17	4,974.14	0.00	61.8	5,116.95
J-18	4,970.03	4.34	63.3	5,116.32
J-19	4,968.72	4.34	63.7	5,116.04
J-20	4,966.03	4.34	64.8	5,115.82
J-21	4,966.42	4.34	64.7	5,116.06
J-22	4,969.77	4.34	63.4	5,116.27
J-23	4,971.61	4.34	62.7	5,116.42
J-24	4,972.46	3.26	62.3	5,116.54
J-25	4,987.00	3.26	65.0	5,137.32
J-26	4,984.04	4.34	66.5	5,137.81
J-27	4,988.16	4.34	66.2	5,141.19
J-28	4,991.60	4.34	63.0	5,137.32
J-29	5,012.06	3.26	70.4	5,174.71
J-30	5,016.00	4.88	70.0	5,177.89
J-31	5,018.50	4.34	69.4	5,178.82
J-32	5,025.69	4.34	66.5	5,179.41
J-33	5,023.49	4.34	68.2	5,181.13
J-34	5,019.30	4.34	70.1	5,181.30
J-35	5,023.56	4.34	68.6	5,182.02
J-36	5,026.60	3.26	67.3	5,182.05
J-37	5,032.11	4.34	64.6	5,181.51
J-38	5,029.83	0.00	65.6	5,181.54
J-39	5,022.22	0.00	68.7	5,181.05
J-40	5,031.17	0.00	65.5	5,182.53
J-41	5,041.78	0.00	60.9	5,182.53
J-42	5,043.98	4.34	60.2	5,183.03
J-43	5,038.09	4.34	62.7	5,183.03
J-44	5,026.34	4.34	67.4	5,182.23
J-45	5,030.65	4.34	65.6	5,182.36
J-46	5,035.69	4.34	63.5	5,182.53

Spring Hill
Active Scenario: MAX HOUR
FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-47	5,031.90	4.34	65.1	5,182.27
J-48	5,041.23	4.34	61.0	5,182.30
J-49	5,045.40	4.34	59.3	5,182.35
J-50	5,049.25	4.34	58.3	5,183.94
J-51	5,041.59	4.34	62.2	5,185.46
J-52	5,036.60	4.88	63.7	5,183.83
J-53	5,025.00	4.88	68.1	5,182.43
J-54	4,971.65	4.34	62.7	5,116.53
J-55	4,971.92	3.26	62.3	5,115.95
J-56	4,967.81	4.34	64.2	5,116.16
J-57	5,028.21	3.80	66.5	5,181.87
J-58	5,028.20	2.17	66.6	5,182.24
J-59	4,989.11	4.34	64.1	5,137.32
J-60	5,045.05	4.34	60.0	5,183.63
J-61	5,040.70	4.34	61.7	5,183.28
J-62	5,033.46	4.88	64.9	5,183.51
J-63	5,028.17	4.34	66.9	5,182.89
J-64	5,044.04	4.34	60.7	5,184.39
J-65	5,035.07	3.26	63.8	5,182.53
J-66	5,039.17	4.34	62.0	5,182.53
J-67	5,034.36	4.34	63.7	5,181.51
J-68	5,033.54	3.26	64.0	5,181.52
J-69	5,031.67	3.26	64.8	5,181.53
J-70	5,032.56	4.34	64.8	5,182.35
J-71	5,034.49	4.34	64.0	5,182.35
J-72	5,041.03	4.34	61.1	5,182.35
J-73	5,034.24	4.34	64.0	5,182.28
J-74	5,037.58	4.34	62.6	5,182.29
J-75	5,049.55	4.34	57.5	5,182.39
J-76	5,044.76	4.34	59.6	5,182.43
J-77	5,046.96	4.34	58.9	5,183.21
J-78	5,022.36	4.34	67.9	5,179.18
J-79	5,019.64	3.80	68.9	5,178.95
J-80	5,022.45	4.34	67.8	5,179.15
J-81	5,037.83	4.34	62.5	5,182.29
J-82	5,034.29	4.34	64.0	5,182.28
J-83	5,038.74	4.34	62.2	5,182.49
J-84	5,013.44	3.26	70.9	5,177.25
J-85	5,012.76	4.34	71.1	5,177.05
J-86	5,008.94	3.26	72.3	5,176.00
J-87	5,029.56	4.34	65.8	5,181.73
J-88	5,032.99	4.34	65.1	5,183.40
J-89	5,020.16	4.34	69.8	5,181.52
J-90	5,022.28	5.43	69.0	5,181.81

Spring Hill
Active Scenario: MAX HOUR
FlexTable: Reservoir Table

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
101	R-1	5,150.18	693.68	5,150.18
104	R-2	5,107.00	-577.58	5,107.00
107	R-3	5,162.45	-1,142.62	5,162.45
321	R-4	5,193.75	1,369.40	5,193.75

MAX DAY WITH

FIRE FLOW

Spring Hill
Active Scenario: MAX DAY WITH FIRE FLOW
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-4	J-5	J-6	192	8.0	PVC	120.0	3.90	611.73	0.009
P-5	J-6	J-7	144	8.0	PVC	120.0	3.87	606.09	0.008
P-8	J-9	J-10	180	8.0	PVC	120.0	9.61	1,505.64	0.045
P-11	J-12	J-5	224	8.0	PVC	120.0	1.76	-276.44	0.002
P-12	J-12	J-13	216	8.0	PVC	120.0	4.05	-634.40	0.009
P-13	J-13	J-14	124	8.0	PVC	120.0	4.09	-641.45	0.009
P-15	J-3	J-15	293	8.0	PVC	120.0	2.01	-314.62	0.002
P-16	J-15	J-14	248	8.0	PVC	120.0	4.14	648.51	0.009
P-17	J-15	J-16	265	8.0	PVC	120.0	6.18	-968.77	0.020
P-27	J-26	J-27	321	8.0	PVC	120.0	6.43	-1,006.85	0.021
P-28(1)	R-1	J-11	645	8.0	PVC	120.0	6.50	1,018.14	0.022
P-28(2)	J-11	J-27	193	8.0	PVC	120.0	6.46	1,012.50	0.022
P-29	R-2	J-1	1,120	8.0	PVC	120.0	4.04	632.79	0.009
P-30	R-3	J-29	452	8.0	PVC	120.0	3.52	-551.29	0.007
P-31	J-30	J-31	258	8.0	PVC	120.0	1.48	231.85	0.001
P-32	J-32	J-33	435	8.0	PVC	120.0	5.08	-795.66	0.014
P-33	J-33	J-34	150	8.0	PVC	120.0	2.26	-353.65	0.003
P-34	J-35	J-36	347	8.0	PVC	120.0	0.72	-113.35	0.000
P-35	J-37	J-33	324	8.0	PVC	120.0	2.86	447.65	0.005
P-36	J-38	J-39	208	8.0	PVC	120.0	1.30	203.95	0.001
P-37	J-29	J-39	475	8.0	PVC	120.0	5.16	-807.83	0.014
P-38	J-36	J-40	289	8.0	PVC	120.0	2.49	-389.94	0.004
P-39	J-41	J-38	336	8.0	PVC	120.0	2.61	409.57	0.004
P-40	J-41	J-42	155	8.0	PVC	120.0	3.12	-488.38	0.006
P-41	J-42	J-43	280	8.0	PVC	120.0	0.27	41.59	0.000
P-42	J-43	J-40	328	8.0	PVC	120.0	2.22	347.62	0.003
P-43	J-35	J-44	288	8.0	PVC	120.0	1.69	-264.28	0.002
P-44	J-44	J-45	304	8.0	PVC	120.0	1.22	-191.25	0.001
P-45	J-45	J-46	280	8.0	PVC	120.0	1.43	-224.36	0.001
P-46	J-46	J-40	280	8.0	PVC	120.0	0.17	-26.62	0.000
P-47	J-48	J-49	280	8.0	PVC	120.0	0.74	-115.35	0.000
P-48	J-50	J-51	280	8.0	PVC	120.0	4.24	-664.99	0.010
P-49	J-51	J-52	280	8.0	PVC	120.0	4.05	634.21	0.009
P-50	J-53	J-39	260	8.0	PVC	120.0	3.85	603.88	0.008
P-51(2)	J-17	J-54	208	8.0	PVC	120.0	1.71	-268.41	0.002
P-52(1)(1)	J-54	J-19	252	8.0	PVC	120.0	1.75	-274.05	0.002
P-52(1)(2)	J-19	J-20	244	8.0	PVC	120.0	1.20	-188.36	0.001
P-52(2)	J-20	J-1	134	8.0	PVC	120.0	1.85	-289.57	0.002
P-54(1)	J-1	J-21	191	8.0	PVC	120.0	2.19	343.22	0.003
P-54(2)	J-21	J-56	143	8.0	PVC	120.0	1.08	169.31	0.001
P-55(1)	J-56	J-18	230	8.0	PVC	120.0	1.04	163.66	0.001
P-60(1)	J-28	J-8	67	8.0	PVC	120.0	0.04	-5.64	0.000
P-60(2)	J-8	J-59	130	8.0	PVC	120.0	0.08	-11.99	0.000
P-61	J-59	J-25	137	8.0	PVC	120.0	0.11	-17.63	0.000
P-62	J-50	J-60	222	8.0	PVC	120.0	2.06	322.95	0.003

Spring Hill
Active Scenario: MAX DAY WITH FIRE FLOW
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-63	J-60	J-61	253	8.0	PVC	120.0	2.03	317.31	0.003
P-64	J-61	J-43	187	8.0	PVC	120.0	1.99	311.67	0.002
P-65	J-52	J-62	202	8.0	PVC	120.0	2.01	315.17	0.002
P-66	J-62	J-63	401	8.0	PVC	120.0	1.97	308.82	0.002
P-67	J-63	J-53	313	8.0	PVC	120.0	1.94	303.18	0.002
P-68	J-51	J-64	286	8.0	PVC	120.0	3.45	541.26	0.007
P-69	J-64	J-42	375	8.0	PVC	120.0	3.42	535.62	0.007
P-70	J-40	J-65	298	8.0	PVC	120.0	0.44	-68.94	0.000
P-71	J-65	J-66	283	8.0	PVC	120.0	0.47	-73.17	0.000
P-72	J-66	J-41	187	8.0	PVC	120.0	0.50	-78.81	0.000
P-73	J-37	J-67	262	8.0	PVC	120.0	1.22	-191.52	0.001
P-74	J-67	J-68	190	8.0	PVC	120.0	1.26	-197.16	0.001
P-75	J-68	J-69	183	8.0	PVC	120.0	1.29	-201.39	0.001
P-76	J-69	J-38	203	8.0	PVC	120.0	1.31	-205.62	0.001
P-77	J-70	J-45	246	8.0	PVC	120.0	0.18	-27.47	0.000
P-78	J-71	J-70	181	8.0	PVC	120.0	0.14	-21.82	0.000
P-79	J-49	J-72	187	8.0	PVC	120.0	0.07	-10.54	0.000
P-79	J-24	J-23	154	8.0	PVC	120.0	1.00	-156.99	0.001
P-80	J-72	J-71	299	8.0	PVC	120.0	0.10	-16.18	0.000
P-80	J-23	J-22	192	8.0	PVC	120.0	1.04	-162.63	0.001
P-81	J-47	J-73	293	8.0	PVC	120.0	0.23	-35.33	0.000
P-82	J-73	J-74	365	8.0	PVC	120.0	0.26	-40.97	0.000
P-83	J-74	J-48	379	8.0	PVC	120.0	0.30	-46.62	0.000
P-84	J-49	J-75	250	8.0	PVC	120.0	0.70	-110.45	0.000
P-84(2)	J-20	J-55	525	8.0	PVC	120.0	0.61	95.57	0.000
P-85	J-75	J-76	252	8.0	PVC	120.0	0.74	-116.09	0.000
P-85	J-24	J-17	144	8.0	PVC	120.0	1.98	310.78	0.002
P-86	J-46	J-77	468	8.0	PVC	120.0	2.11	-330.75	0.003
P-86(1)	J-25	J-4	99	8.0	PVC	120.0	2.98	-466.39	0.005
P-86(2)	J-4	J-26	95	8.0	PVC	120.0	3.02	-472.74	0.005
P-87	J-77	J-50	493	8.0	PVC	120.0	2.15	-336.39	0.003
P-87	J-2	J-25	217	8.0	PVC	120.0	2.84	-444.53	0.005
P-88	J-78	J-32	314	8.0	PVC	120.0	3.80	-595.78	0.008
P-88	J-2	J-26	313	8.0	PVC	120.0	3.37	-528.48	0.007
P-89	J-31	J-79	191	8.0	PVC	120.0	2.65	414.80	0.004
P-89	J-2	J-16	1,251	8.0	PVC	120.0	6.18	968.77	0.020
P-90	J-79	J-78	330	8.0	PVC	120.0	2.62	409.87	0.004
P-90	J-3	J-5	251	8.0	PVC	120.0	5.70	893.81	0.017
P-91	J-32	J-80	181	8.0	PVC	120.0	1.24	194.24	0.001
P-91	J-17	J-3	455	8.0	PVC	120.0	3.70	579.19	0.008
P-92	J-80	J-31	239	8.0	PVC	120.0	1.20	188.60	0.001
P-92	J-7	J-9	259	8.0	PVC	120.0	9.65	1,511.28	0.046
P-93	J-48	J-81	195	8.0	PVC	120.0	0.40	63.09	0.000
P-93	J-55	J-19	361	8.0	PVC	120.0	0.58	91.33	0.000
P-94	J-81	J-82	216	8.0	PVC	120.0	0.37	57.44	0.000

Spring Hill
Active Scenario: MAX DAY WITH FIRE FLOW
FlexTable: Pipe Table

Label	Start Node	Stop Node	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Velocity (ft/s)	Flow (gpm)	Headloss Gradient (ft/ft)
P-94	J-21	J-22	301	8.0	PVC	120.0	1.07	168.28	0.001
P-95	J-82	J-47	150	8.0	PVC	120.0	0.33	51.80	0.000
P-95	J-18	J-24	286	8.0	PVC	120.0	1.01	158.02	0.001
P-96	J-7	J-12	135	8.0	PVC	120.0	5.81	-910.84	0.018
P-98	J-84	J-30	183	8.0	PVC	120.0	1.52	238.19	0.001
P-99	J-85	J-84	60	8.0	PVC	120.0	1.55	242.43	0.002
P-100	J-29	J-86	388	8.0	PVC	120.0	1.61	252.30	0.002
P-101	J-86	J-85	312	8.0	PVC	120.0	1.58	248.07	0.002
P-102(1)	J-36	J-57	181	8.0	PVC	120.0	1.74	272.35	0.002
P-102(2)	J-57	J-87	151	8.0	PVC	120.0	1.71	267.42	0.002
P-103	J-87	J-37	244	8.0	PVC	120.0	1.67	261.77	0.002
P-104	J-53	J-88	638	8.0	PVC	120.0	1.96	-307.05	0.002
P-105	J-88	J-52	276	8.0	PVC	120.0	2.00	-312.69	0.002
P-106	J-34	J-89	201	8.0	PVC	120.0	2.29	-359.29	0.003
P-107	J-89	J-90	242	8.0	PVC	120.0	2.33	-364.94	0.003
P-108	J-90	J-35	170	8.0	PVC	120.0	2.37	-371.99	0.003
P-109	J-76	J-83	278	8.0	PVC	120.0	0.78	-121.73	0.000
P-110	J-83	J-46	169	8.0	PVC	120.0	0.81	-127.37	0.000
P-111	J-44	J-58	199	8.0	PVC	120.0	0.50	-78.67	0.000
P-112	J-58	J-47	389	8.0	PVC	120.0	0.52	-81.49	0.000
P-113	R-4	J-51	219	8.0	PVC	120.0	11.78	1,846.10	0.066

Spring Hill
Active Scenario: MAX DAY WITH FIRE FLOW
FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-1	4,964.71	0.00	57.2	5,096.83
J-2	4,983.63	4.23	60.3	5,122.96
J-3	4,986.00	0.00	45.8	5,091.94
J-4	4,985.16	6.35	60.3	5,124.49
J-5	4,983.80	5.64	44.9	5,087.63
J-6	4,984.30	5.64	44.0	5,085.99
J-7	4,988.58	5.64	41.6	5,084.78
J-8	4,990.92	6.35	57.6	5,123.98
J-9	4,986.70	5.64	37.3	5,072.97
J-10	4,988.00	1,505.64	33.2	5,064.85
J-11	4,990.49	5.64	63.0	5,136.06
J-12	4,991.58	0.00	41.4	5,087.19
J-13	4,996.71	7.05	40.0	5,089.16
J-14	4,994.67	7.05	41.4	5,090.31
J-15	4,989.15	5.64	44.8	5,092.67
J-16	4,991.65	0.00	46.0	5,097.97
J-17	4,974.14	0.00	52.5	5,095.44
J-18	4,970.03	5.64	54.5	5,095.99
J-19	4,968.72	5.64	55.2	5,096.31
J-20	4,966.03	5.64	56.5	5,096.55
J-21	4,966.42	5.64	56.2	5,096.28
J-22	4,969.77	5.64	54.6	5,096.04
J-23	4,971.61	5.64	53.8	5,095.90
J-24	4,972.46	4.23	53.4	5,095.79
J-25	4,987.00	4.23	59.3	5,123.98
J-26	4,984.04	5.64	61.0	5,124.99
J-27	4,988.16	5.64	62.2	5,131.87
J-28	4,991.60	5.64	57.3	5,123.98
J-29	5,012.06	4.23	66.4	5,165.63
J-30	5,016.00	6.35	64.1	5,164.13
J-31	5,018.50	5.64	62.8	5,163.76
J-32	5,025.69	5.64	59.9	5,164.18
J-33	5,023.49	5.64	63.5	5,170.21
J-34	5,019.30	5.64	65.5	5,170.67
J-35	5,023.56	5.64	64.5	5,172.68
J-36	5,026.60	4.23	63.3	5,172.81
J-37	5,032.11	5.64	60.4	5,171.76
J-38	5,029.83	0.00	61.8	5,172.65
J-39	5,022.22	0.00	65.0	5,172.41
J-40	5,031.17	0.00	61.7	5,173.88
J-41	5,041.78	0.00	57.2	5,174.01
J-42	5,043.98	5.64	56.6	5,174.88
J-43	5,038.09	5.64	59.2	5,174.86
J-44	5,026.34	5.64	63.5	5,173.20
J-45	5,030.65	5.64	61.8	5,173.50
J-46	5,035.69	5.64	59.8	5,173.87

Spring Hill
Active Scenario: MAX DAY WITH FIRE FLOW
FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydraulic Grade (ft)
J-47	5,031.90	5.64	61.2	5,173.32
J-48	5,041.23	5.64	57.2	5,173.38
J-49	5,045.40	5.64	55.4	5,173.49
J-50	5,049.25	5.64	55.1	5,176.54
J-51	5,041.59	5.64	59.6	5,179.33
J-52	5,036.60	6.35	60.6	5,176.78
J-53	5,025.00	6.35	64.7	5,174.58
J-54	4,971.65	5.64	53.7	5,095.83
J-55	4,971.92	4.23	53.9	5,096.41
J-56	4,967.81	5.64	55.5	5,096.16
J-57	5,028.21	4.94	62.4	5,172.47
J-58	5,028.20	2.82	62.8	5,173.24
J-59	4,989.11	5.64	58.4	5,123.98
J-60	5,045.05	5.64	56.6	5,175.96
J-61	5,040.70	5.64	58.2	5,175.32
J-62	5,033.46	6.35	61.8	5,176.27
J-63	5,028.17	5.64	63.7	5,175.31
J-64	5,044.04	5.64	57.7	5,177.38
J-65	5,035.07	4.23	60.1	5,173.93
J-66	5,039.17	5.64	58.3	5,173.97
J-67	5,034.36	5.64	59.6	5,172.02
J-68	5,033.54	4.23	60.0	5,172.22
J-69	5,031.67	4.23	60.9	5,172.42
J-70	5,032.56	5.64	61.0	5,173.50
J-71	5,034.49	5.64	60.1	5,173.49
J-72	5,041.03	5.64	57.3	5,173.49
J-73	5,034.24	5.64	60.2	5,173.33
J-74	5,037.58	5.64	58.7	5,173.35
J-75	5,049.55	5.64	53.7	5,173.58
J-76	5,044.76	5.64	55.8	5,173.68
J-77	5,046.96	5.64	55.5	5,175.15
J-78	5,022.36	1,005.64	60.3	5,161.63
J-79	5,019.64	4.94	62.0	5,162.97
J-80	5,022.45	5.64	61.2	5,163.99
J-81	5,037.83	5.64	58.6	5,173.35
J-82	5,034.29	5.64	60.2	5,173.33
J-83	5,038.74	5.64	58.4	5,173.80
J-84	5,013.44	4.23	65.3	5,164.40
J-85	5,012.76	5.64	65.6	5,164.49
J-86	5,008.94	4.23	67.5	5,164.99
J-87	5,029.56	5.64	61.7	5,172.19
J-88	5,032.99	5.64	61.9	5,176.10
J-89	5,020.16	5.64	65.4	5,171.31
J-90	5,022.28	7.05	64.8	5,172.10

Spring Hill
Active Scenario: MAX DAY WITH FIRE FLOW
FlexTable: Reservoir Table

ID	Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
101	R-1	5,150.18	1,018.14	5,150.18
104	R-2	5,107.00	632.79	5,107.00
107	R-3	5,162.45	-551.29	5,162.45
321	R-4	5,193.75	1,846.10	5,193.75

SANITARY SEWER LAYOUT

SPRING HILL SANITARY SEWER SYSTEM

CO 3

HWY 52

TIE INTO EXISTING SS LINE

TIE INTO EXISTING SS LINE

TIE INTO EXISTING SS LINE

TIE INTO EXISTING SS LINE

TIE INTO EXISTING SS LINE

TIE INTO EXISTING SS LINE

NOTE:
SEE SANITARY PLANS
FOR MORE DETAIL

200 100 0 200 400

SCALE: 1" = 200'

No.	Revisions	Date	Init.	Appr.	Date
			CVL		

CVL a Westwood team
10333 E. Dry Creek Rd.
Suite 240
Englewood, CO 80112
Tel:720.482.952
www.cvlinc.net
westwoodps.com

SPRING HILL
EXHIBIT
SANITARY SEWER SYSTEM EXHIBIT

SCALE:	AS SHOWN	FILE NO:	8130307501
DRAWN BY:	MSD		
CHECKED BY:	BPW		
DATE:	DECEMBER, 2021		
SHEET NUMBER	EX		

N:\PROJECTS\SPRING HILL\CAD\ENGINEERING\EXHIBITS\8-30-21 SPRING HILL SANITARY SEWER SYSTEM.DWG, AALAMAR, 12/1/2021 1:27 PM

SECTION 600 WATER SUPPLY FACILITIES

610.00 DESIGN CRITERIA

610.01 General

All water distribution systems shall comply with the requirements of the STANDARDS AND SPECIFICATIONS for water main and service line construction and may include special criteria established by the Town for the overall hydraulics of the water utility system. Special criteria shall be outlined at pre-design meetings scheduled, as determined necessary, by the Town Engineer. The requirements set forth in the latest edition of the Denver Water Board Engineering Standards shall apply for information not set forth in these STANDARDS AND SPECIFICATIONS.

611.00 Design Flow Requirements

The design of the water distribution system shall be based on the following:

UNIT WATER DEMANDS FOR FUTURE LAND USE

Land Type	Avg. Demand	Max. Day Demand	Peak Hour: Max. Day Flow Ratio
Residential	140 GPCD*	1,000 gpd/SFE	2.0
Commercial	N/A	3,000 gpd/acre	2.0
Industrial	N/A	1,630 gpd/SFE	2.0

*Gallons Per Capita/Day

611.01 Fire Flows

Fire flows may be calculated from more than one hydrant, providing the hydrants used are directly accessible to all possible fire locations in the area served. Fire flows, per Mountain View Fire Protection District, shall be:

A. Available fire flow shall be based on a 20 psi residual minimum.

B. Minimum fire flow for any newly developed areas:

1. 1 and 2 family units..... 1,000 gpm, 2 hour duration
2. Multi-family units ..... 1,500 gpm, 2 hour duration
3. Institutional development 2,000 gpm, 2 hour duration
4. Commercial development..... 2,500 gpm, 2 hour duration
5. Industrial development..... 3,500 gpm, 3 duration

SECTION 700 SANITARY SEWER FACILITIES

710.00 DESIGN CRITERIA

711.00 General

All extensions of and/or additions to the Town sewer systems will comply with the requirements of these STANDARDS AND SPECIFICATIONS for sewer main and service line construction.

712.00 Design Flow

The design will include consideration of providing service for the entire area tributary to the outfall point. The following wastewater flow rates, which include infiltration, shall be used:

User Type	Unit Wastewater Flow Rate
Residential	90 gallons/capita/day
Industrial	1,500 gallons/acre/day
Commercial	1,000 gallons/acre/day
Park/Recreation	50 gallons/acre/day
Elementary Schools	13 gallons/student/day
Jr. & Sr. High Schools	20 gallons/student/day

The Town's minimum residential population density or household density is 2.89 people per dwelling unit. The land usage shall be as noted on an approved PUD and/or Plat.

Wastewater flow peaking factors shall be computed using the following equation:

$$PF = 2.6 * Q_{\text{Max Day}}^{-0.16}$$

Where $Q_{\text{Max Day}}$ = maximum daily flow in CFS

The peaking factor will not be less than 2.0 or greater than four (4.0).

713.00 Hydraulic Design

Sewers twelve (12) inches in diameter and smaller shall carry the peak design flow at a maximum flow depth of fifty percent (50%) of the pipe diameter (d/D). Sewer mains larger than twelve (12) inches in diameter may be designed to 0.70 d/D at the peak design flow rate.

The minimum velocity at the peak design flow rate shall be two (2) feet per second. Where actual flow will be considerably below the design flow for several years, the Town Engineer may require that the minimum velocity be attained by suitable grades at the partial peak design flow rate.

PRELIMINARY GEOTECHNICAL SUBSURFACE EXPLORATION REPORT
PROPOSED ANDALUSIA DEVELOPMENT
WELD COUNTY, COLORADO
SOILOGIC # 13-1109
September 27, 2013

September 27, 2013

Moradi Properties
c/o Mr. Jerry Bouldin- Owner's Authorized Representative
3733 Florentine Circle
Longmont, Colorado 80503

Attn: Mr. Jerry Bouldin

Re: Preliminary Geotechnical Subsurface Exploration Report
Proposed Andalusia Development - 313 Acre Parcel
Southwest Corner of Colorado State Highway 52 and Weld County Road 3
Weld County, Colorado
Soilogic Project #13-1109

Mr. Bouldin:

Soilogic, Inc. (Soilogic) personnel have completed the preliminary geotechnical subsurface exploration you requested for the proposed Andalusia PUD, a single and multi-family residential development on approximately 313 acres of land located southwest of the intersection of Colorado State Highway 52 and County Road 3 in Weld County, Colorado. The results of our preliminary explorations are included with this report.

The subsurface materials encountered in the completed test borings consisted of approximately 4 to 6 inches of vegetation and topsoil underlain by brown/rust/beige/gray sandy lean clay and silty to clayey sand. The lean clay and silty/clayey sand varied from very soft to very stiff in terms of consistency or very loose to dense in terms of relative density and typically showed no to low swell potential at current moisture and density conditions. The lean clay/silty, clayey sand extended to the bottom of borings B-1, B-4, B-6, B-7, B-8, B-10 and B-15 at a depth of approximately 15 feet below present site grade and to depths ranging from approximately 8½ to 14½ feet below ground surface in the remainder of the completed site borings and was underlain by siltstone/sandstone and/or claystone bedrock of varying composition or sand with silt and gravel. The bedrock varied from weathered to very hard in hardness. The siltstone/sandstone and interbedded sandstone/siltstone/claystone bedrock typically showed low swell potential at in-situ moisture and density conditions, while the claystone bedrock showed very high swell potential. Borings B-2, B-3, B-5 and B-11 through B-14 were terminated at a

depths ranging of approximately 15 feet below present site grades in the competent bedrock. Boring B-9 was terminated at a depth of approximately 15 feet below present site grade in a sand with silt and gravel deposit.

The subsurface materials encountered in the subsequent test pits excavated at the subject property consisted of approximately the same subsurface stratigraphy. The lean clay and silty/clayey sand varied from very soft to stiff in terms of consistency or very loose to medium dense in terms of relative density and typically showed no to low swell potential at current moisture and density conditions. The lean clay/silty, clayey sand extended to the bottom of test pits TP-1 through TP-7, TP-9 and TP-11 at depths of approximately 5 to 10 feet below present site grade and to depths ranging from approximately 4 to 9 feet below ground surface in the remainder of the completed test pits and was underlain by bedrock of varying composition similar as previously discussed. Test pits TP-8 and TP-10 were terminated at a depth of approximately 10 feet below present site grades in the competent bedrock.

Groundwater level measurements were completed in all borings approximately 24 hours after the completion of drilling. Groundwater was measured in borings B-2, B-3, B-5, B-7 through B-9, B-11 and B-15 at depths ranging from about 4 to 13 feet below present site grades. Borings B-1, B-6, B-10 and B-12 through B-14 were observed to be dry to the approximate depths explored at that time, while boring B-4 had dry caved at a depth of about 7½ feet below ground surface. Groundwater level measurements were completed in the test pit excavations shortly after completion. Groundwater was measured at depths between about 2 to 3½ feet below ground surface in test pits TP-1 through TP-5, and at depths between about 6 to 8 feet below ground surface in test pits TP-6 through TP-8. Test pits TP-9 through TP-11 remained dry to the depth explored, about 10 feet below ground surface.

Based on the subsurface conditions encountered and type of construction proposed, we expect most of the proposed lightly-loaded residential structures could be constructed with conventional spread footing foundations and slab-on-grade floors bearing on the site lean clay, silty/clayey sand or underlying siltstone/sandstone bedrock with low swell potential, however, moderate to very high swelling claystone bedrock was encountered on portions of this site at depths which could influence spread footing foundations and

slab-on-grade floors. Where moderate or higher swelling claystone bedrock is encountered within 5 to 6 feet of proposed basement foundation bearing elevation, drilled pier foundations used in conjunction with structurally-supported floor systems should be anticipated.

With the presence of shallow groundwater in areas of the site (notably in the vicinities of borings B-2, B-3 and B-9 and test pits TP-1 through TP-5), care will be needed to maintain adequate separation distances between site groundwater and finish basement floor slab levels. Precluding basement construction will likely be necessary in some areas of the site unless these areas are raised considerably from present site grade. Installation of an underdrain system could also be considered to facilitate basement construction but would require a suitable outfall. Very soft to soft/very loose to loose lean clay/clayey, silty sand was also encountered relatively near-surface in the site borings/test pits completed in these areas. Care will be needed at the time of construction to ensure grading fills are properly compacted such that footing foundations are supported on soils with suitable strength. Overexcavation/backfill procedures could be considered in areas of soft/loose lean clay/clayey and/or silty sand to reduce the potential for post-construction movement of the proposed residences. The soft lean clay/very loose silty, clayey sand encountered relatively near surface in several of the completed site borings/test pits would be subject to consolidation under additionally imposed loads. Areas of the site expected to receive fill depths greater than 3 to 4 feet should be evaluated closely for consolidation potential. Fill soils may need to be placed and allowed to remain in place for several months prior to construction of any overlying improvements in order to allow for consolidation of the underlying soft/very loose soils.

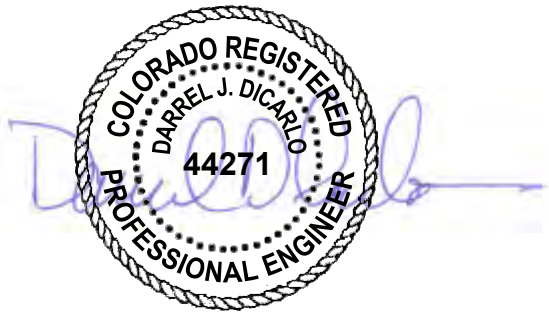
The site lean clay/clayey, silty sand also appears suitable for support of site pavements and exterior flatwork. Depending on finish site grading, stabilization of the pavement subgrades may be necessary to develop a suitable paving platform.

Other preliminary opinions and recommendations concerning design criteria and construction details for the proposed site improvements are included with this report. Pavement section design estimates are also provided. A final subsurface exploration and pavement design report for the interior site roadways should be completed once the roadways have been cut to approximate finish grade. Site-specific explorations should

also be completed for each of the individual residential structures after infrastructure development of the site has been completed.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the enclosed information or if we can be of further service to you in any way, please do not hesitate to contact us.

Very Truly Yours,
Soilogic, Inc.



Darrel DiCarlo, P.E.
Senior Project Engineer

Reviewed by:



Wolf von Carlowitz, P.E.
Principal Engineer

PRELIMINARY GEOTECHNICAL EXPLORATION REPORT
PROPOSED ANDALUSIA DEVELOPMENT
WELD COUNTY, COLORADO
SOILOGIC # 13-1109
September 27, 2013

INTRODUCTION

This report contains the results of the preliminary geotechnical subsurface exploration completed for the proposed Andalusia PUD, a proposed single and multi-family residential development located southwest of the intersection of Colorado State Highway 52 and Weld County Road 3, north of the Town of Erie, Colorado. The purpose of our investigation was to describe the subsurface conditions encountered in the completed site borings and test pit excavations and develop preliminary recommendations concerning design and construction of residence foundations and support of floor slabs and site pavements. Recommendations concerning the installation of site utilities and pavement section design estimates for the interior site roadways are also included. The conclusions and recommendations outlined in this report are based on the results of the completed field and laboratory testing and our experience with subsurface conditions in this area. As part of our evaluation, two preliminary geotechnical subsurface exploration reports prepared for the subject parcel by Terracon Consultants Inc. (Project #22055172, dated September 13, 2005 and Project #22055197, dated October 28, 2005) were reviewed.

PROPOSED CONSTRUCTION

The proposed development parcel includes approximately 313 acres to be developed as single and multi-family residential. A small portion of the site at the northeast property boundary may be developed as commercial/retail. We expect the residential structures will be lightly-loaded one or two-story, wood-frame structures which will likely include full basements, if/where subsurface conditions permit. Foundations loads for the structures are expected to be relatively light, with continuous wall loads less than 3 kips per lineal foot and individual column loads less than 75 kips. Floor loads are expected to be light, on the order of 150 psf or less. Infrastructure improvements for the development will include utility installation and roadway construction. We expect the site roadways

will be used by relatively low volumes of automobiles and light trucks. Small grade changes are anticipated to develop finish site grades.

SITE DESCRIPTION

The development site includes a total of approximately 313 acres located in the South ½ and East ½ of Section 6, Township 1 North, Range 68 West of the 6th Principal Meridian in Weld County, Colorado. In general, the site is surrounded by agricultural land and sparse residential development. At the time of our site exploration, the site was being used for agricultural and livestock grazing purposes and contained both tilled and vegetated areas. Residential properties were noted near the north property boundary along CO Highway 52. Site topography is generally characterized by a knoll near the center of the south property line, which is the relative high point of the property. Ground surface slopes downward in a radial fashion from the relative high point. Site drainage across the property was generally toward the north overall, with a maximum difference in ground surface elevation across the site estimated to be approximately 80 to 90 feet based on provided site topography. Numerous water features are located on or adjacent to the property, most notably the Lower Boulder Ditch, Boulder & Weld County Ditch and Cottonwood Extension Ditch, all earth-lined irrigation channels of varying size. These irrigation channels were active and carrying water at the time of our explorations. The site has also been drilled for oil/gas production in the past, as evidenced by several well-heads and associated collection equipment. Evidence of prior building construction was not observed on the development parcel at the time of drilling.

SITE EXPLORATION

Field Exploration

To develop subsurface information across the development parcel, a total of fifteen (15) soil borings were extended to a depth of approximately 15 feet below present site grades across the parcel. In addition, eleven (11) test pits were excavated to depths between approximately 5 to 10 feet below present site grades at selected locations. The boring and test pit locations were selected based upon the provided preliminary development plan and were established in the field by Soilogic personnel by using a mechanical

surveyor's wheel and by estimating angles from identifiable site references. A diagram indicating the approximate boring and test pit locations is included with this report. Graphic logs of each of the auger borings and test pit excavations are also included.

The test holes were advanced using 4-inch diameter continuous-flight auger, powered by a truck-mounted CME-45 drill rig. Samples of the subsurface materials were obtained at regular intervals using California barrel sampling procedures in general accordance with ASTM specification D-1586. As part of the D-1586 sampling procedure, the standard sampling barrel is driven into the substrata using a 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the sampler a distance of 12 inches is recorded and helpful in estimating the consistency, relative density or hardness of the soils or bedrock encountered. In the California barrel sampling procedure, relatively undisturbed samples are obtained in removable brass liners.

Test pits were excavated with a backhoe to the approximate depth of groundwater encountered or to about 10 feet below present site grade, whichever resulted in the lesser excavation depth. A dynamic cone penetrometer was used to estimate the "N" value, or consistency/relative density of the soils encountered. A hand sampler with a California barrel sleeve was driven into the subsoils to obtain relatively intact and undisturbed soil samples at the test pit locations at selected elevations. Samples of the subsurface materials obtained in the field were sealed and returned to the laboratory for further evaluation, classification and testing.

Laboratory Testing

The samples collected were tested in the laboratory to measure natural moisture content and visually and/or manually classified in accordance with the Unified Soil Classification System (USCS). The USCS group symbols are indicated on the attached boring logs. An outline of the USCS classification system is included with this report. Classification of bedrock was completed through visual and tactual observation of disturbed samples. Other bedrock types could be revealed through petrographic analysis.

As part of the laboratory testing, a calibrated hand penetrometer (CHP) was used to estimate the unconfined compressive strength of essentially cohesive specimens. The

CHP also provides a more reliable estimate of soil consistency than tactual observation alone. Dry density, Atterberg limits, -200 wash and swell/consolidation tests were completed on selected samples to help establish specific soil characteristics. Atterberg limits tests are used to determine soil plasticity. The percent passing the #200 size sieve (-200 wash) test is used to determine the percentage of fine grained soils (clay and silt) in a sample. Swell/consolidation tests are performed to evaluate soil and bedrock volume change potential with variation in moisture content. The results of the completed laboratory tests are outlined on the attached boring and test pit logs and swell/ consolidation test summaries.

SUBSURFACE CONDITIONS

The subsurface materials encountered in the completed test borings consisted of approximately 4 to 6 inches of vegetation and topsoil underlain by brown/rust/beige/gray sandy lean clay and silty to clayey sand. The lean clay and silty/clayey sand varied from very soft to very stiff in terms of consistency or very loose to dense in terms of relative density and typically showed no to low swell potential at current moisture and density conditions. The lean clay/silty, clayey sand extended to the bottom of borings B-1, B-4, B-6, B-7, B-8, B-10 and B-15 at a depth of approximately 15 feet below present site grade and to depths ranging from approximately 8½ to 14½ feet below ground surface in the remainder of the completed site borings and was underlain by siltstone/sandstone and/or claystone bedrock of varying composition or sand with silt and gravel. The bedrock varied from weathered to very hard in hardness. The siltstone/sandstone and interbedded interbedded sandstone/siltstone/claystone bedrock typically showed low swell potential at in-situ moisture and density conditions, while the claystone bedrock tested showed very high swell potential. Borings B-2, B-3, B-5 and B-11 through B-14 were terminated in the competent bedrock at a depth of approximately 15 feet below present site grades. Boring B-9 was terminated at a depth of approximately 15 feet below present site grade in sand with silt and gravel.

The subsurface materials encountered in the subsequent test pits excavated at the subject property consisted of approximately the same subsurface stratigraphy. The lean clay and silty/clayey sand varied from very soft to stiff in terms of consistency or very loose to medium dense in terms of relative density and typically showed no to low swell potential

at current moisture and density conditions. The lean clay/silty, clayey sand extended to the bottom of test pits TP-1 through TP-7, TP-9 and TP-11 at depths of approximately 5 to 10 feet below present site grade and to depths ranging from approximately 4 to 9 feet below ground surface in the remainder of the completed test pits and was underlain by bedrock of varying composition similar as previously discussed. Test pits TP-8 and TP-10 were terminated at a depth of approximately 10 feet below present site grades in the competent bedrock.

The stratigraphy indicated on the included boring and test pit logs represents the approximate location of changes in soil and bedrock types. Actual changes may be more gradual than those indicated.

Groundwater level measurements were completed in all borings immediately after the completion of drilling and approximately 24 hours later. Groundwater was measured in borings B-2, B-3, B-5, B-7 through B-9, B-11 and B-15 at depths ranging from about 4 to 13 feet below present site grades when checked one day after drilling. Borings B-1, B-6, B-10 and B-12 through B-14 were observed to be dry to the approximate depths explored at that time, while boring B-4 had dry caved at a depth of about 7½ feet below ground surface. Groundwater level measurements were completed in the test pits shortly after completion of excavation and then the excavations were backfilled due to livestock safety concerns. Groundwater was measured at depths between about 2 to 3½ feet below ground surface in test pits TP-1 through TP-5, and at depths between about 6 to 8 feet below ground surface in test pits TP-6 through TP-8. Test pits TP-9 through TP-11 remained dry to the depth explored, about 10 feet below ground surface.

Groundwater levels will vary seasonally and over time based on weather conditions, site development, irrigation practices and other hydrologic conditions. We expect site groundwater levels would be directly impacted by the activity/water levels in the multiple irrigation channels which cross the property. Perched and/or trapped groundwater conditions may also be encountered at some locations at times throughout the year. Perched water is commonly encountered in soils overlying less permeable soil layers and/or bedrock. Trapped water is typically encountered within more permeable zones of layered soil and bedrock systems. The location and amount of perched and/or trapped water can also vary over time. Longer-term observation of site groundwater levels would

be required in wells which are cased and sealed from the influence of surface water to more accurately establish static groundwater levels and possible fluctuations in those groundwater levels over time.

ANALYSIS AND RECOMMENDATIONS

General

At the time of test pit exploration and/or when checked 24 hours after completion of drilling, groundwater was encountered on the lower-lying areas of the development site (most notably in the vicinities of borings B-2, B-3 and B-9 and test pits TP-1 through TP-8) at depths ranging from approximately 2 to 8 feet below ground surface. Depending on finish site grading, we expect current groundwater levels at the above-mentioned locations as well as localized areas near the irrigation ditches on this site and fluctuations in overall site groundwater levels would impact the feasibility of full-depth basement construction. We estimate full depth basement construction may not be possible across approximately 20% to 30% of the site. Precluding the use of full depth basement construction may be required at some locations where groundwater was encountered less than about 4 feet below present site grade. Raising finish site grades in these areas and constructing basements as shallow as possible or lowering the groundwater table with an underdrain system could be considered to facilitate garden-level, or possibly full-basement construction. If an underdrain system will be constructed, a suitable outfall would be required to accommodate any collected waters. Although normally not feasible, lining or piping the irrigation ditches crossing the parcel could also be considered. Typically, we recommend a minimum 3-foot separation be maintained between basement floor slab levels and seasonal high groundwater.

Zones of very soft to soft/very loose to loose lean clay/clayey, silty sand were encountered relatively near-surface in many of the completed site borings, especially where comparatively shallow groundwater was encountered. The site soils would be expected to be soft/loose near current groundwater levels. These soils may complicate site grading and require stabilization prior to the placement of grading fill. We recommend avoiding grading cuts in the vicinity of the irrigation ditches and near the marshy area where test pits TP-2 through TP-5 were excavated or limiting them to as

shallow as possible. If soft/loose soils are encountered at proposed foundation bearing elevation at the time of construction, some overexcavation/backfill procedures or other approved stabilization measures may be required to develop suitable strength foundation bearing. The soft/very loose soils encountered with depth would be easily disturbed by construction activities. Soft clay and very loose sand which are disturbed by the construction activities should be removed and replaced or reworked or stabilized in-place prior to placement of any overlying improvements. Depending on finish site grades, the time of year when pavement construction occurs and other hydrologic conditions, stabilization of the pavement subgrade soils may be required to develop a suitable paving platform.

Site Development

All existing topsoil and vegetation should be removed from any proposed fill and pavement areas. After stripping and completing all cuts and prior to placement of any overlying fill and/or improvements, we recommend the exposed subgrade soils be scarified to a depth of 9 inches, adjusted in moisture content and compacted to at least 95% of the materials standard Proctor maximum dry density. The moisture content of the reconditioned subgrade soils should be adjusted to be within the range of ±2% of standard Proctor optimum moisture content at the time of compaction. Areas of soft lean clay/very loose silty, clayey sand were encountered relatively near surface in several of the completed site borings and test pits. Depending on the depth of site cuts, stabilization procedures may be required in some areas to develop a suitable working platform.

Fill soils required to develop structural areas of the site should consist of approved low volume change (LVC) soils free from organic matter, debris and other objectionable materials. Based on the results of the completed laboratory testing, it is our opinion the site lean clay and silty/clayey sand could be used as fill to develop the site. In general, the site siltstone/sandstone and interbedded sandstone/siltstone/claystone bedrock appears suitable for use as fill provided those materials are thoroughly-processed and the proper moisture contents developed prior to placement and compaction. Because of the high plasticity and swell potential of the site claystone bedrock, it is considered unsuitable for use as fill below any structural or paved areas of the site. Wet materials encountered near current groundwater levels would need to be dried out prior to placement as fill. If it is

necessary to import fill material to the site, those materials should have low potential for volume change and be relatively impervious. Fill soils should be approved by Soilogic prior to use. We recommend suitable fill materials be placed in loose lifts not to exceed 9 inches thick, adjusted in moisture content and compacted as recommended for the scarified materials above.

The soft lean clay/very loose silty, clayey sand encountered relatively near surface in several of the completed site borings/test pits would be subject to consolidation under additionally imposed loads. Areas of the site expected to receive fill depths greater than 3 to 4 feet should be evaluated closely for consolidation potential. Fill soils may need to be placed and allowed to remain in place for several months prior to construction of any overlying improvements in order to allow for consolidation of the underlying soft/very loose soils.

The soft lean clay/very loose silty, clayey sand soils encountered relatively near surface would be easily disturbed by the construction activities. Disturbed soils should be removed and replaced or reworked in place prior to placement of any overlying improvements

Footing Foundations

Based on the materials encountered in the completed site borings and the results of laboratory testing, we expect most of the site structures could be supported on conventional footing foundations bearing on the natural site lean clay or silty/clayey sand overburden soils, suitable fill soils placed and compacted as outlined above or siltstone/sandstone and interbedded interbedded sandstone/siltstone/claystone bedrock with low swell potential. All foundations for individual site structures should bear on like materials.

For design of footing foundations bearing on the natural site lean clay, silty/clayey sand or properly placed and compacted fill developed as outlined above, maximum net allowable soil bearing pressures in the range of 1,000 to 2,000 psf appear usable. Soft clay and very loose silty/clayey sand with insufficient strength were encountered relatively near surface in several of the completed site borings. Settlement of

improvements placed directly on or immediately above soft clay or very loose sands would be expected subsequent to construction. If more extensive zones of soft clay or very loose sand are encountered near proposed foundation bearing at the time of construction, some overexcavation/backfill procedures may be required. For site structures supported on siltstone/sandstone or interbedded sandstone/siltstone/claystone bedrock with low swell potential, maximum net allowable soil bearing pressures in the range of 2,000 to 3,000 psf appear usable with minimum dead load pressures in the range of 500 to 1,000 psf. If basement area foundations will be supported on siltstone/ sandstone or interbedded sandstone/siltstone/claystone bedrock with low swell potential, extending garage and any other at-grade footing foundations deeper may be required to develop consistent foundation bearing.

Individual site explorations should be completed for the proposed residences to help better define subsurface conditions at the specific residence locations and help ensure the proposed improvements will be supported on like materials with suitable strength and low volume change potential.

No unusual problems are anticipated in completing excavations through the site overburden soils required for construction of footing foundations. Layers of cemented sandstone were encountered in limited areas of the site. Depending on finish site grading, heavy duty excavation equipment may be required to penetrate these more competent bedrock layers.

Floor Slabs

Based on the type of construction proposed and results of the completed field and laboratory testing, we expect most of the lightly-loaded residential floor slabs could be supported on natural, undisturbed site lean clay, silty/clayey sand, siltstone/sandstone or interbedded sandstone/siltstone/claystone bedrock with low swell potential or properly placed and compacted fill.

Care should be taken to avoid disturbing floor slab subgrades prior to concrete placement. Subgrade soils expected to receive floor slab concrete should be evaluated closely prior to surfacing. If areas of disturbed, wet and softened, or dry subgrade soils develop during

construction, those materials should be removed and replaced or reworked in place prior to placement of the overlying improvements.

Drilled Pier Foundations

The siltstone/sandstone and interbedded sandstone/siltstone/claystone bedrock tested at this site generally showed low swell potential at current moisture and density conditions. However, isolated areas of claystone bedrock with moderate or higher swell potential were encountered in test borings drilled for this and previous explorations, most notably to the south of the Cottonwood Extension Ditch and some areas slightly north of the ditch.

If/where moderately to highly expansive claystone bedrock is encountered near proposed foundation bearing elevation at the time of subsurface exploration, it is our opinion drilled pier foundations used in conjunction with structural flooring systems would offer the most reliable method for mitigating damage to the residences and residence floor slabs as a result of expansive bedrock uplift forces. We expect drilled pier and structural flooring systems would be required across approximately 10% to 20 % of the site. Drilled piers would develop support capacity through a combination of end bearing and skin friction along the drilled shaft extended into bedrock underlying the site. Uplift forces developed on the drilled piers by expansive soils would be resisted by anchoring the piers into deeper lying bedrock less likely to experience moisture induced volume change subsequent to construction. Minimum bedrock penetration lengths of 10 to 15 feet would be expected with minimum overall pier lengths on the order of approximately 26 to 32 feet. Based on the depth to groundwater observed in the completed site borings, we expect casing of the drilled pier excavations or placement of pier concrete with a tremmie would be required.

Basement Construction

We recommend perimeter drain systems be installed around all below-grade areas to help reduce the potential for development of hydrostatic pressures behind below-grade walls and surface water infiltration into the basement areas. Perimeter drain systems should consist of perforated drain pipe surrounded by a minimum of six (6) inches of free

draining gravel. A filter fabric should be considered around the free-draining gravel or perforated pipe to reduce the potential for an influx of fine-grained soils into the systems. The drain pipes should be placed at approximate foundation bearing level at the high point of the systems and run around the exterior perimeter of the below-grade areas to a sump pit and pump system, underdrain system or free outfall with a minimum slope of ⅛-inch per foot to facilitate efficient water removal. If free outfalls will be considered, measures to help reduce the potential for reverse flow and animal access into the systems should be considered.

Backfill placed adjacent to the below-grade walls should consist of LVC potential and relatively impervious soils which are free from organic matter, debris and other objectionable materials. The site lean clay, silty/clayey sand and thoroughly-processed siltstone/sandstone and interbedded sandstone/siltstone/claystone bedrock could be used as fill in these areas. Because of the high plasticity and swell potential of the claystone bedrock encountered on limited areas of the site, we do not recommend this material for use as foundation wall backfill. The backfill soils should be placed in loose lifts not to exceed 9 inches thick, adjusted to be within ±2% of standard Proctor optimum moisture content and compacted to at least 95% of the materials standard Proctor maximum dry density.

Excessive lateral stress can be imposed on below-grade walls when using heavier mechanical compaction equipment. We recommend compaction of unbalanced basement wall backfill be completed using light mechanical or hand compaction equipment.

Utility Installation

Bedding around utility pipelines should be placed in accordance with recommendations from the pipeline designer. Backfill soils placed above pipelines should consist of approved materials which are free from organic matter, debris and other objectionable materials. The on-site lean clay, silty/clayey sand and thoroughly-processed siltstone/ sandstone and interbedded sandstone/siltstone/claystone bedrock could be used as pipeline backfill. Because of the high plasticity and swell potential of the site claystone bedrock, we recommend these materials be placed as deep as possible in the utility trenches and not be used as utility trench backfill within three (3) feet of finish roadway

subgrade levels. Care will be needed to keep expansive claystone materials separated from more suitable lean clay/clayey, silty sand, siltstone/sandstone and interbedded sandstone/siltstone/claystone utility backfill. Bedrock should be processed to less than 3 inches in any dimension prior to use as utility backfill. LVC pipeline backfill should be placed in maximum 9-inch loose lifts, adjusted to within ±2% of standard Proctor optimum moisture content and compacted to at least 95% of the materials standard Proctor maximum dry density. Claystone bedrock should be adjusted to within -1% to +3% of standard Proctor optimum moisture content and compacted to within 94% to 98% of standard Proctor maximum dry density. Wet soils encountered with depth would need to be dried out prior to placement as utility backfill.

Care will be needed to ensure utilities are not placed on or above disturbed or sloughed materials. Utility excavations will likely expose the overburden lean clay and silty/ clayey sand. Care will also be needed to develop stable side slopes in pipeline trenches excavated through some of the less cohesive overburden soils and soft lean clay. As such, we expect temporary shoring, bracing, or cutting of shallow slopes may be necessary in deeper excavations and where groundwater is encountered. Excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards. As a safety measure, it is recommended that vehicles and soil stockpiles be kept to a minimum lateral distance from the crest of the slope equal to no less than the slope height.

Cuts below groundwater elevation will require dewatering to facilitate proper construction. We expect a majority of the dewatering procedures could be completed through open pumping procedures in sumps fed from ditches or sloped trench excavations. If deeper utility installation is required in areas of cleaner sands, well-point dewatering systems may be required.

Site Roadways

We expect the site pavement subgrades will consist of lean clay and silty/clayey sand with low swell potential. Pavement subgrades should be developed as outlined in the "Site Development" portion of this report. A final subgrade evaluation and pavement section design report should be completed once roadways are developed to approximate

finish grade. For preliminary design estimates, a pavement section consisting of 4 inches of asphaltic concrete overlying 6 inches of aggregate base course could be used for local residential roadways. A pavement section consisting of approximately 5 inches of asphaltic concrete overlying 8 inches of aggregate base course could be used for preliminary estimates for collector roadways. Arterial roadways would likely require a thicker pavement section.

The site lean clay and silty/clayey sand would be particularly susceptible to strength loss and instability when elevated in moisture content with a tendency to rut and pump when wetted. Depending on the time of year when construction occurs and other hydrologic conditions, stabilization of site pavement subgrades may become necessary to develop a suitable paving platform. If required, we recommend consideration be given to stabilization of the pavement subgrades with Class C fly ash. Fly ash stabilization can also eliminate some of the uncertainty associated with attempting to pave during periods of inclement weather. In addition, it may be possible to reduce the required thicknesses of asphaltic concrete and aggregate base course with the increase in subgrade strength developed through the stabilization procedures.

Drainage

Positive drainage is imperative for long-term performance of the proposed site structures and associated site improvements. We recommend positive drainage be developed away from all site structures and pavement areas to reduce the potential for wetting of the subgrade and bearing materials. Water which is allowed to pond adjacent to the site improvements can result in unacceptable performance of those improvements over time.

LIMITATIONS

This report was prepared based upon the data obtained from the completed site exploration, laboratory testing, engineering analysis and any other information discussed. The completed borings provide an indication of subsurface conditions at the boring locations only. Variations in subsurface conditions can occur in relatively short distances away from the borings. This report does not reflect any variations which may occur across the site or away from the borings. If variations in the subsurface conditions

anticipated become evident, the geotechnical engineer should be notified immediately so that further evaluation and supplemental recommendations can be provided.

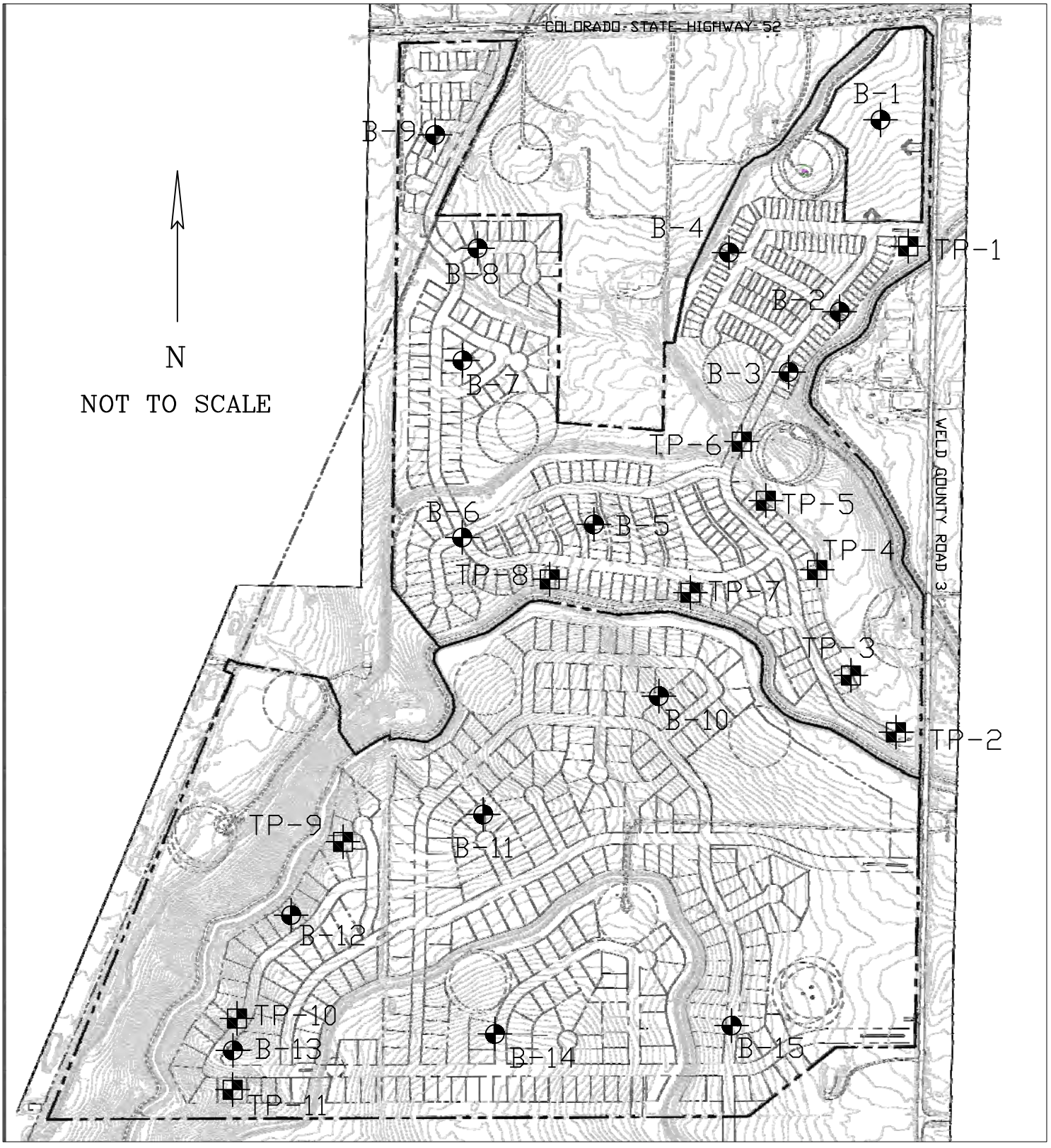
The scope of services for this project does not include either specifically or by implication any biological or environmental assessment of the site or identification or prevention of pollutants or hazardous materials or conditions. Other studies should be completed if concerns over the potential of such contamination or pollution exist.

The geotechnical engineer should be retained to review the plans and specifications so that comments can be made regarding the interpretation and implementation of our geotechnical recommendations in the design and specifications. The geotechnical engineer should also be retained to provide testing and observation services during construction to help determine that the design requirements are fulfilled.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with the generally accepted standard of care for the profession. No warranties express or implied, are made. The conclusions and recommendations contained in this report should not be considered valid in the event that any changes in the nature, design or location of the project as outlined in this report are planned, unless those changes are reviewed and the conclusions of this report modified and verified in writing by the geotechnical engineer.

SEPTEMBER 2013
PROJECT #13-1109

TEST BORING AND TEST PIT LOCATION DIAGRAM



ANDALUSIA PROPERTY PRELIMINARY EXPLORATION

SOUTHWEST OF CO HIGHWAY 52 AND WCR 3, ERIE, COLORADO

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-1

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	NE
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	NE

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits		% Passing # 200 Sieve (%)
										LL	PI	
	0 - 4" VEGETATION & TOPSOIL	-										
		1 - 2 - 3 - 4 -										
		5	**CS**	**8**	**4.9**	**96.1**	**N/A**	**None**	**<500**	**-**	**-**	**-**
CL w/ SC-SM	SANDY LEAN CLAY with SILTY to CLAYEY SAND lenses brown, rust, beige medium stiff to stiff / loose	- 6 - 7 - 8 - 9 -										
		10	**CS**	**9**	**8.1**	**101.7**	**6000**	**None**	**<500**	**-**	**-**	**-**
		- 11 - 12 - 13 - 14 -										
		15	**CS**	**11**	**9.6**	**112.9**	**7500**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-2

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	4.0'
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	4.0'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	4.0'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	-										
		1										
		-										
		2										
		-										
		3										
		-										
		4										
		-										
		5	**CS**	**2**	**22.9**	**102.9**	**<500**	**None**	**<500**	**-**	**-**	**-**
		-										
		6										
CL	SANDY LEAN CLAY	-										
w/	with SILTY to CLAYEY SAND lenses	7										
SC-SM	dark brown, brown, rust, beige	-										
	very soft to stiff /	8										
	very loose to loose	-										
		9										
		-										
		10	**CS**	**13**	**19.6**	**105.3**	**7000**	**None**	**<500**	**-**	**-**	**-**
		-										
		11										
		-										
		12										
		-										
		13										
		-										
		14										
	SILTSTONE/SANDSTONE	-										
	gray, beige, rust, very hard	**15**	**CS**	**50/3"**	**NR**	**NR**	**NR**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	-										
		16										
		-										
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ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-3

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	4.0'
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	4.0'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	Wci @ 4.0'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	-										
		1 - 2 - 3 - 4 -										
		5	**CS**	**5**	**21.4**	**104.5**	**1000**	**None**	**<500**	**-**	**-**	**-**
SC-SM w/ CL	SILTY to CLAYEY SAND with SANDY LEAN CLAY lenses dark brown, brown, rust, beige very loose / very soft to soft	- 6 - 7 - 8 - 9 -										
		10	**CS**	**2**	**25.5**	**101.1**	**<500**	**None**	**<500**	**-**	**-**	**-**
		- 11 - 12 - 13 - 14 -										
	SILTSTONE/SANDSTONE gray, beige, rust, medium hard	**15**	**CS**	**50/10"**	**18.6**	**102.1**	**9000+**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-4

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	NE
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	Dci @ 7.5'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	-										
		1 - 2 - 3 - 4 -										
		5	**CS**	**12**	**7.4**	**107.8**	**9000+**	**None**	**<500**	**22**	**9**	**59.2%**
CL w/ SC-SM	SANDY LEAN CLAY with SILTY to CLAYEY SAND lenses brown, rust, beige stiff / loose	- 6 - 7 - 8 - 9 -										
		10	**CS**	**14**	**8.8**	**105.3**	**9000+**	**0.8%**	**1200**	**-**	**-**	**-**
		- 11 - 12 - 13 - 14 -										
		15	**CS**	**12**	**7.3**	**111.1**	**9000+**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-5

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	NE
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	10.0'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits		% Passing # 200 Sieve (%)
										LL	PI	
	0 - 4" VEGETATION & TOPSOIL	-										
		1 - 2 - 3 - 4										
SC-SM w/ CL	SILTY to CLAYEY SAND with SANDY LEAN CLAY lenses dark brown, brown, rust, beige loose / medium stiff to stiff	- **5**	**CS**	**10**	**10.1**	**108.4**	**9000+**	**None**	**<500**	**-**	**-**	**48.9%**
		- 6 - 7 - 8 - 9										
		- **10**	**CS**	**12**	**17.8**	**108.6**	**9000+**	**0.3%**	**1000**	**-**	**-**	**-**
		- 11 - 12 - 13 - 14										
	SANDSTONE/SILTSTONE/CLAYSTONE olive-gray, brown, rust slightly weathered to very hard	- **15**	**CS**	**50/3"**	**14.0**	**114.1**	**9000+**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-6

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	NE
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	Dci @ 13.0'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	- 1 - 2 - 3 - 4 -										
		5	**CS**	**14**	**6.0**	**108.4**	**9000+**	**0.5%**	**1000**	**-**	**-**	**-**
CL w/ SC-SM	SANDY LEAN CLAY with SILTY to CLAYEY SAND lenses brown, rust, beige medium stiff to stiff / loose	- 6 - 7 - 8 - 9 -										
		10	**CS**	**9**	**11.6**	**101.8**	**9000+**	**None**	**<500**	**-**	**-**	**-**
		- 11 - 12 - 13 - 14 -										
		15	**CS**	**10**	**12.5**	**116.0**	**8000**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-7

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	11.5'
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	11.5'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	10.5'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	-										
		1										
		-										
		2										
		-										
		3										
		-										
		4										
		-										
		5	**CS**	**18**	**11.3**	**119.1**	**9000+**	**0.4%**	**800**	**-**	**-**	**-**
		-										
		6										
		-										
CL	SANDY LEAN CLAY	7										
w/	with SILTY to CLAYEY SAND lenses	-										
SC-SM	brown, rust, beige	8										
	soft to stiff /	-										
	loose to medium dense	9										
		-										
		10	**CS**	**3**	**21.1**	**105.9**	**1000**	**None**	**<500**	**-**	**-**	**-**
		-										
		11										
		-										
		12										
		-										
		13										
		-										
		14										
		-										
		15	**CS**	**17**	**20.0**	**105.0**	**4500**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	-										
		16										
		-										
		17										
		-										
		18										
		-										
		19										
		-										
		20										
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		21										
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		22										
		-										
		23										
		-										
		24										
		-										
		25										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-8

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	NE
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	13.5'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	-										
SC-SM w/ CL	SILTY to CLAYEY SAND with SANDY LEAN CLAY lenses brown, rust, beige loose / medium stiff	1 - 2 - 3 - 4 -										
		5	**CS**	**10**	**8.4**	**106.7**	**N/A**	**-**	**-**	**-**	**-**	**-**
		- 6 - 7 - 8 - 9 -										
		10	**CS**	**15**	**15.0**	**114.9**	**9000+**	**None**	**<500**	**-**	**-**	**-**
CL w/ SC-SM	SANDY LEAN CLAY with SILTY to CLAYEY SAND lenses brown, rust, beige stiff to very stiff / medium dense	- 11 - 12 - 13 - 14 -										
		15	**CS**	**20**	**22.4**	**106.3**	**6000**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-9

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	6.0'
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	6.0'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	6.0'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	-										
		1 - 2 - 3 - 4										
		- 5	CS	4	23.6	101.0	<500	None	<500	-	-	-
CL w/ SC-SM	SANDY LEAN CLAY with SILTY to CLAYEY SAND lenses dark brown, brown, rust, beige soft to stiff / loose to medium dense	- 6 - 7 - 8 - 9										
		- 10	CS	15	17.9	110.5	5000	-	-	-	-	-
		- 11 - 12 - 13 - 14										
SP-SM	SAND with SILT and GRAVEL, medium dense	- 15	CS	27	14.3	105.8	N/A	-	-	-	-	-
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-10

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	NE
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	NE

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	- 1 - 2 - 3 - 4 -										
CL w/ SC-SM	SANDY LEAN CLAY with SILTY to CLAYEY SAND lenses dark brown, brown, rust, beige medium stiff / loose	**5**	**CS**	**6**	**7.1**	**106.1**	**9000+**	**None**	**<500**	**-**	**-**	**-**
		- 6 - 7 - 8 - 9 -										
		10	**CS**	**6**	**11.5**	**109.8**	**3000**	**None**	**<500**	**-**	**-**	**-**
		- 11 - 12 - 13 - 14 -										
		15	**CS**	**10**	**14.5**	**111.9**	**6000**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-11

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	13.0'
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	13.0'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	Wci @ 13.0'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	-										
		1 - 2 - 3 - 4 -										
		5	**CS**	**5**	**9.6**	**107.7**	**8000**	**None**	**<500**	**-**	**-**	**-**
SC-SM w/ CL	SILTY to CLAYEY SAND with SANDY LEAN CLAY lenses brown, rust, beige loose / soft to medium stiff	- 6 - 7 - 8 - 9 -										
		10	**CS**	**6**	**24.4**	**96.2**	**2000**	**-**	**-**	**-**	**-**	**-**
		- 11 - 12 - 13 - 14 -										
	CLAYSTONE gray, rust/orange, brown slightly weathered to firm	**15**	**CS**	**31**	**20.7**	**108.0**	**9000+**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-12

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	NE
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	NE

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	-										
		1										
		-										
		2										
		-										
		3										
		-										
		4										
		-										
		5	**CS**	**14**	**4.1**	**111.3**	**9000+**	**0.1%**	**700**	**-**	**-**	**-**
		-										
CL	SANDY LEAN CLAY	6										
w/	with SILTY to CLAYEY SAND lenses	-										
SC-SM	dark brown, brown, rust, beige	7										
	medium stiff to stiff / loose	-										
		8										
		-										
		9										
		-										
		10	**CS**	**7**	**9.7**	**107.8**	**9000+**	**None**	**<500**	**-**	**-**	**-**
		-										
		11										
		-										
		12										
		-										
		13										
	SILTSTONE/SANDSTONE	-										
	gray, olive-brown, rust	14										
	slightly weathered to very hard	-										
		15	**CS**	**50/1"**	**16.2**	**-**	**9000+**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	-										
		16										
		-										
		17										
		-										
		18										
		-										
		19										
		-										
		20										
		-										
		21										
		-										
		22										
		-										
		23										
		-										
		24										
		-										
		25										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-13

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	NE
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	Dci @ 12.5'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	- 1 - 2 - 3 - 4 -										
		5	**CS**	**21**	**4.0**	**106.6**	**9000+**	**0.7%**	**1100**	**-**	**-**	**-**
CL w/ SC-SM	SANDY LEAN CLAY with SILTY to CLAYEY SAND lenses dark brown, brown, rust, beige medium stiff to very stiff / loose to medium dense	- 6 - 7 - 8 - 9 -										
		10	**CS**	**8**	**10.6**	**105.1**	**9000+**	**None**	**<500**	**-**	**-**	**-**
		- 11 - 12 - 13 - 14 -										
	SILTSTONE/SANDSTONE gray, olive-brown, rust slightly weathered to very hard	**15**	**CS**	**50/1"**	**8.8**	**-**	**9000+**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-14

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	NE
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	Dci @ 12.0'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	-										
CL w/ SC-SM	SANDY LEAN CLAY with SILTY to CLAYEY SAND lenses dark brown, brown, rust, beige medium stiff to very stiff / loose to medium dense	1 - 2 - 3 - 4 - **5**	**CS**	**13**	**4.6**	**99.2**	**9000+**	**-**	**-**	**-**	**-**	**-**
		- 6 - 7 - 8 - 9 - **10**	**CS**	**50/9"**	**11.3**	**109.1**	**9000+**	**11.2%**	**11000**	**-**	**-**	**-**
	CLAYSTONE gray, rust/orange, brown, yellow slightly weathered to hard slightly LIGNITIC in places	- 11 - 12 - 13 - 14 - **15**	**CS**	**11**	**15.4**	**107.9**	**9000+**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF BORING B-15

Sheet	1/1	Drilling Rig:	CME 45	Water Depth Information	
Start Date	9/3/2013	Auger Type:	4" CFA	During Drilling	13.5'
Finish Date	9/3/2013	Hammer Type:	Manual	After Drilling	13.5'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Drilling	13.0'

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	- 1 - 2 - 3 - 4 -										
		5	**CS**	**10**	**9.7**	**106.6**	**9000+**	**None**	**<500**	**-**	**-**	**-**
CL w/ SC-SM	SANDY LEAN CLAY with SILTY to CLAYEY SAND lenses dark brown, brown, rust, beige medium stiff to stiff / loose	- 6 - 7 - 8 - 9 -										
		10	**CS**	**9**	**7.2**	**101.5**	**6500**	**None**	**<500**	**-**	**-**	**-**
		- 11 - 12 - 13 - 14 -										
		15	**CS**	**11**	**20.2**	**90.1**	**1500**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF BORING @ 15.0'	- 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF TEST PIT TP-1

Sheet	1/1	Drilling Rig:	Backhoe	Water Depth Information	
Start Date	9/10/2013	Auger Type:	-	During Excavation	-
Finish Date	9/10/2013	Hammer Type:	DCP	After Excavation	3.5'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Ex.	Backfilled

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	-										
		1										
		-										
CL	SANDY LEAN CLAY	2										
w/	with SILTY to CLAYEY SAND lenses	-										
SC-SM	brown, rust, beige	3	HS	13	15.4	120.5	4000	-	-	-	-	-
	very soft to stiff /	-										
	very loose to medium dense	4										
		-										
		5	HS	2	24.4	101.2	<500	None	<500	-	-	-
	BOTTOM OF TEST PIT @ 5.0'	-										
		6										
		-										
		7										
		-										
		8										
		-										
		9										
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ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF TEST PIT TP-2

Sheet	1/1	Drilling Rig:	Backhoe	Water Depth Information	
Start Date	9/10/2013	Auger Type:	-	During Excavation	-
Finish Date	9/10/2013	Hammer Type:	DCP	After Excavation	2.0'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Ex.	Backfilled

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits		% Passing # 200 Sieve (%)
										LL	PI	
	0 - 4" VEGETATION & TOPSOIL	-										
SC-SM w/ CL	SILTY to CLAYEY SAND with SANDY LEAN CLAY lenses dark brown, gray/black, rust very loose / very soft	1 - 2 -										
		3	HS	2	17.5	108.8	6000	-	-	-	-	-
		4 -										
		5	HS	2	22.2	103.3	<500	None	<500	-	-	-
	BOTTOM OF TEST PIT @ 5.0'	6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF TEST PIT TP-3

Sheet	1/1	Drilling Rig:	Backhoe	Water Depth Information	
Start Date	9/10/2013	Auger Type:	-	During Excavation	-
Finish Date	9/10/2013	Hammer Type:	DCP	After Excavation	2.0'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Ex.	Backfilled

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits		% Passing # 200 Sieve (%)
										LL	PI	
	0 - 4" VEGETATION & TOPSOIL	-										
SC-SM w/ CL	SILTY to CLAYEY SAND with SANDY LEAN CLAY lenses dark brown, gray/black, rust very loose to loose / very soft to soft	1 - 2 -										
		3	HS	4	22.8	100.5	1000	-	-	-	-	-
		- 4 -										
		5	HS	2	25.9	95.4	<500	None	<500	-	-	-
	BOTTOM OF TEST PIT @ 5.0'	- 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

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LOG OF TEST PIT TP-4

Sheet	1/1	Drilling Rig:	Backhoe	Water Depth Information	
Start Date	9/10/2013	Auger Type:	-	During Excavation	-
Finish Date	9/10/2013	Hammer Type:	DCP	After Excavation	2.0'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Ex.	Backfilled

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits		% Passing # 200 Sieve (%)
										LL	PI	
	0 - 4" VEGETATION & TOPSOIL	-										
SC-SM w/ CL	SILTY to CLAYEY SAND with SANDY LEAN CLAY lenses dark brown, gray/black, rust very loose / very soft	1 - 2 - 3	HS	2	21.2	110.2	1000	-	-	-	-	-
		- 4 - 5	HS	2	19.4	110.8	<500	None	<500	-	-	-
	BOTTOM OF TEST PIT @ 5.0'	- 6 - 7 - 8 - 9 - **10** - 11 - 12 - 13 - 14 - **15** - 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF TEST PIT TP-5

Sheet	1/1	Drilling Rig:	Backhoe	Water Depth Information	
Start Date	9/10/2013	Auger Type:	-	During Excavation	-
Finish Date	9/10/2013	Hammer Type:	DCP	After Excavation	3.5'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Ex.	Backfilled

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits		% Passing # 200 Sieve (%)
										LL	PI	
	0 - 4" VEGETATION & TOPSOIL	-										
		1										
		-										
SC-SM	SILTY to CLAYEY SAND	2										
w/	with SANDY LEAN CLAY lenses	-										
CL	dark brown, gray/black, rust	3	HS	7	19.5	108.8	4500	None	<500	-	-	-
	very loose to loose /	-										
	very soft to medium stiff	4										
		-										
		5	HS	2	22.4	100.3	2000	-	-	-	-	-
	BOTTOM OF TEST PIT @ 5.0'	-										
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		-										
		7										
		-										
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		25										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF TEST PIT TP-6

Sheet	1/1	Drilling Rig:	Backhoe	Water Depth Information	
Start Date	9/10/2013	Auger Type:	-	During Excavation	-
Finish Date	9/10/2013	Hammer Type:	DCP	After Excavation	8.0'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Ex.	Backfilled

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits		% Passing # 200 Sieve (%)
										LL	PI	
	0 - 4" VEGETATION & TOPSOIL	-										
		1										
		-										
		2										
		-										
		3										
		-										
		4										
CL	SANDY LEAN CLAY	-										
w/	with SILTY to CLAYEY SAND lenses	**5**	**HS**	**10**	**15.2**	**107.1**	**4500**	**None**	**<500**	**-**	**-**	**-**
SC-SM	brown, rust, beige	-										
	very soft to stiff /	6										
	very loose to medium dense	-										
		7										
		-										
		8										
		-										
		9										
		-										
		10	**HS**	**2**	**21.9**	**109.3**	**<500**	**None**	**<500**	**-**	**-**	**-**
	BOTTOM OF TEST PIT @ 10.0'	-										
		11										
		-										
		12										
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ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF TEST PIT TP-7

Sheet	1/1	Drilling Rig:	Backhoe	Water Depth Information	
Start Date	9/10/2013	Auger Type:	-	During Excavation	-
Finish Date	9/10/2013	Hammer Type:	DCP	After Excavation	6.0'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Ex.	Backfilled

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits		% Passing # 200 Sieve (%)
										LL	PI	
	0 - 4" VEGETATION & TOPSOIL	-										
		1										
		-										
		2										
		-										
		3										
		-										
		4										
SC-SM	SILTY to CLAYEY SAND	-										
w/	with SANDY LEAN CLAY lenses	**5**	**HS**	**5**	**21.1**	**104.1**	**<500**	**None**	**<500**	**-**	**-**	**-**
CL	brown, gray, rust	-										
	very loose to loose / very soft to soft	6										
		-										
		7										
		-										
		8										
		-										
		9										
		-										
		10	**HS**	**2**	**22.3**	**92.8**	**1500**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF TEST PIT @ 10.0'	-										
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ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF TEST PIT TP-8

Sheet	1/1	Drilling Rig:	Backhoe	Water Depth Information	
Start Date	9/10/2013	Auger Type:	-	During Excavation	-
Finish Date	9/10/2013	Hammer Type:	DCP	After Excavation	8.0'
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Ex.	Backfilled

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits LL	Atterberg Limits PI	% Passing # 200 Sieve (%)
	0 - 4" VEGETATION & TOPSOIL	-										
CL w/ SC-SM	SANDY LEAN CLAY with SILTY to CLAYEY SAND lenses brown, rust, beige stiff / loose to medium dense	1 - 2 - 3 - 4 -										
		5	**HS**	**9**	**22.9**	**96.8**	**1500**	**-**	**-**	**-**	**-**	**-**
		- 6 - 7 - 8 - 9 -										
	SILTSTONE/SANDSTONE with CLAYSTONE, gray, medium hard	-										
		10	**HS**	**50/10"**	**22.6**	**100.6**	**9000+**	**None**	**<500**	**-**	**-**	**-**
	BOTTOM OF TEST PIT @ 10.0'	- 11 - 12 - 13 - 14 - **15** - 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF TEST PIT TP-9

Sheet	1/1	Drilling Rig:	Backhoe	Water Depth Information	
Start Date	9/10/2013	Auger Type:	-	During Excavation	-
Finish Date	9/10/2013	Hammer Type:	DCP	After Excavation	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Ex.	Backfilled

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits		% Passing # 200 Sieve (%)
										LL	PI	
	0 - 4" VEGETATION & TOPSOIL	-										
		1										
		-										
		2										
		-										
		3										
		-										
		4										
SC-SM	SILTY to CLAYEY SAND	-										
w/	with SANDY LEAN CLAY lenses	**5**	**HS**	**12**	**3.8**	**95.4**	**N/A**	**-**	**-**	**-**	**-**	**-**
CL	brown, rust, beige	-										
	loose to medium dense / stiff	6										
		-										
		7										
		-										
		8										
		-										
		9										
		-										
		10	**HS**	**9**	**12.0**	**103.0**	**7000**	**None**	**<500**	**-**	**-**	**-**
	BOTTOM OF TEST PIT @ 10.0'	-										
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ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF TEST PIT TP-10

Sheet	1/1	Drilling Rig:	Backhoe	Water Depth Information	
Start Date	9/10/2013	Auger Type:	-	During Excavation	-
Finish Date	9/10/2013	Hammer Type:	DCP	After Excavation	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Ex.	Backfilled

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits		% Passing # 200 Sieve (%)
										LL	PI	
	0 - 4" VEGETATION & TOPSOIL	-										
CL w/ SC-SM	SANDY LEAN CLAY with SILTY to CLAYEY SAND lenses brown, rust, beige	1 - 2 - 3 - 4										
		- **5**	**HS**	**50/5"**	**7.5**	**-**	**9000+**	**-**	**-**	**-**	**-**	**-**
	SILTSTONE/SANDSTONE with lenticular CLAYSTONE interbeds gray, brown, rust very hard	- 6 - 7 - 8 - 9										
		- **10**	**HS**	**50/3"**	**NR**	**NR**	**NR**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF TEST PIT @ 10.0'	- 11 - 12 - 13 - 14 - **15** - 16 - 17 - 18 - 19 - **20** - 21 - 22 - 23 - 24 - **25**										

ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

LOG OF TEST PIT TP-11

Sheet	1/1	Drilling Rig:	Backhoe	Water Depth Information	
Start Date	9/10/2013	Auger Type:	-	During Excavation	-
Finish Date	9/10/2013	Hammer Type:	DCP	After Excavation	NE
Surface Elev.	-	Field Personnel:	BMc	24 Hours After Ex.	Backfilled

USCS	SOIL DESCRIPTION	Depth (ft)	Sampler	"N"	MC (%)	DD (pcf)	Estimated q_u (psf)	% Swell @ 500 psf	Swell Pressure (psf)	Atterberg Limits		% Passing # 200 Sieve (%)
										LL	PI	
	0 - 4" VEGETATION & TOPSOIL	-										
		1										
		-										
		2										
		-										
		3										
		-										
		4										
SC-SM	SILTY to CLAYEY SAND	-										
w/	with SANDY LEAN CLAY lenses	**5**	**HS**	**10**	**7.5**	**101.5**	**4000**	**None**	**<500**	**-**	**-**	**-**
CL	brown, gray, rust	-										
	very loose to medium dense /	6										
	very soft to stiff	-										
		7										
		-										
		8										
		-										
		9										
		-										
		10	**HS**	**2**	**26.5**	**96.4**	**<500**	**-**	**-**	**-**	**-**	**-**
	BOTTOM OF TEST PIT @ 10.0'	-										
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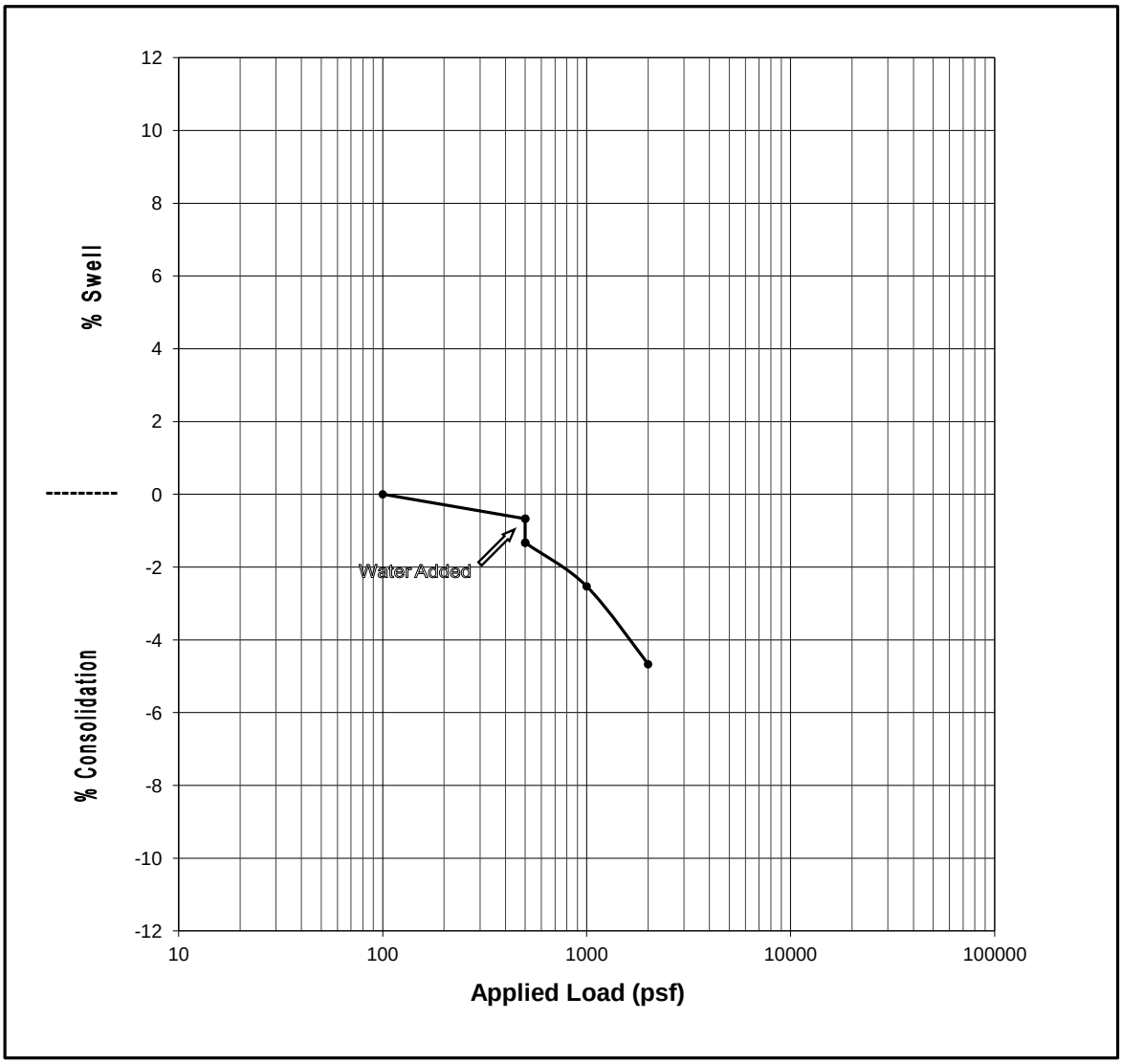
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-1 @ 4'

Sample Description: Rusty Olive-Brown Clayey, Silty Sand (SC-SM)

Initial Moisture	4.9%	Liquid Limit	-
Final Moisture	22.4%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	96.1 pcf

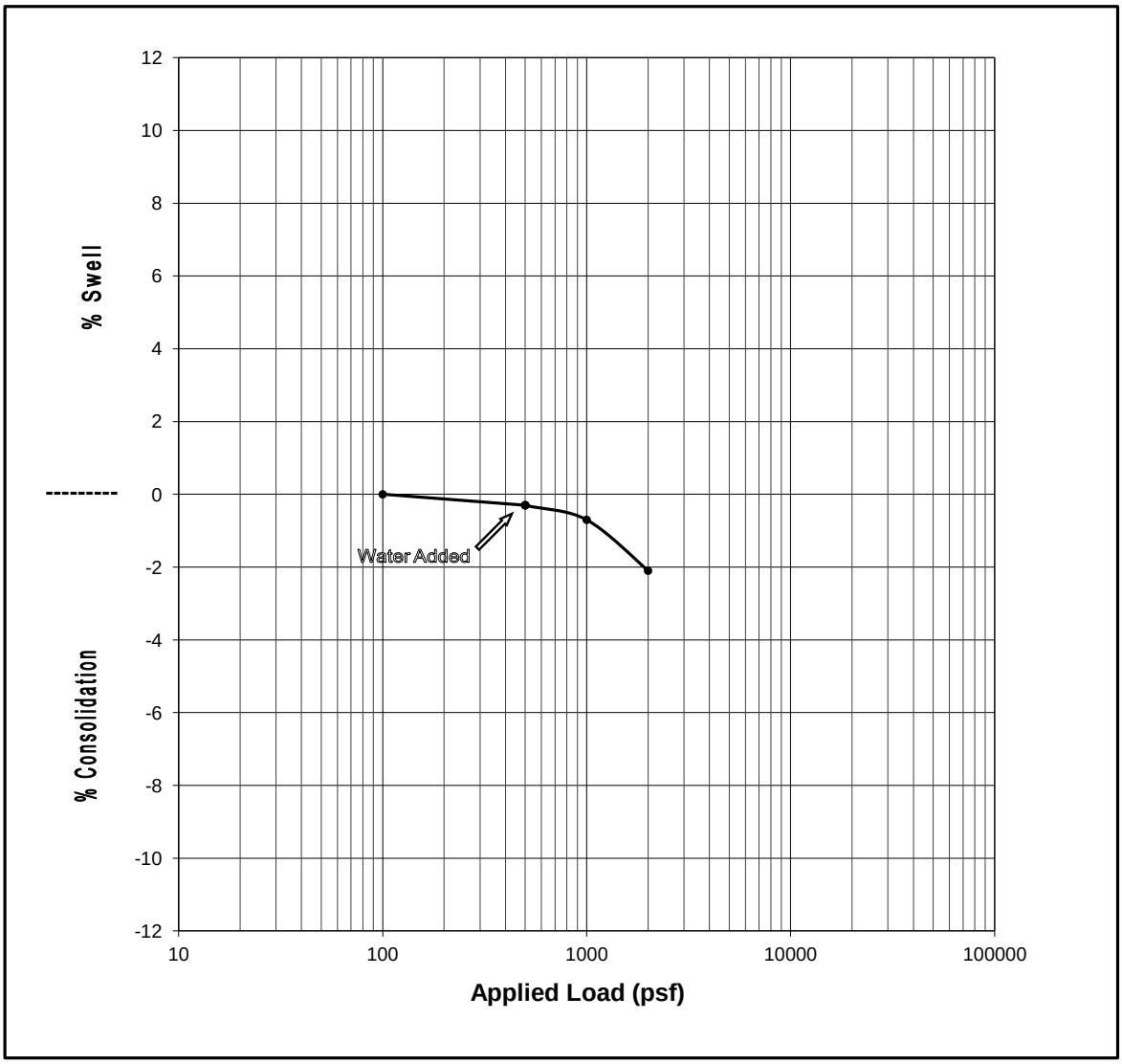
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-1 @ 9'

Sample Description: Brown/Beige/Rust Sandy Lean Clay to Clayey Sand (CL)

Initial Moisture	8.1%	Liquid Limit	-
Final Moisture	20.1%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	101.7 pcf

SOILOGIC

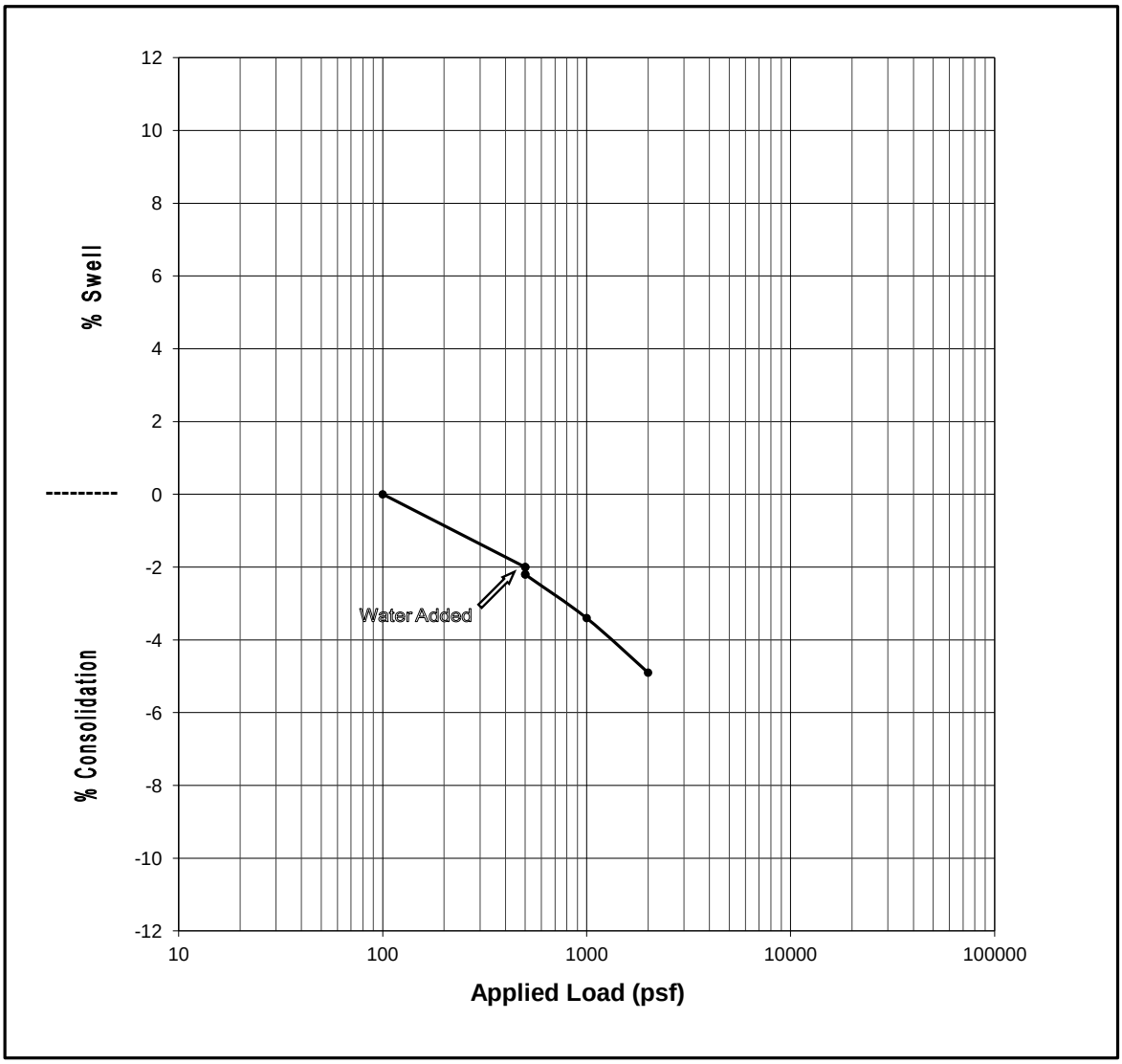
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-2 @ 4'

Sample Description: Brown/Beige Silty, Clayey Sand (SC-SM)

Initial Moisture	22.9%	Liquid Limit	-
Final Moisture	19.7%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	102.9 pcf

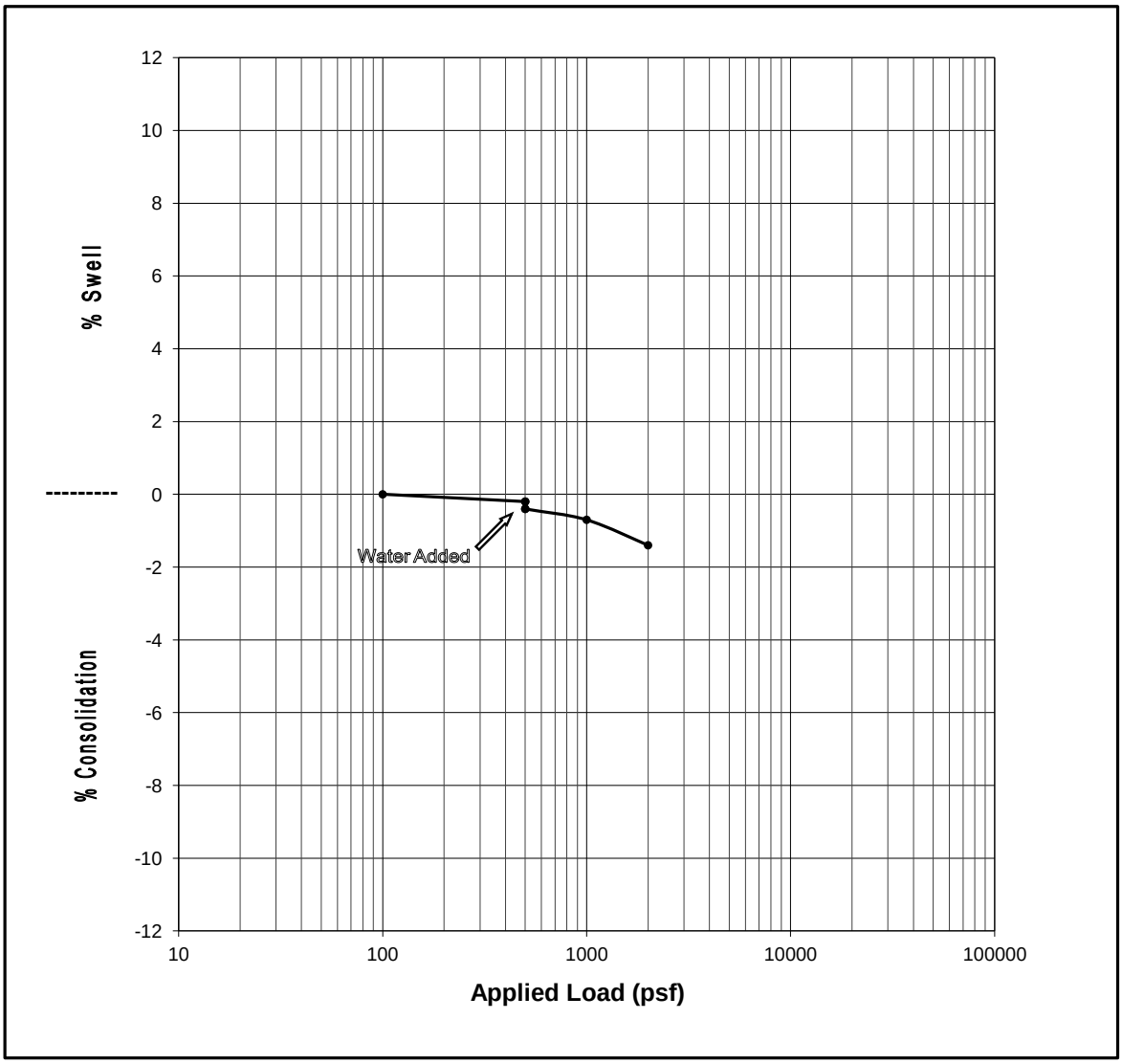
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-2 @ 9'

Sample Description: Rusty Brown/Beige Clayey Sand (SC)

Initial Moisture	19.6%	Liquid Limit	-
Final Moisture	20.8%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	105.3 pcf

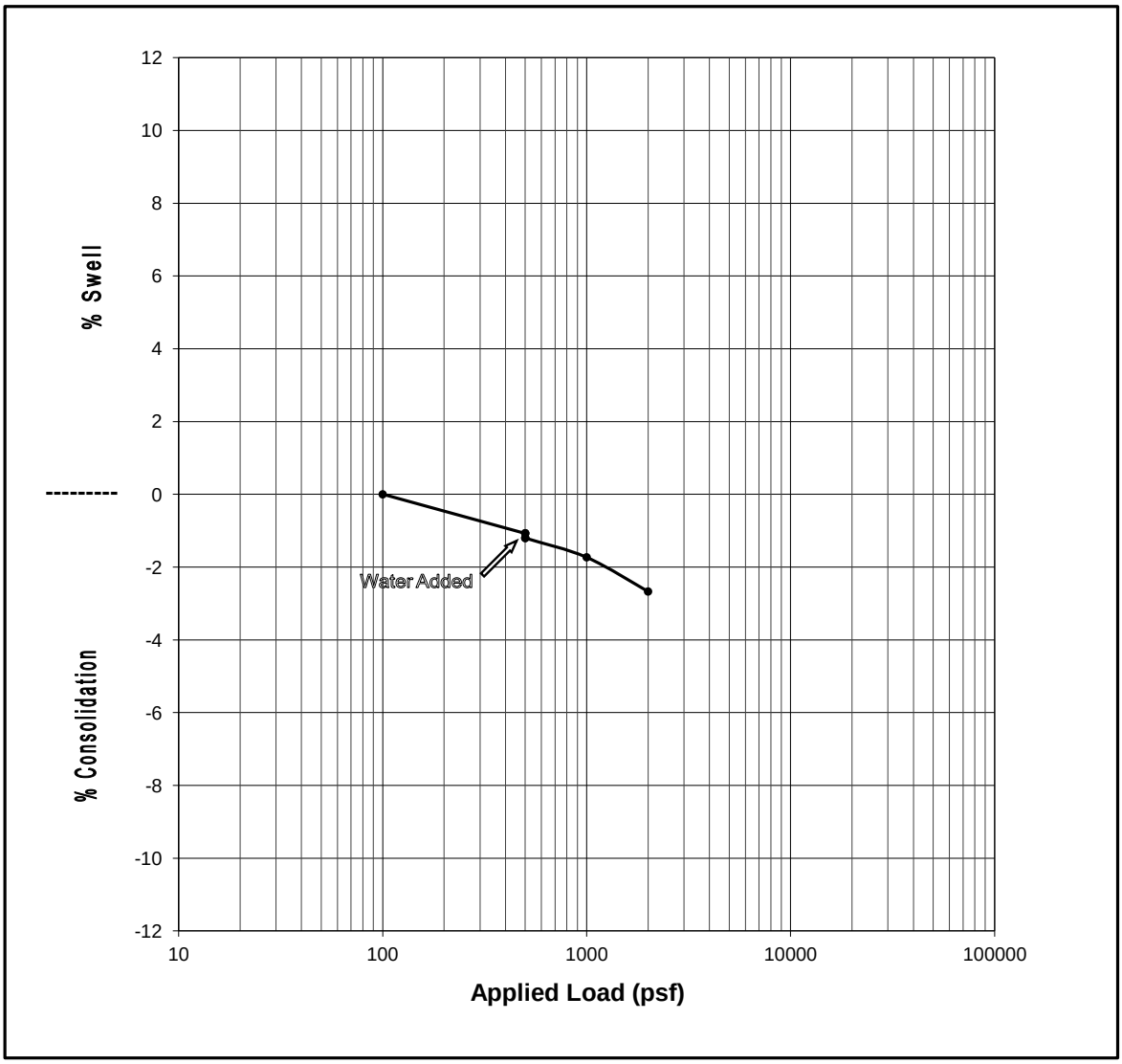
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-3 @ 4'

Sample Description: Brown Silty, Clayey Sand (SC-SM)

Initial Moisture	21.4%	Liquid Limit	-
Final Moisture	19.0%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	104.5 pcf

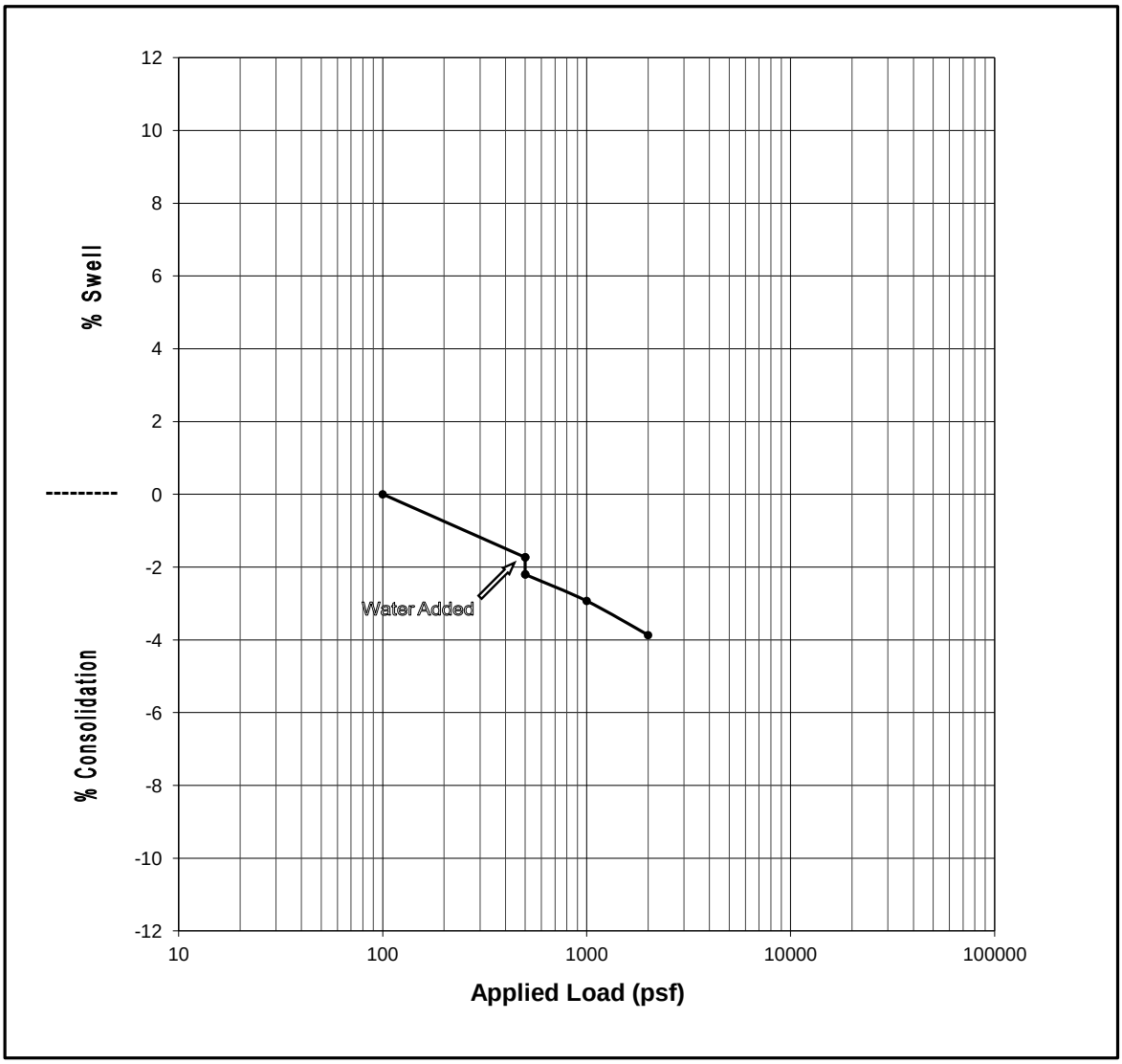
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-3 @ 9'

Sample Description: Brown Silty, Clayey Sand (SC-SM)

Initial Moisture	25.5%	Liquid Limit	-
Final Moisture	17.7%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	101.1 pcf

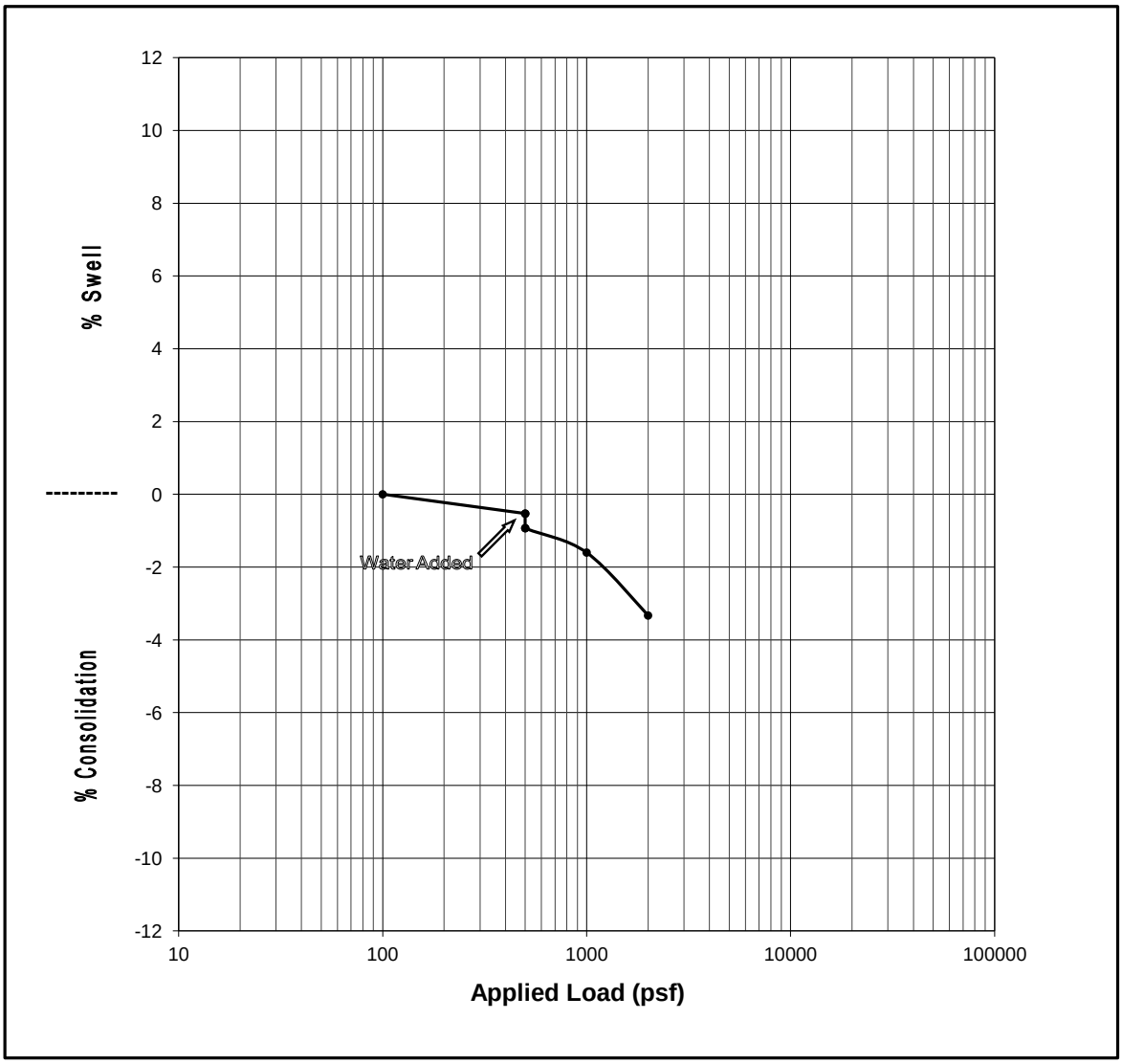
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-4 @ 4'

Sample Description: Dark Brown Sandy Lean Clay (CL)

Initial Moisture	7.4%	Liquid Limit	22
Final Moisture	18.5%	Plasticity Index	9
% Swell @ 500 psf	None	% Passing #200	59.2%
Swell Pressure	<500 psf	Dry Density	107.8 pcf

SOILOGIC

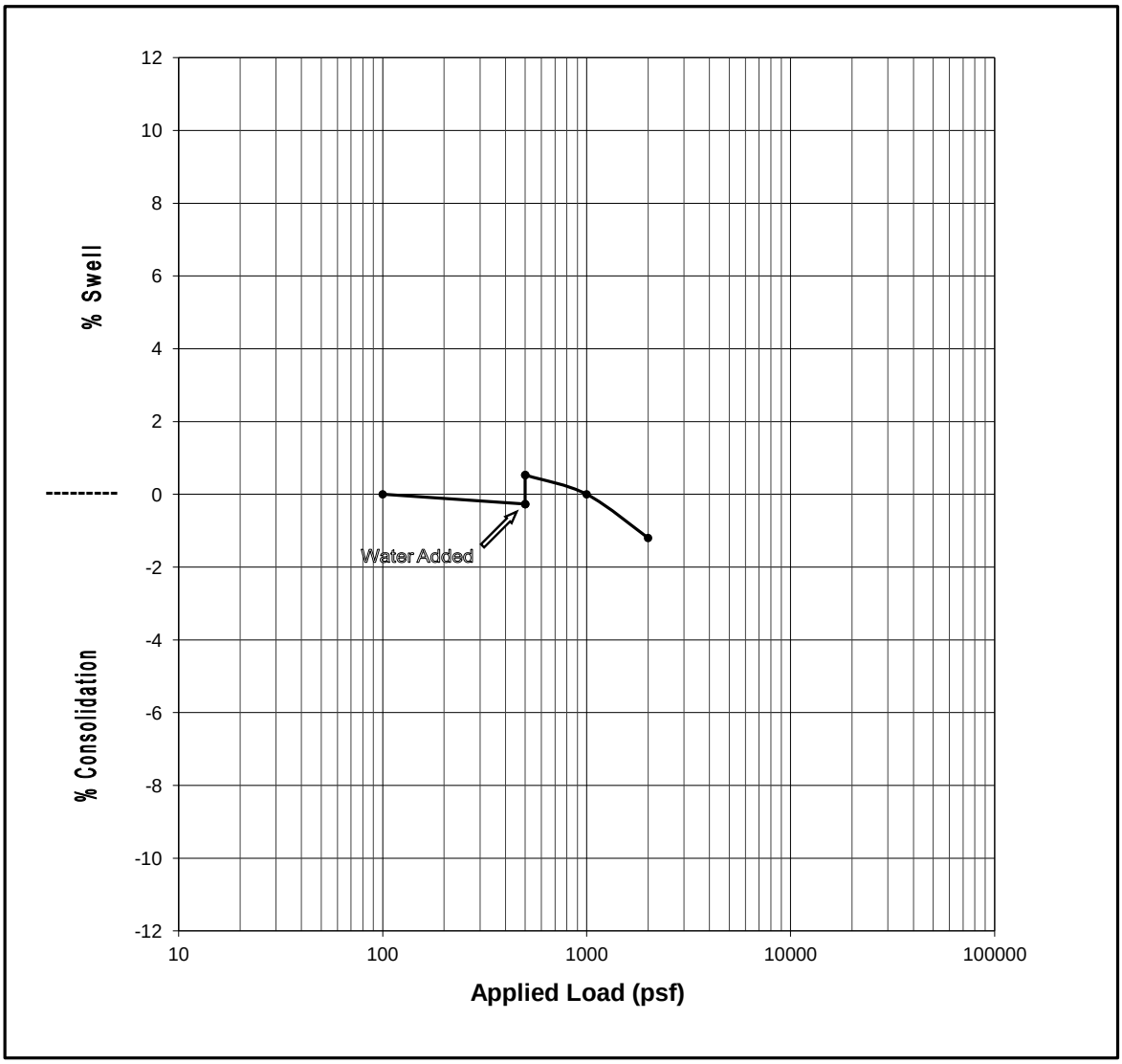
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-4 @ 9'

Sample Description: Brown Sandy Lean Clay to Clayey Sand (CL-SC)

Initial Moisture	8.8%	Liquid Limit	-
Final Moisture	23.0%	Plasticity Index	-
% Swell @ 500 psf	0.8%	% Passing #200	48.9%
Swell Pressure	1,200 psf	Dry Density	105.3 pcf

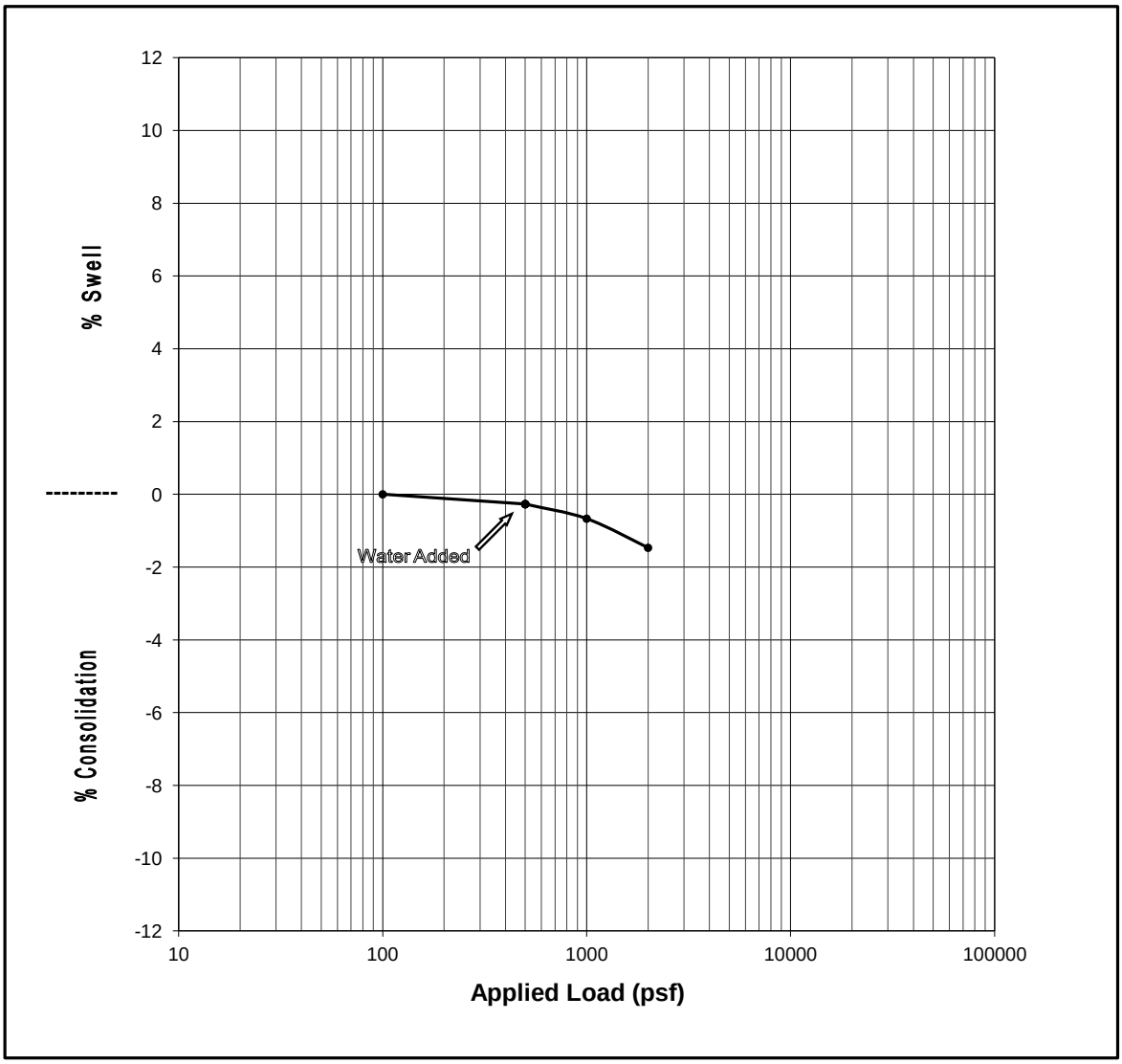
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-5 @ 4'

Sample Description: Brown Silty Sand with Sandy Lean Clay lenses (SM w/CL)

Initial Moisture	10.1%	Liquid Limit	-
Final Moisture	22.7%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	
Swell Pressure	<500 psf	Dry Density	108.4 pcf

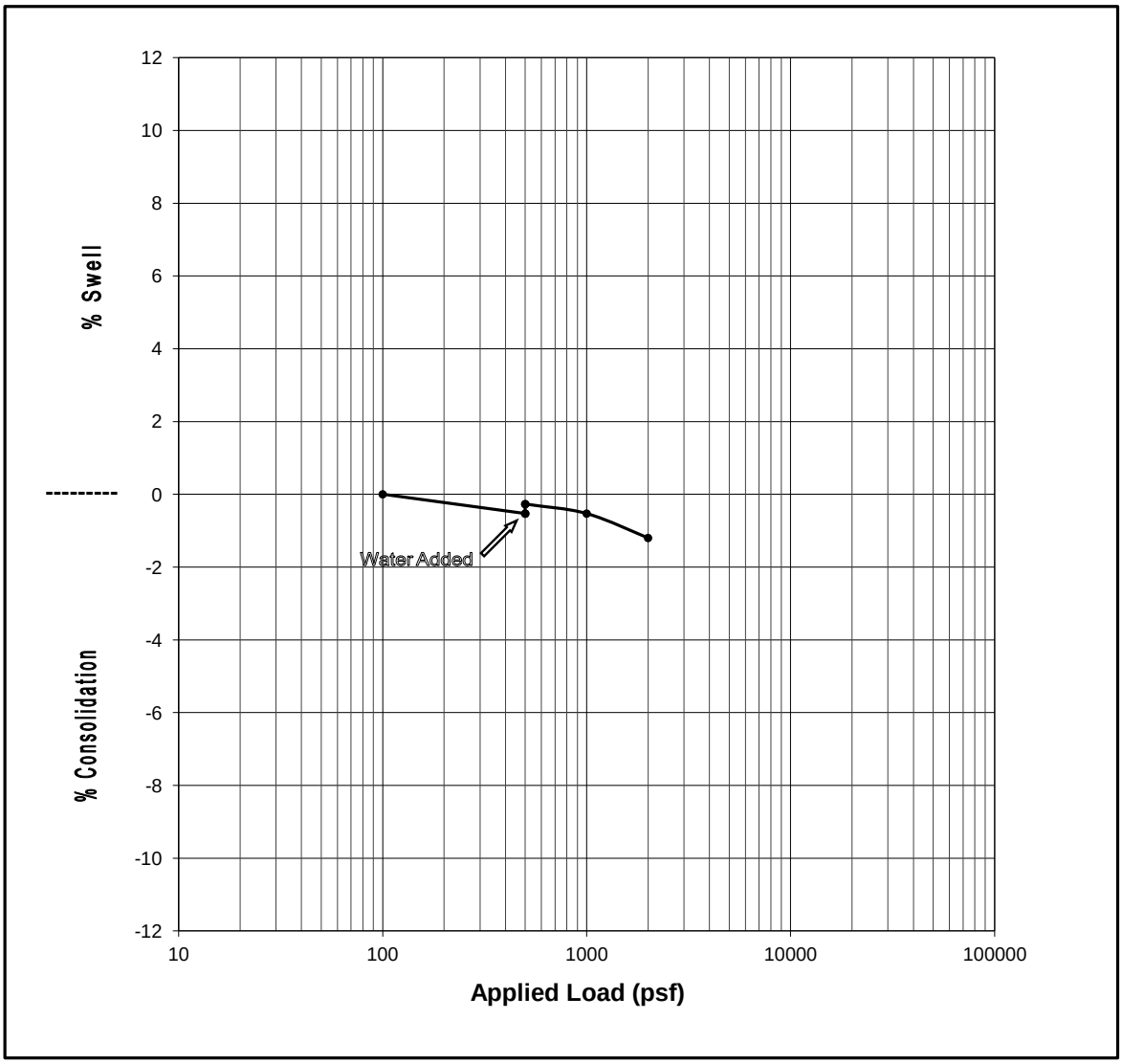
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-5 @ 9'

Sample Description: Gray/Brown/Rust Sandstone/Siltstone/Claystone

Initial Moisture	17.8%	Liquid Limit	-
Final Moisture	20.5%	Plasticity Index	-
% Swell @ 500 psf	0.3%	% Passing #200	-
Swell Pressure	1,000 psf	Dry Density	108.6 pcf

SOILOGIC

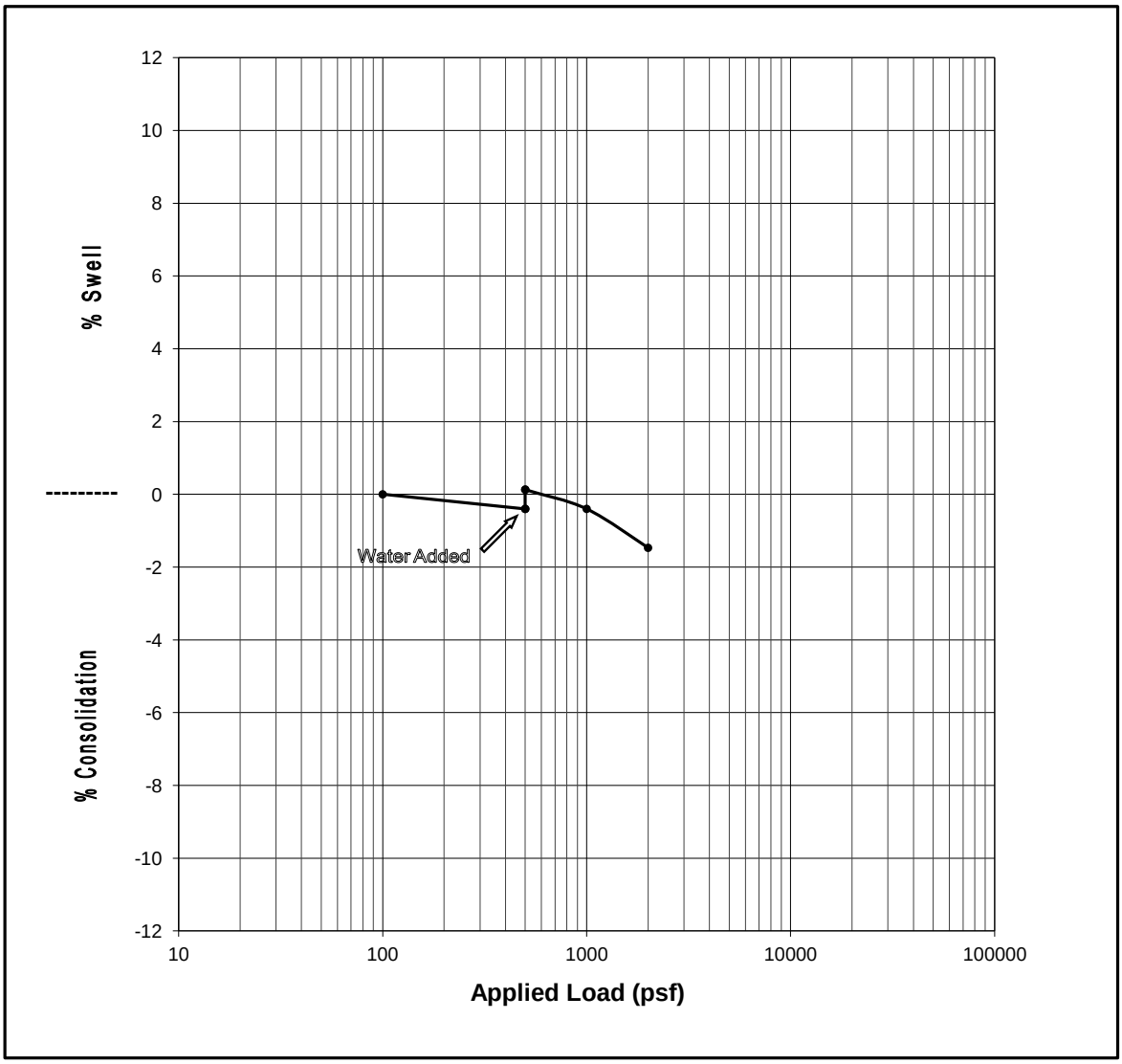
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-6 @ 4'

Sample Description: Brown Sandy Lean Clay (CL)

Initial Moisture	6.0%	Liquid Limit	-
Final Moisture	18.7%	Plasticity Index	-
% Swell @ 500 psf	0.5%	% Passing #200	-
Swell Pressure	1,000 psf	Dry Density	108.4 pcf

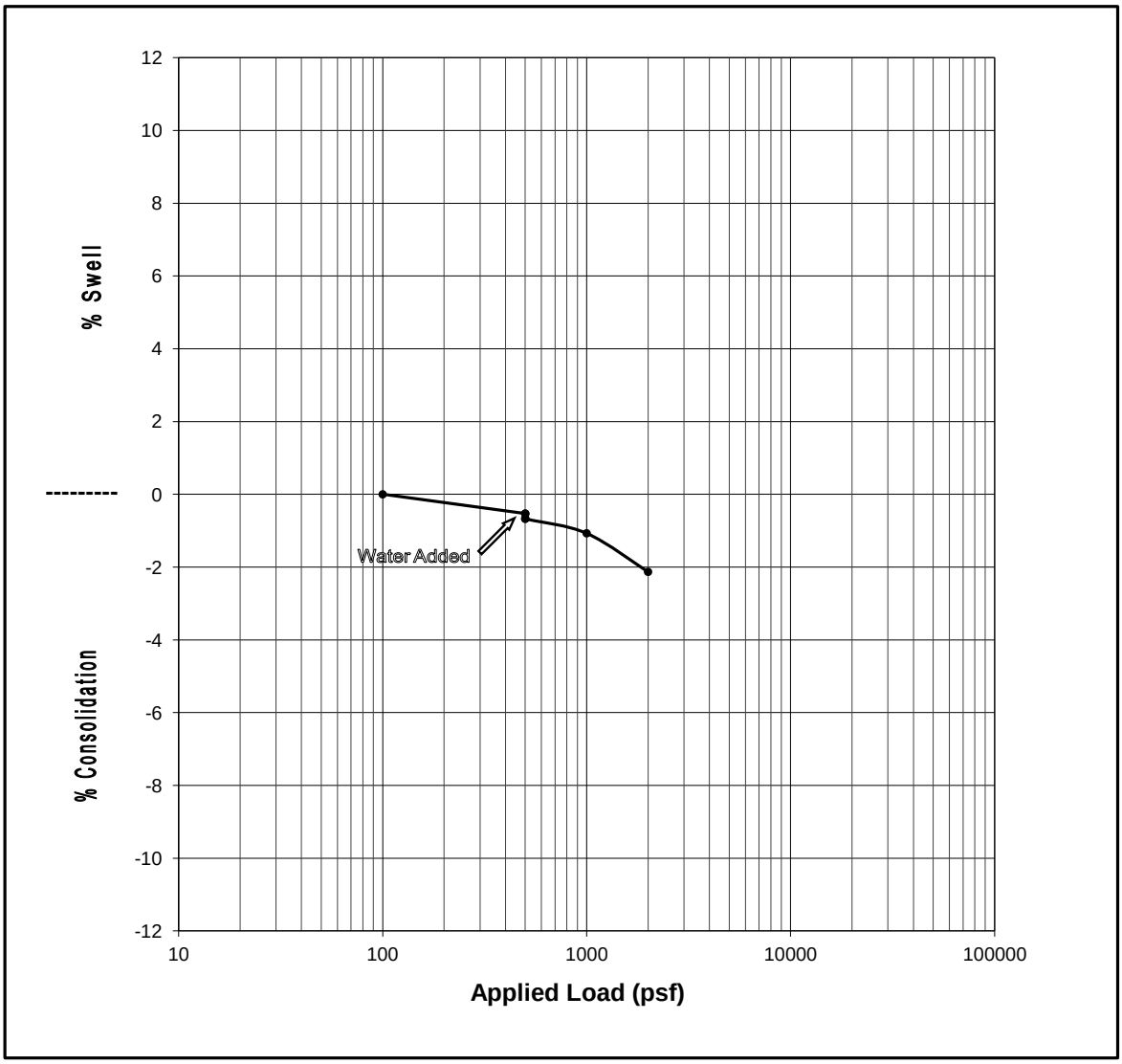
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-6 @ 9'

Sample Description: Brown/Beige Sandy Lean Clay (CL)

Initial Moisture	11.6%	Liquid Limit	-
Final Moisture	21.4%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	101.8 pcf

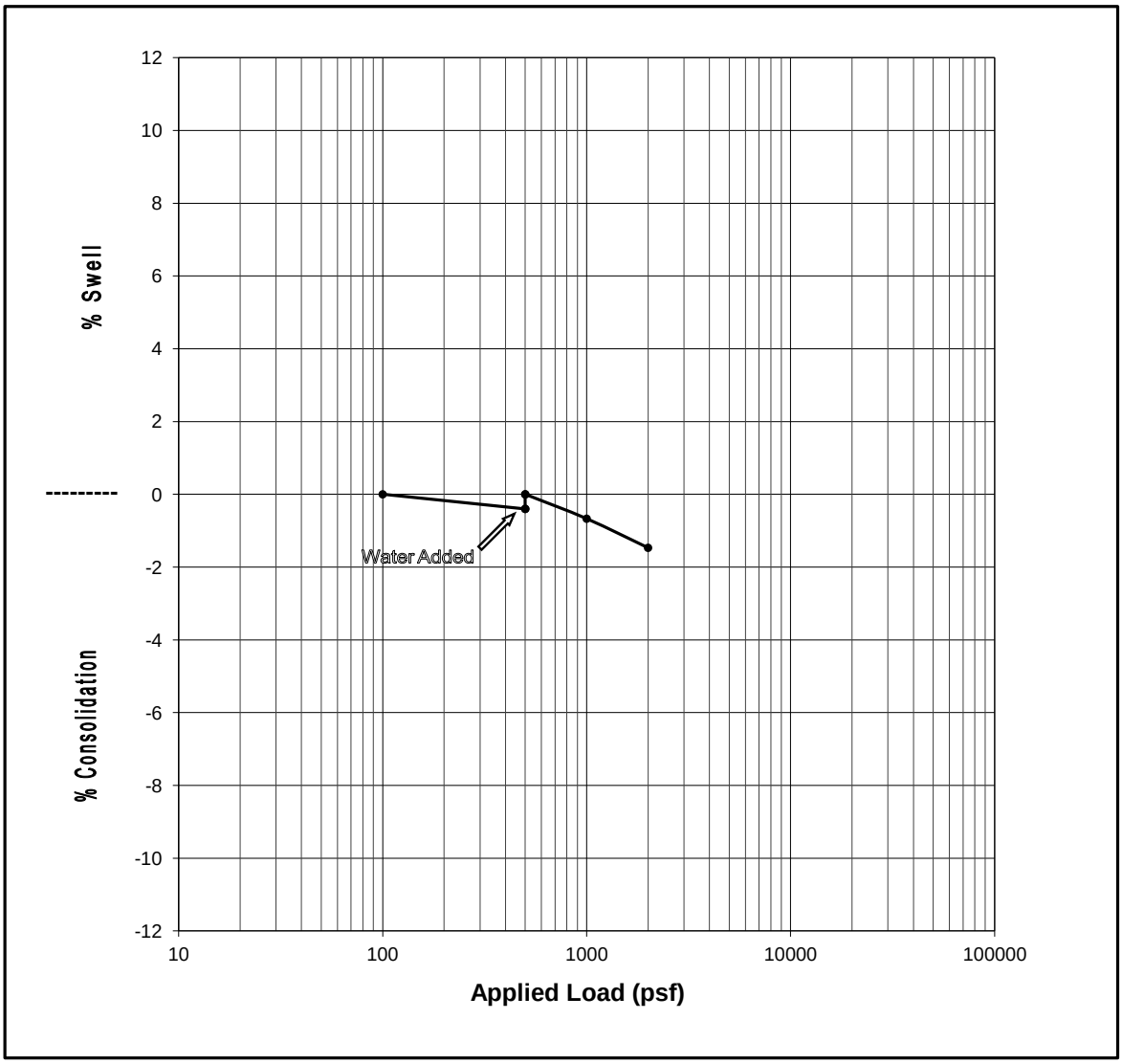
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-7 @ 4'

Sample Description: Rusty Brown Sandy Lean Clay (CL)

Initial Moisture	11.3%	Liquid Limit	-
Final Moisture	16.8%	Plasticity Index	-
% Swell @ 500 psf	0.4%	% Passing #200	-
Swell Pressure	800 psf	Dry Density	119.1 pcf

SOILOGIC

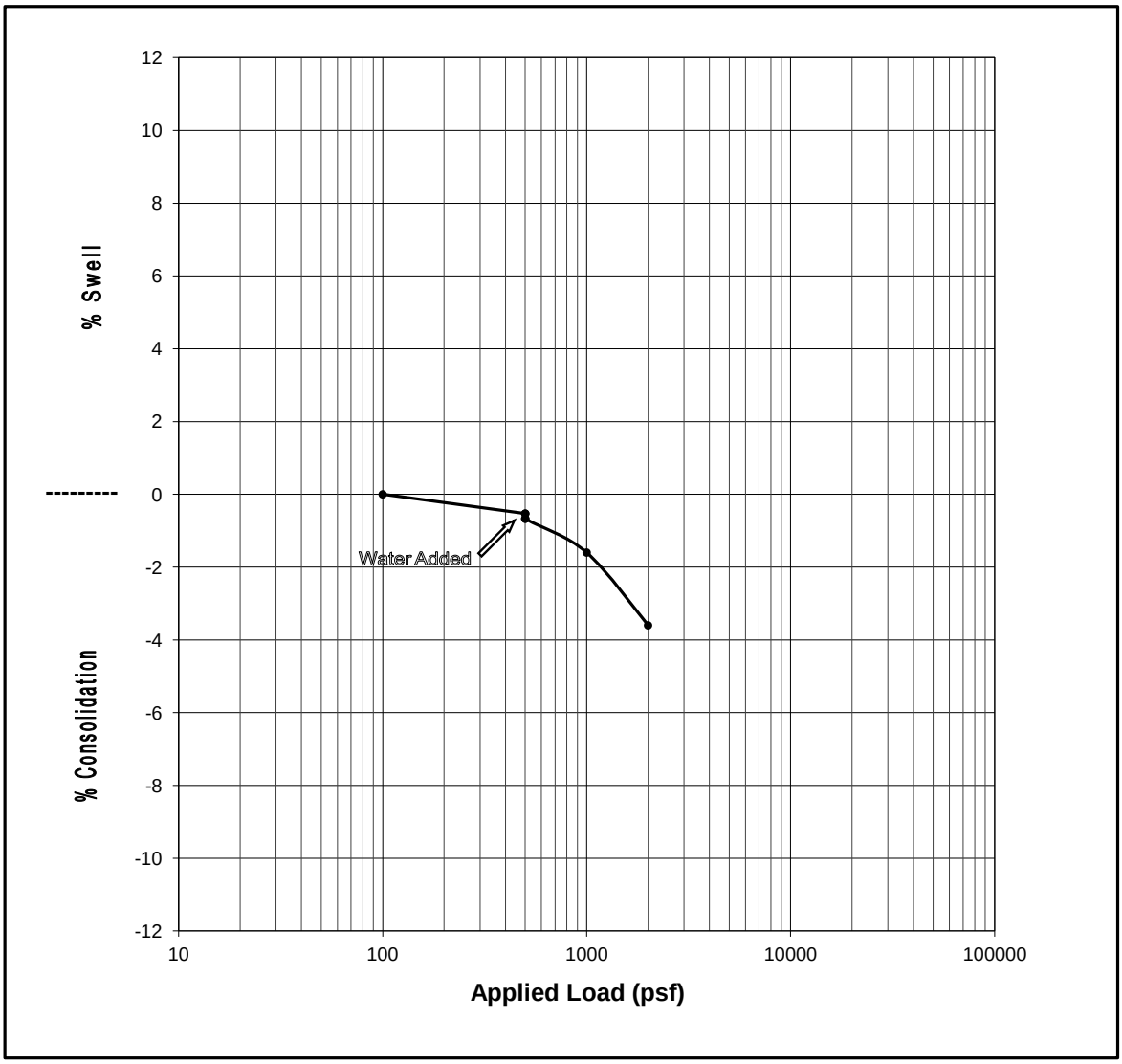
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-7 @ 9'

Sample Description: Brown Sandy Lean Clay (CL)

Initial Moisture	21.1%	Liquid Limit	-
Final Moisture	21.4%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	105.9 pcf

SOILOGIC

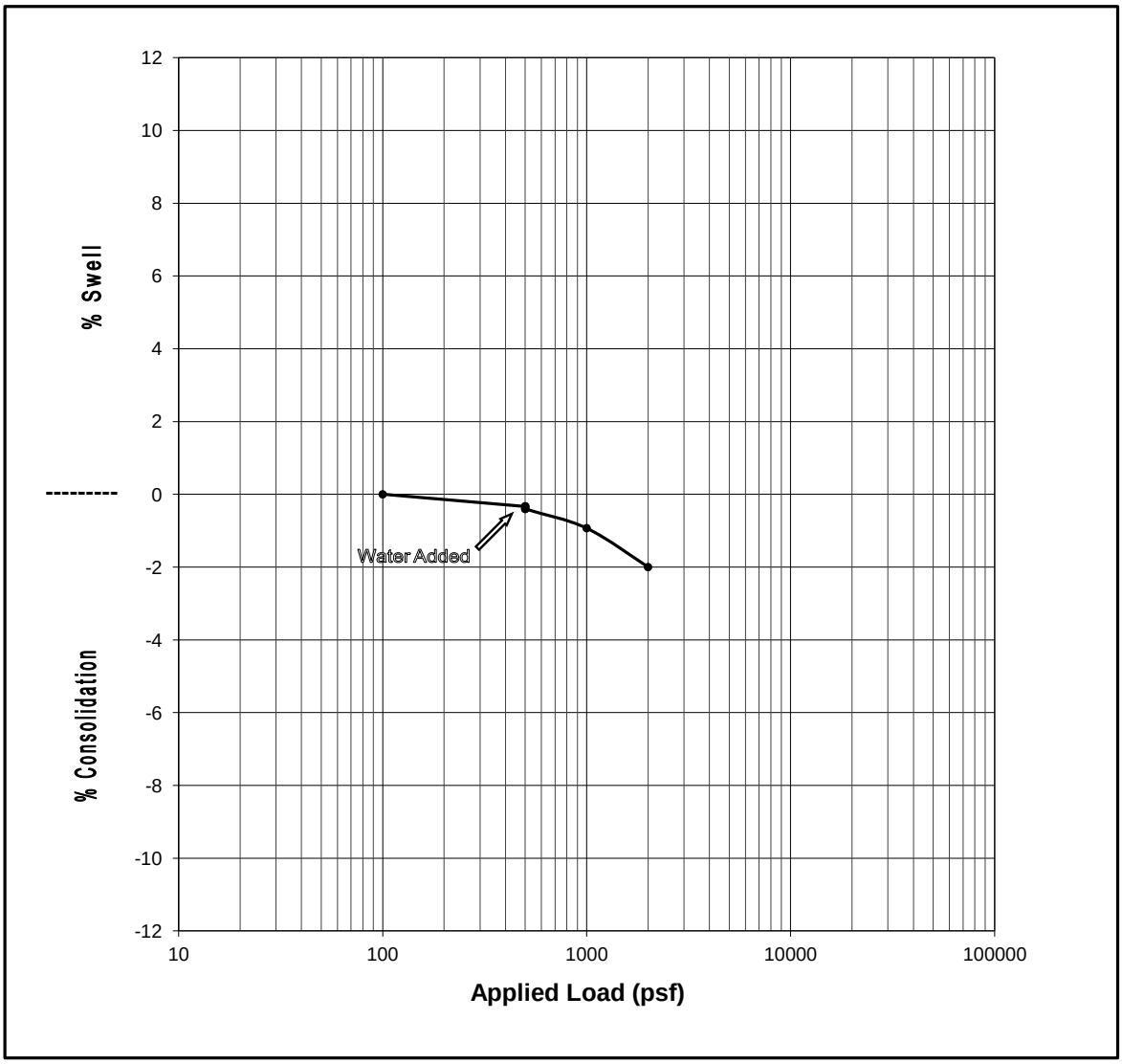
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-8 @ 9'

Sample Description: Rusty Brown Sandy Lean Clay to Clayey Sand (CL-SC)

Initial Moisture	15.0%	Liquid Limit	-
Final Moisture	16.3%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	114.9 pcf

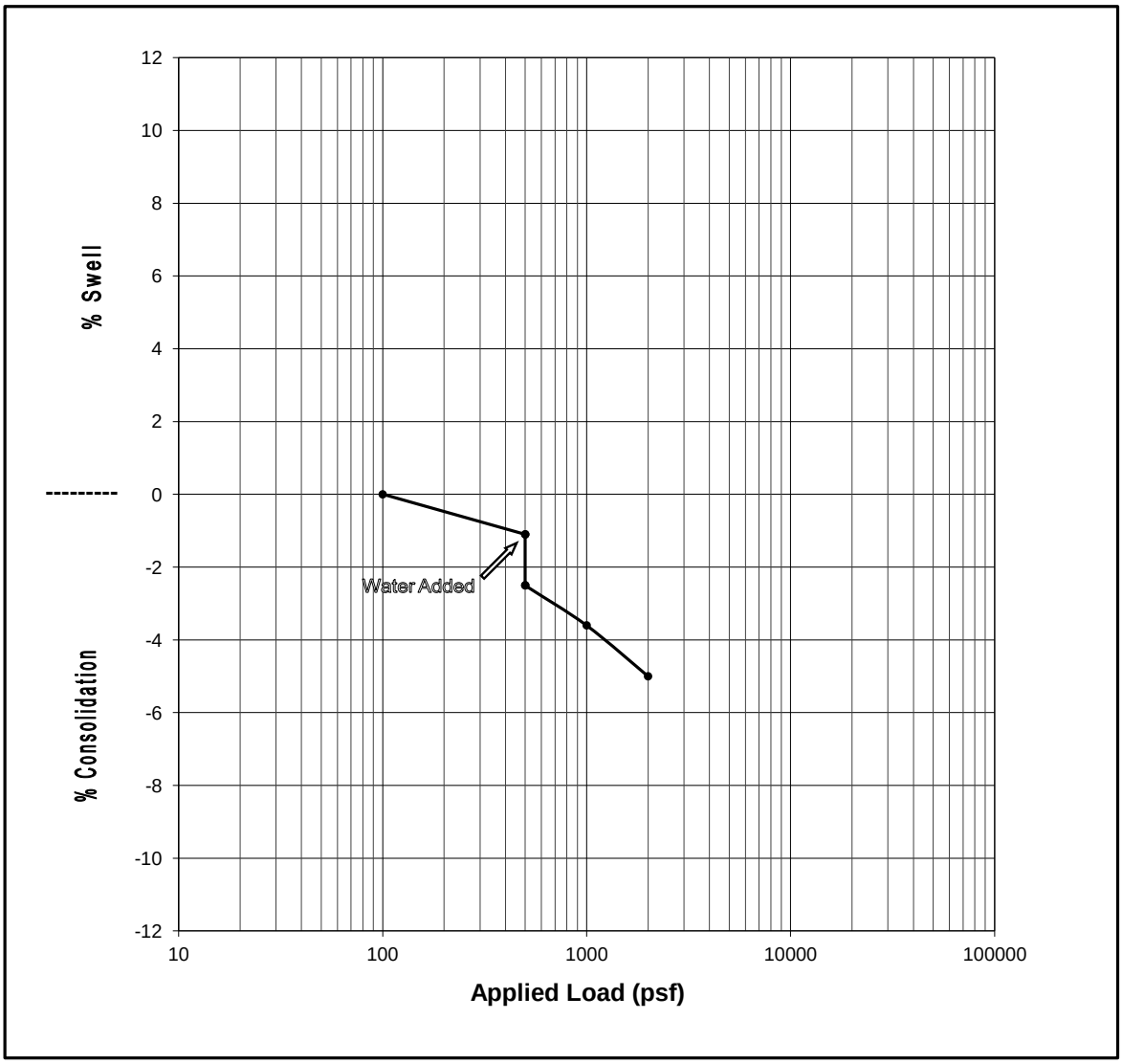
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-9 @ 4'

Sample Description: Dark Brown Sandy Lean Clay (CL)

Initial Moisture	23.6%	Liquid Limit	-
Final Moisture	22.2%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	101.0 pcf

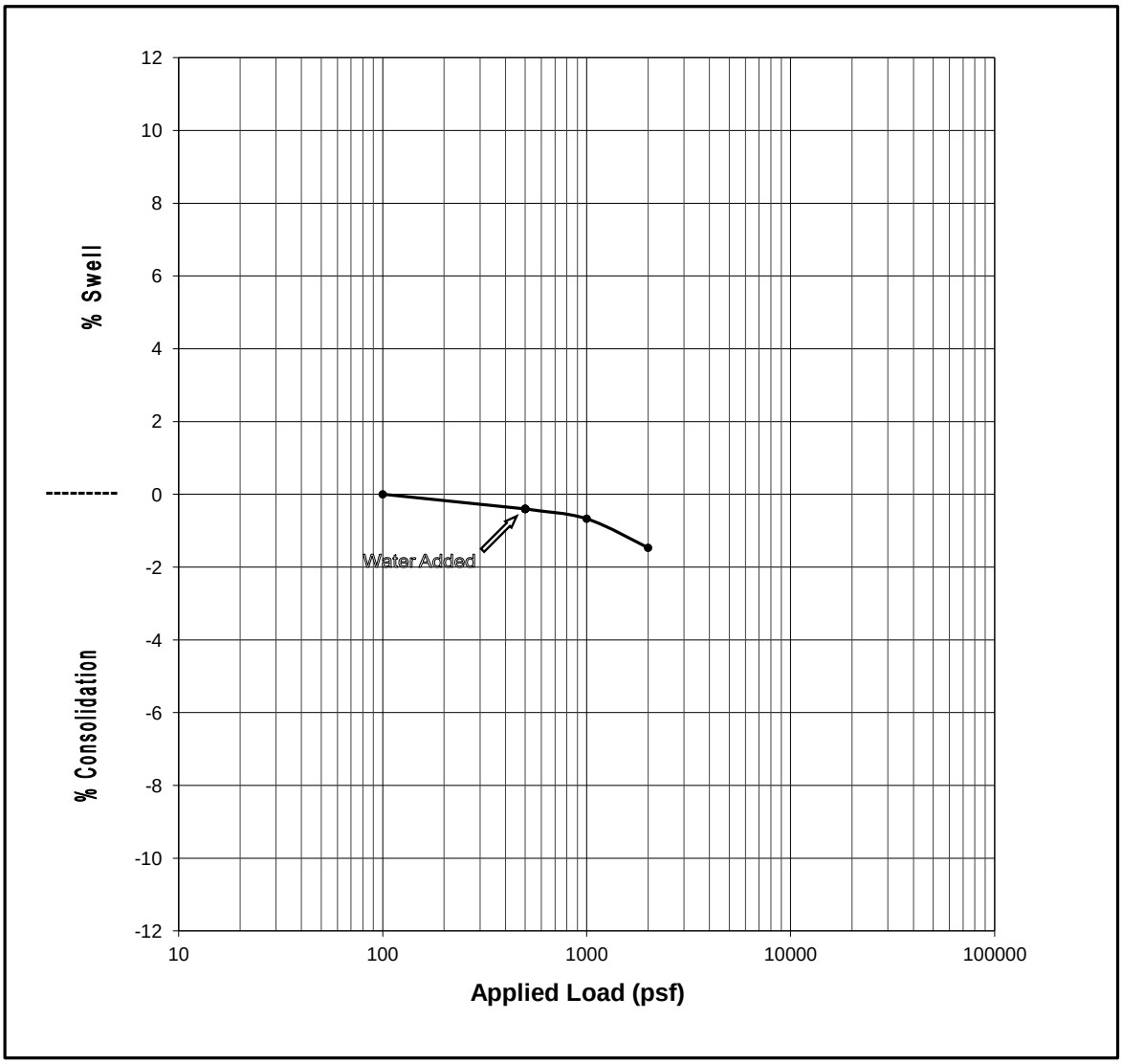
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-10 @ 4'

Sample Description: Rusty Brown Sandy Lean Clay to Clayey Sand (CL-SC)

Initial Moisture	7.1%	Liquid Limit	-
Final Moisture	19.0%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	106.1 pcf

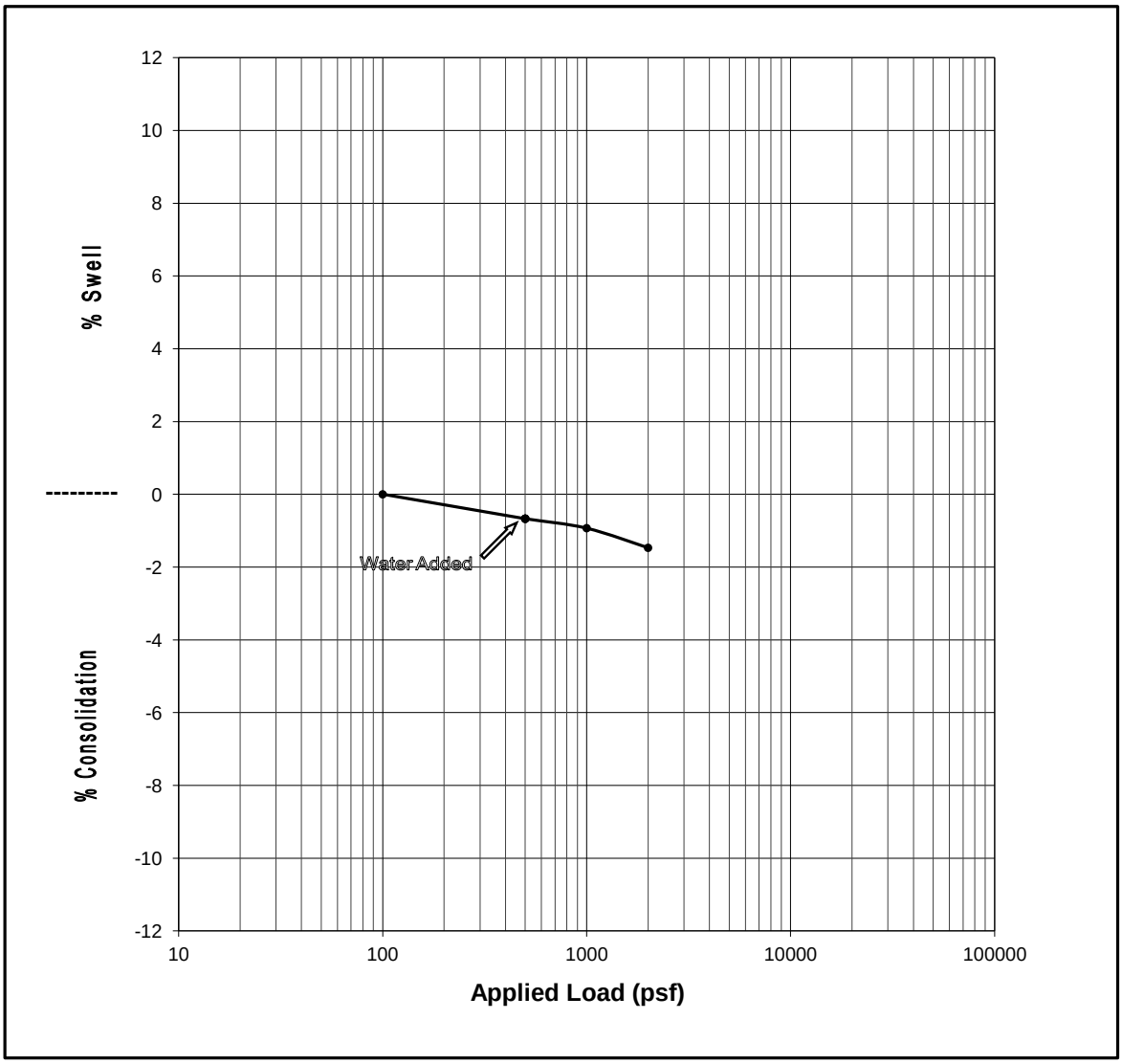
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

Project # 13-1109

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-10 @ 9'

Sample Description: Brown Sandy Lean Clay (CL)

Initial Moisture	11.5%	Liquid Limit	-
Final Moisture	17.6%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	109.8 pcf

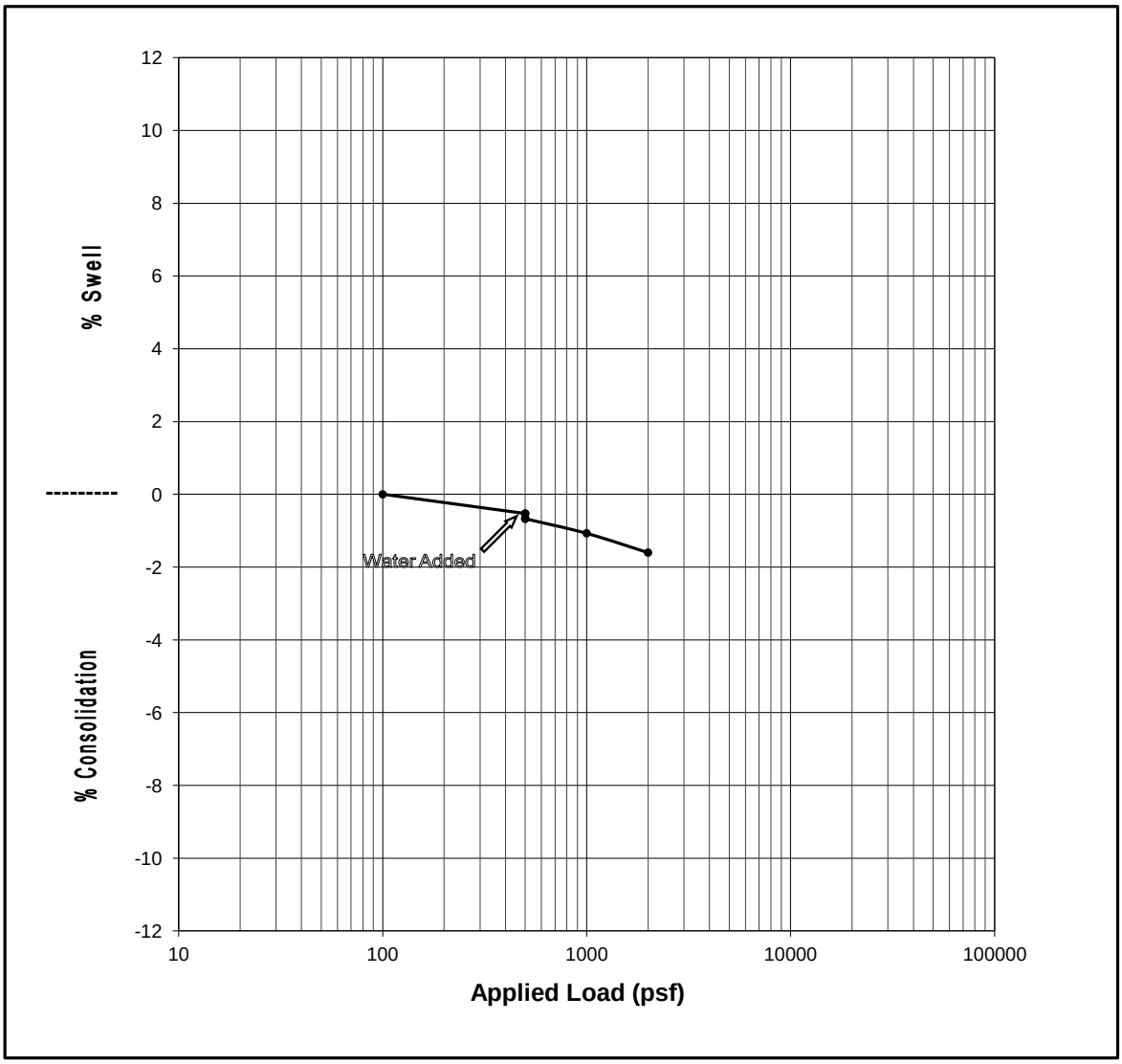
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-11 @ 4'

Sample Description: Brown Sandy Lean Clay to Clayey Sand (CL-SC)

Initial Moisture	9.6%	Liquid Limit	-
Final Moisture	16.8%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	107.7 pcf

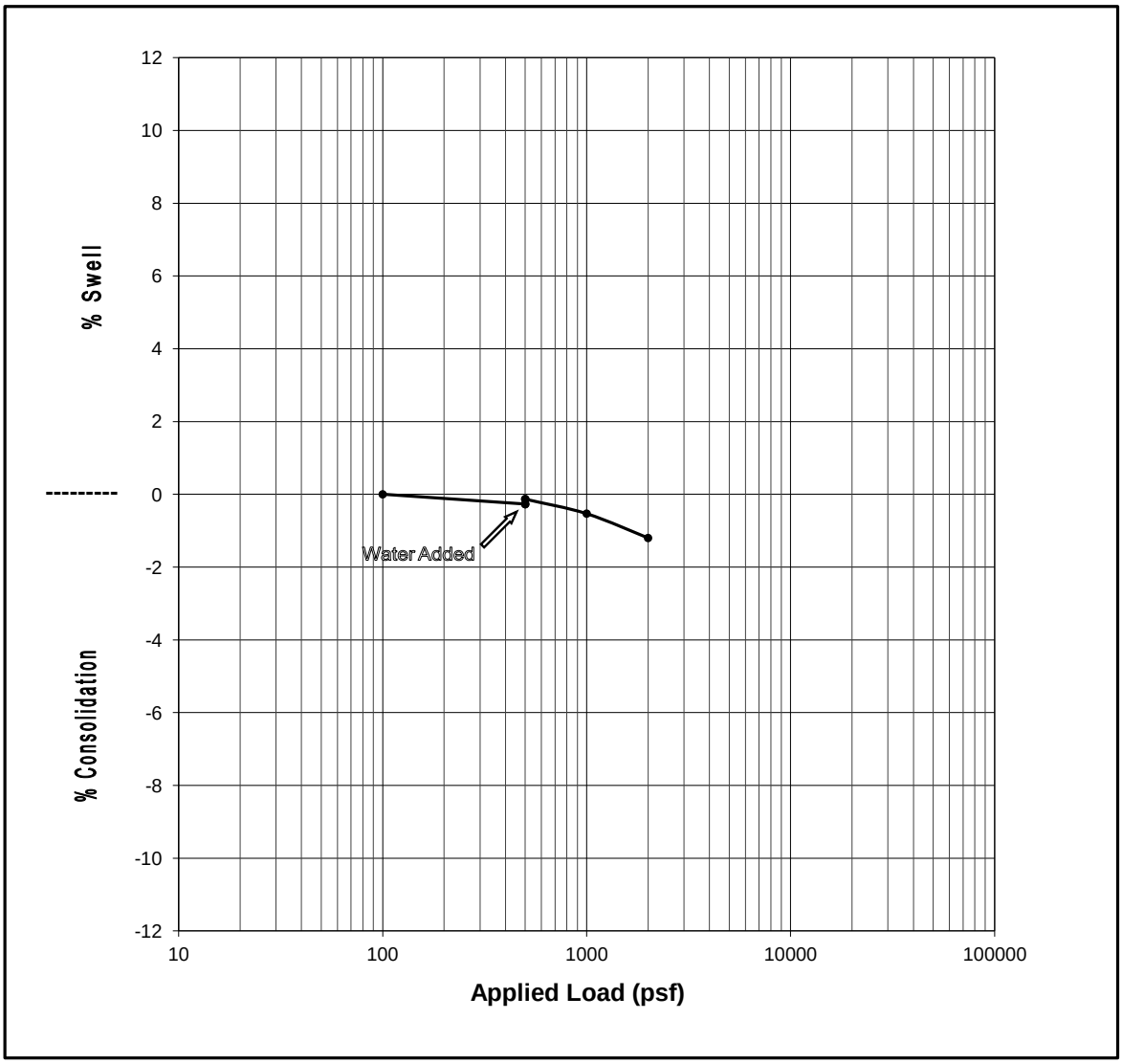
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-12 @ 4'

Sample Description: Light Brown/Beige Silty, Sandy Lean Clay (CL)

Initial Moisture	4.1%	Liquid Limit	-
Final Moisture	19.0%	Plasticity Index	-
% Swell @ 500 psf	0.1%	% Passing #200	-
Swell Pressure	700 psf	Dry Density	111.3 pcf

SOILOGIC

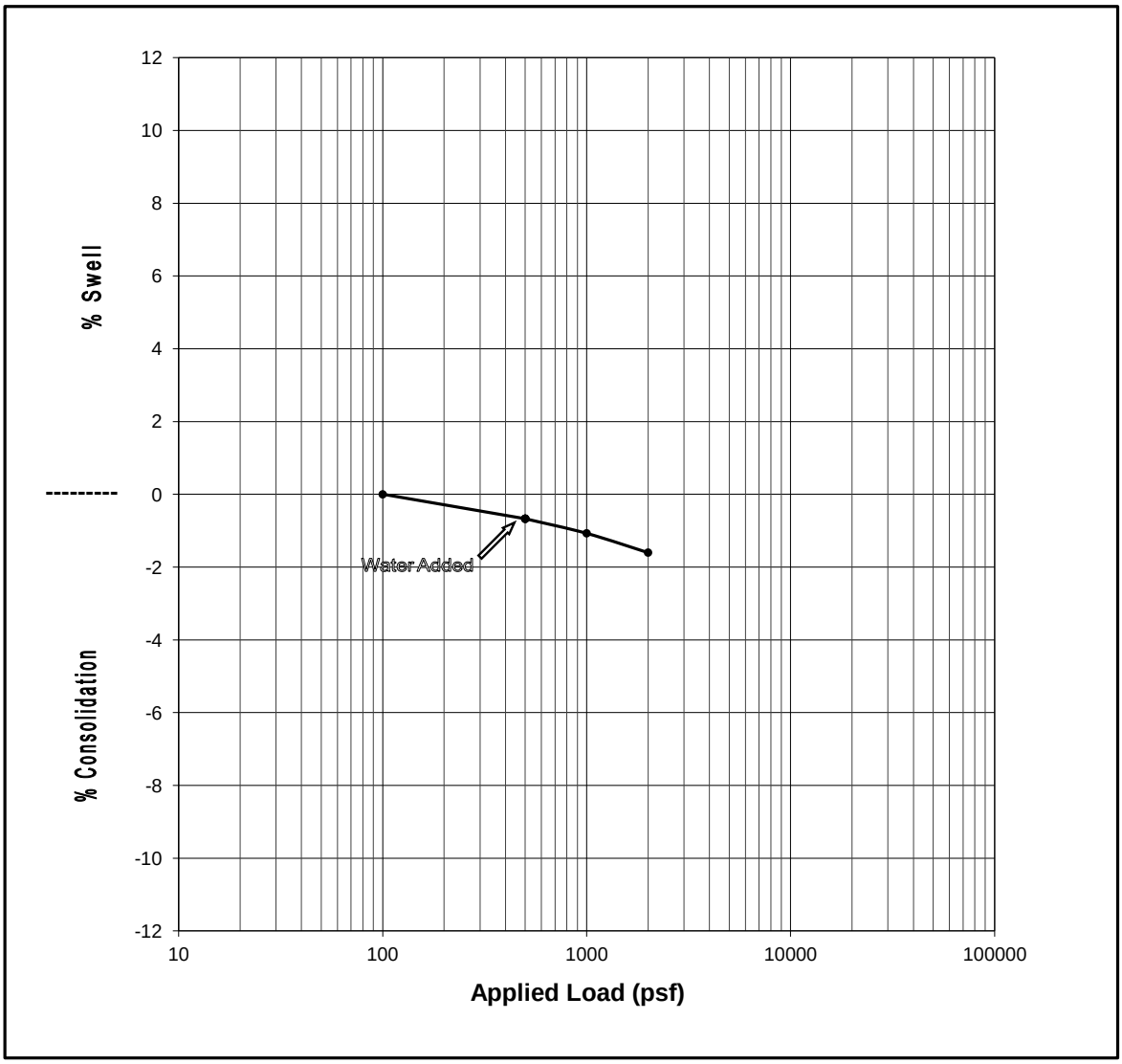
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-12 @ 9'

Sample Description: Brown Clayey, Silty Sand with Sandy Lean Clay (SC-SM w/CL)

Initial Moisture	9.7%	Liquid Limit	-
Final Moisture	20.3%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	107.8 pcf

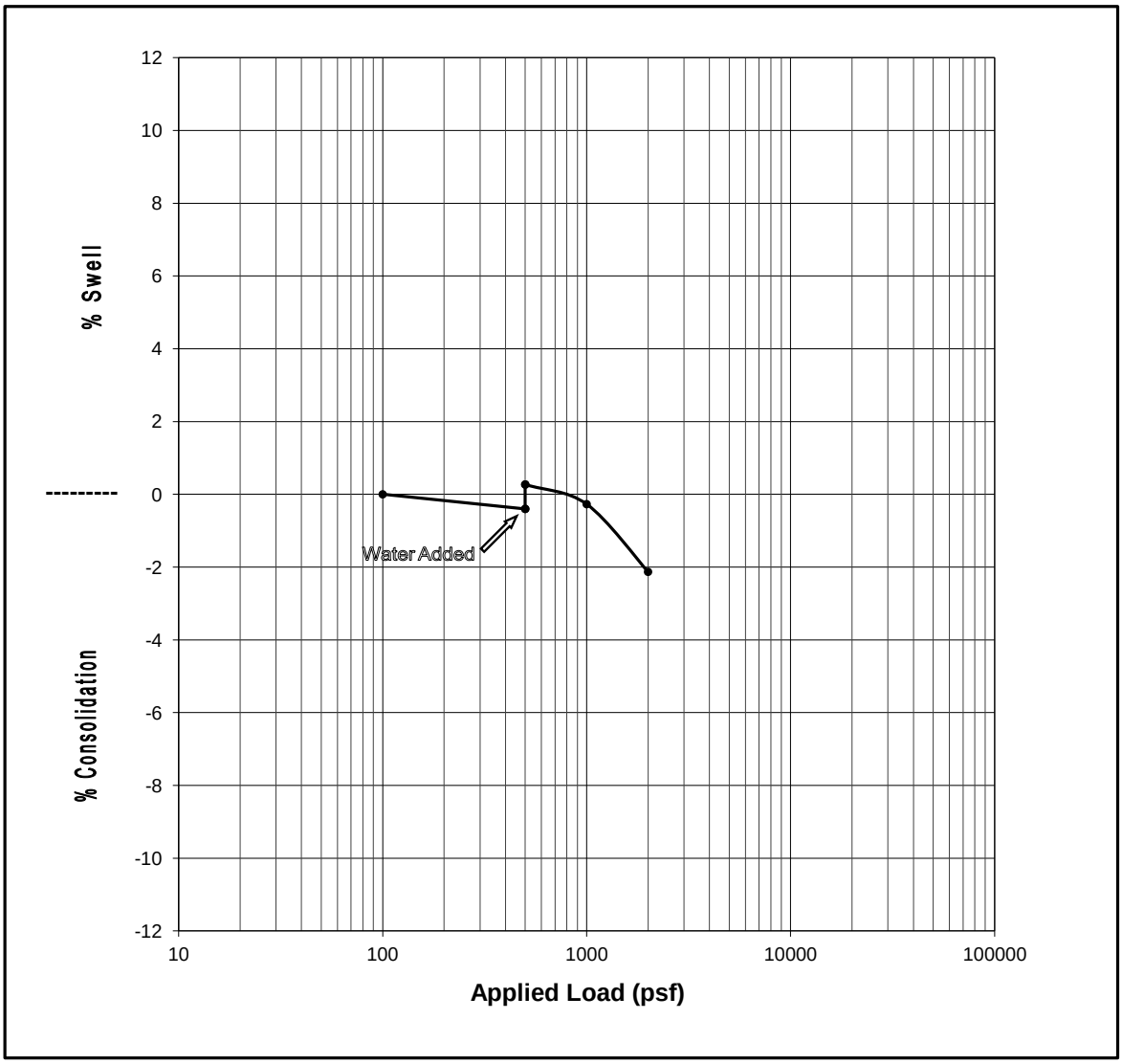
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-13 @ 4'

Sample Description: Light Brown/Beige Silty, Sandy Lean Clay (CL)

Initial Moisture	4.0%	Liquid Limit	-
Final Moisture	21.7%	Plasticity Index	-
% Swell @ 500 psf	0.7%	% Passing #200	-
Swell Pressure	1,100 psf	Dry Density	106.6 pcf

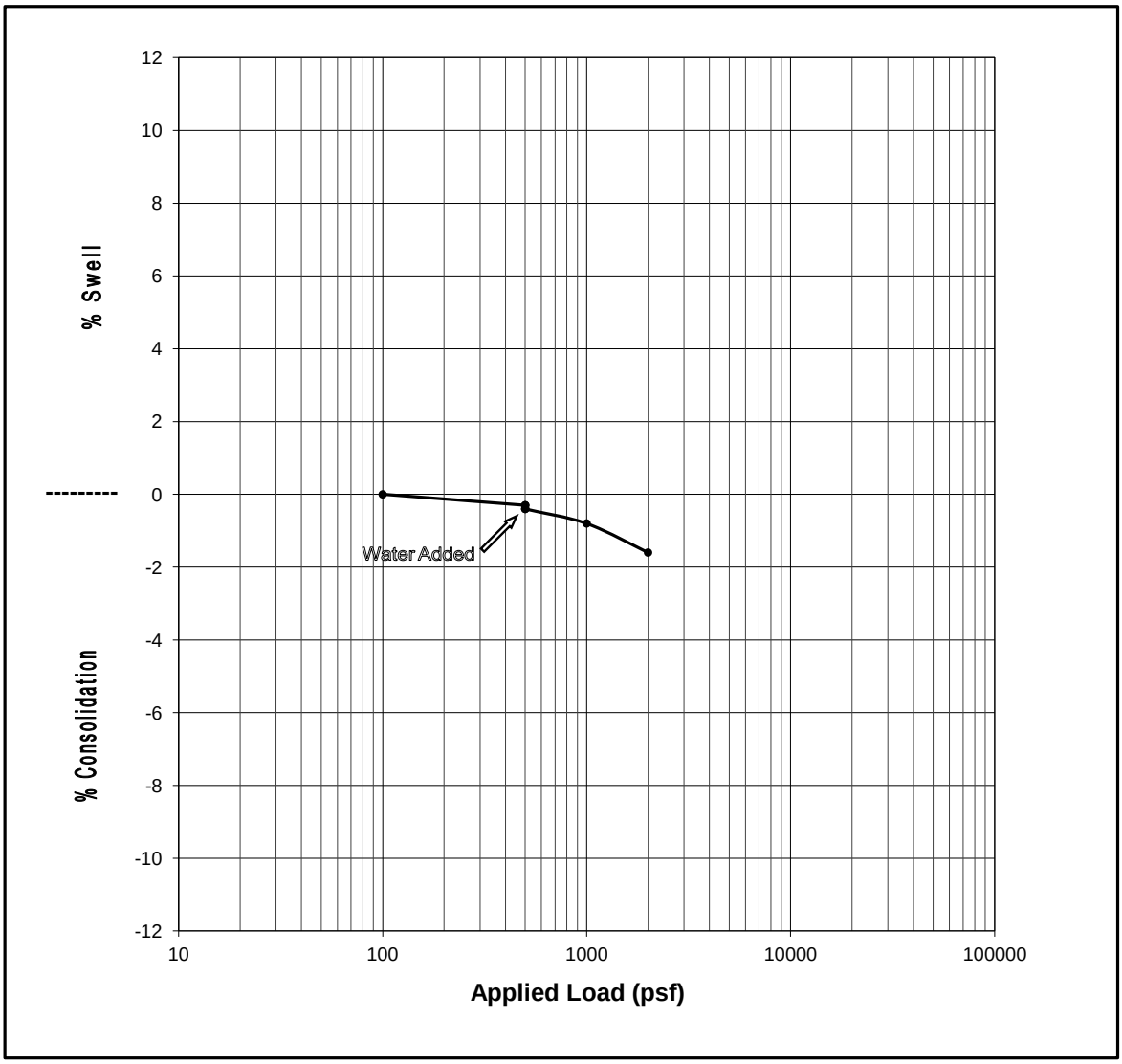
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-13 @ 9'

Sample Description: Red Brown Silty, Sandy Lean Clay (CL)

Initial Moisture	10.6%	Liquid Limit	-
Final Moisture	21.0%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	105.1 pcf

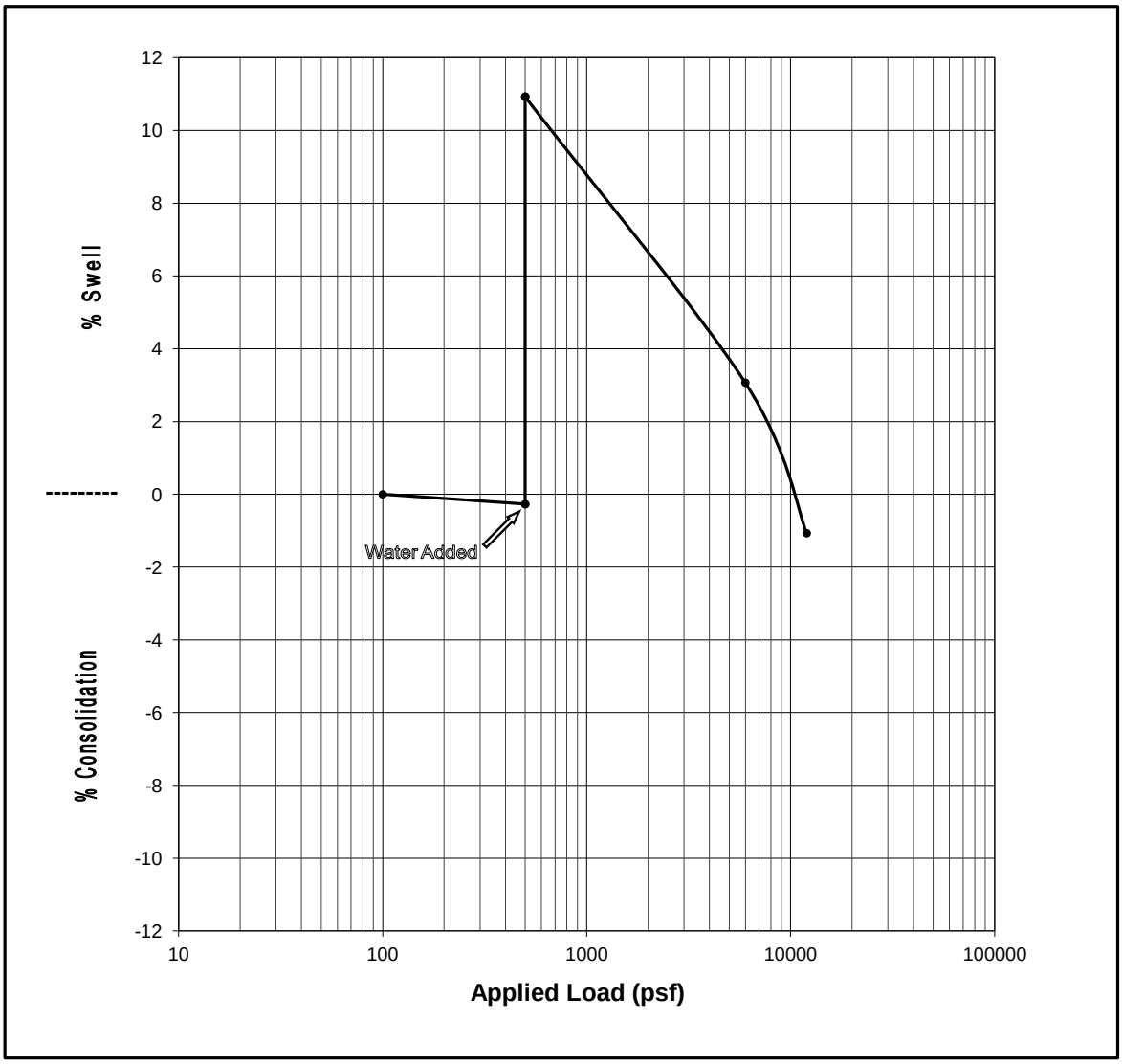
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-14 @ 9'

Sample Description: Dark Gray/Yellow Claystone

Initial Moisture	11.3%	Liquid Limit	-
Final Moisture	29.3%	Plasticity Index	-
% Swell @ 500 psf	11.2%	% Passing #200	-
Swell Pressure	11,000 psf	Dry Density	109.1 pcf

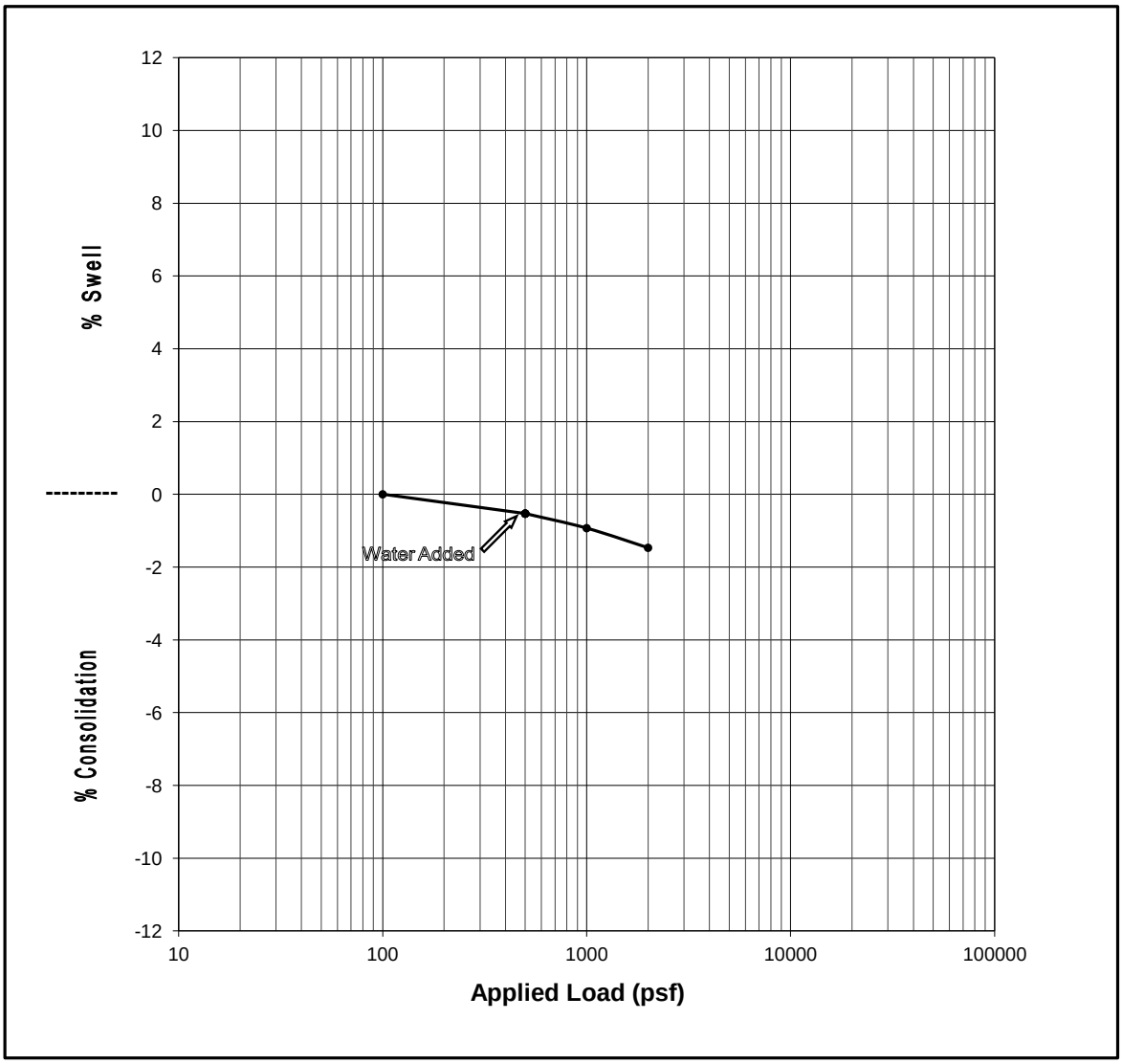
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-15 @ 4'

Sample Description: Brown/Beige Silty, Sandy Lean Clay (CL)

Initial Moisture	9.7%	Liquid Limit	-
Final Moisture	21.7%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	106.6 pcf

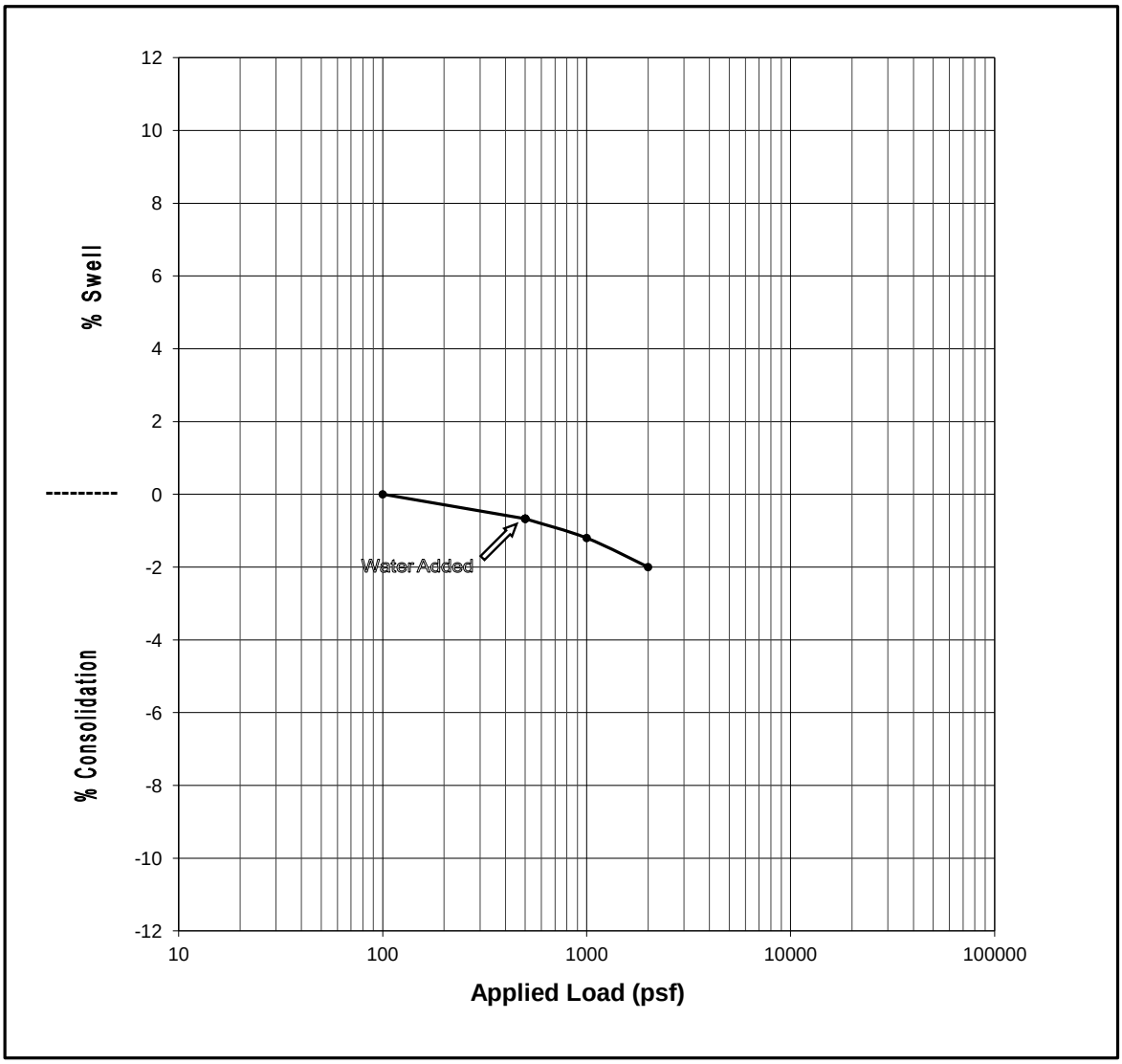
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: B-15 @ 9'

Sample Description: Rusty Brown Clayey, Silty Sand with Sandy Lean Clay (SC-SM w/CL)

Initial Moisture	7.2%	Liquid Limit	-
Final Moisture	22.7%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	101.5 pcf

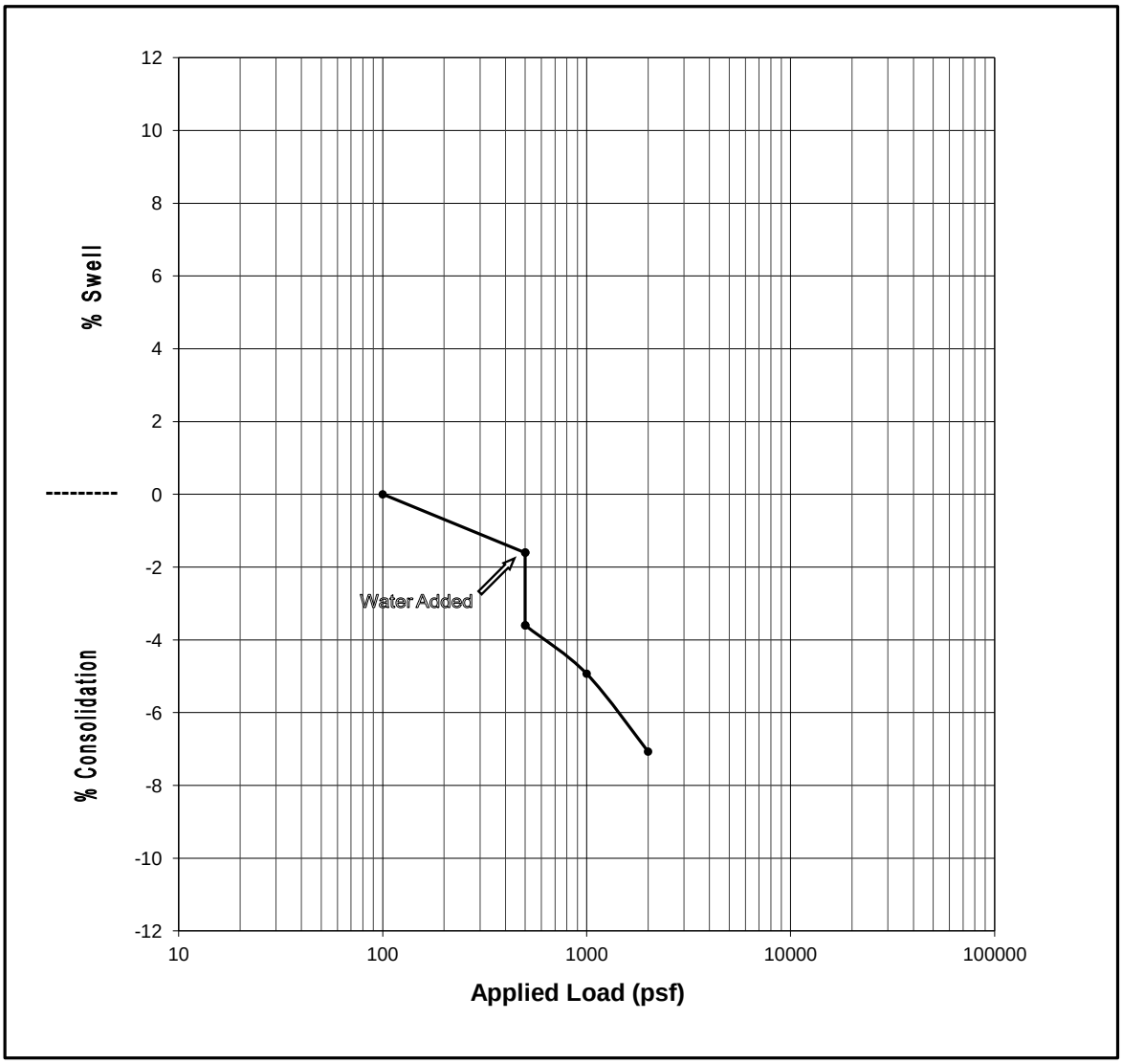
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: TP-1 @ 4'

Sample Description: Light Brown/Beige Silty to Clayey Sand (SM to SC)

Initial Moisture	24.4%	Liquid Limit	-
Final Moisture	20.8%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	101.2 pcf

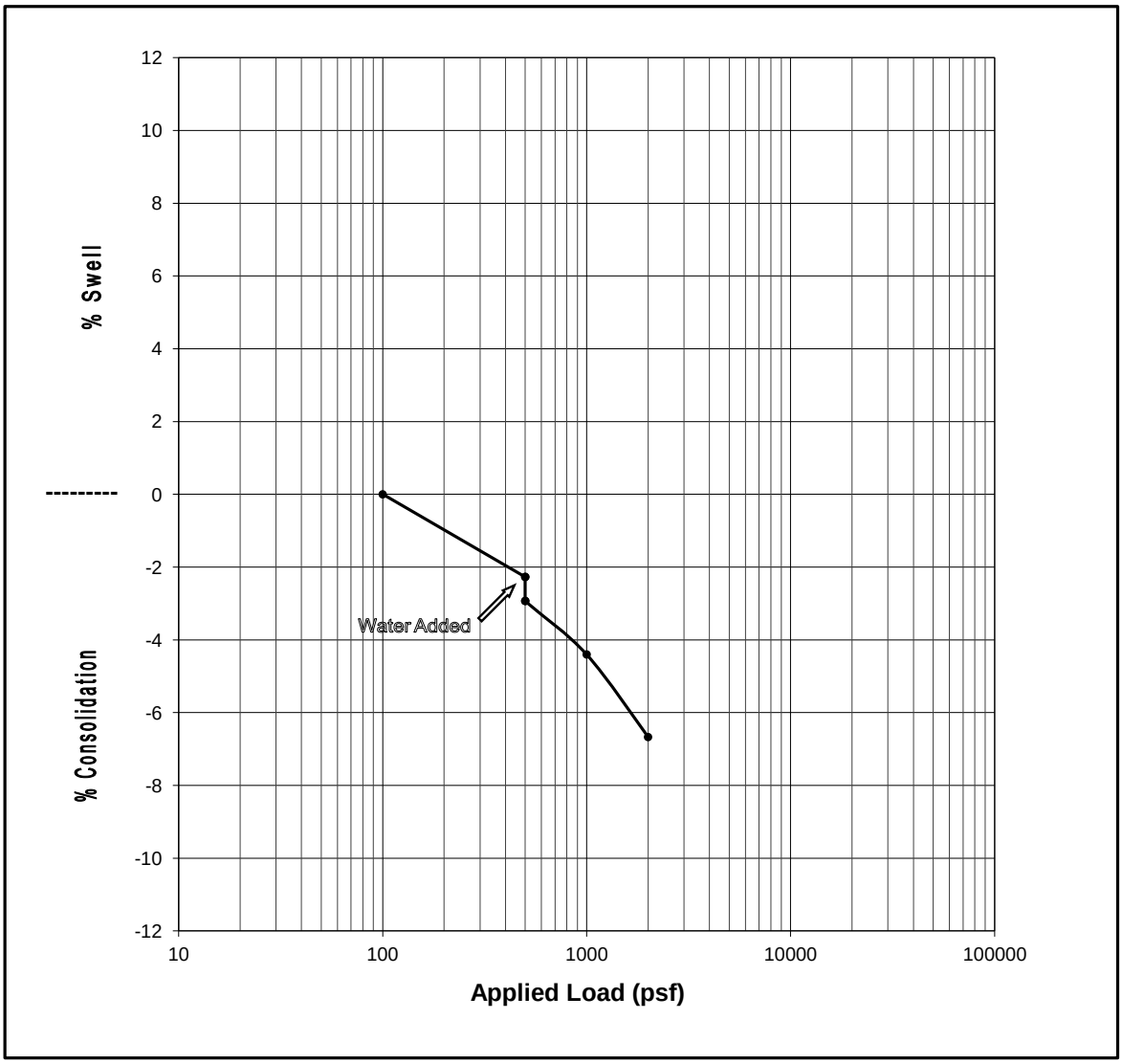
ANDALUSIA PRELIMINARY EXPLORATION

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: TP-2 @ 4'

Sample Description: Brown Silty, Clayey Sand (SC-SM), with trace organics

Initial Moisture	22.2%	Liquid Limit	-
Final Moisture	19.5%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	103.3 pcf

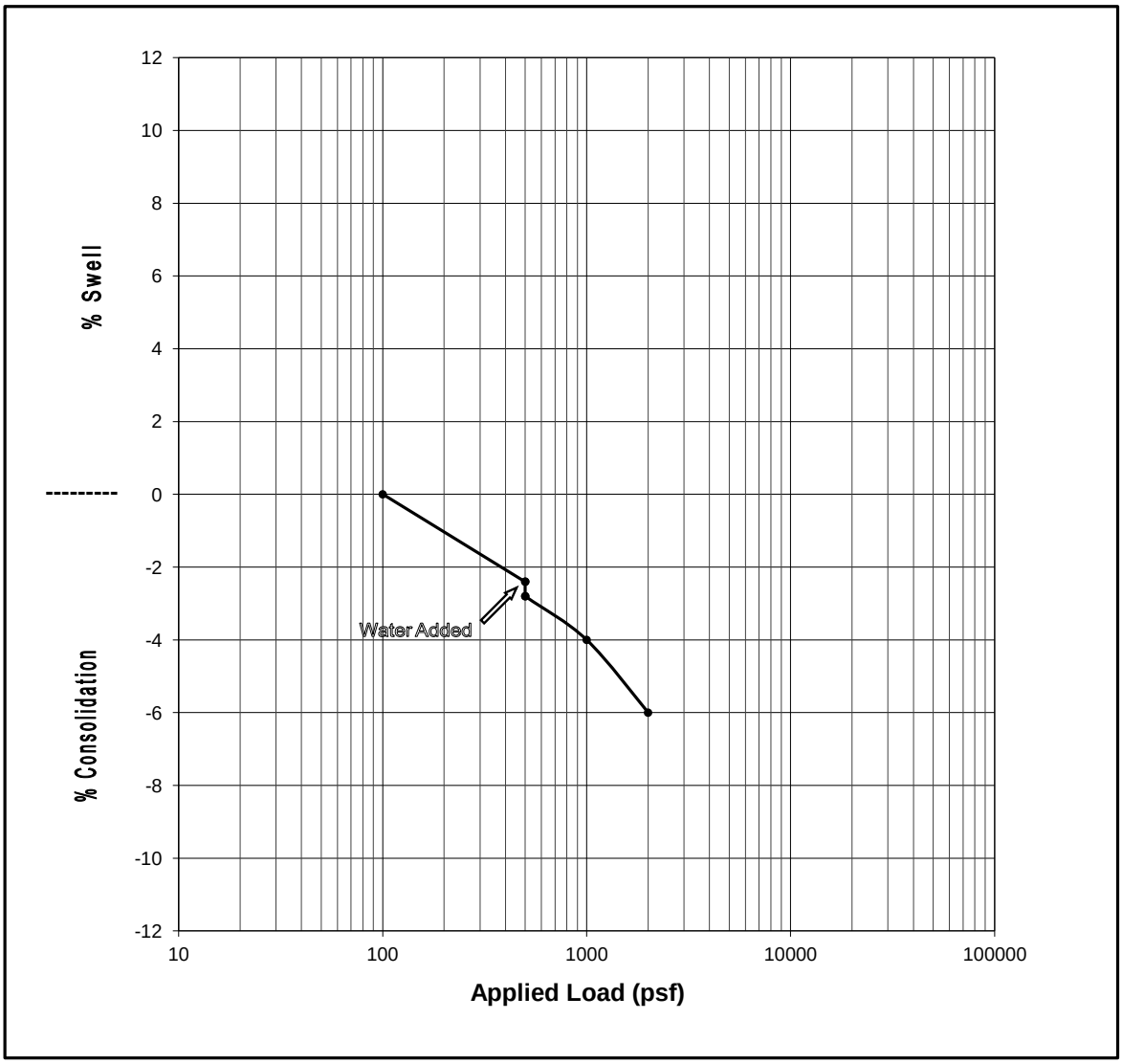
ANDALUSIA PRELIMINARY EXPLORATION

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: TP-3 @ 4'

Sample Description: Olive Brown Clayey Sand (SC)

Initial Moisture	25.9%	Liquid Limit	-
Final Moisture	21.2%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	95.4 pcf

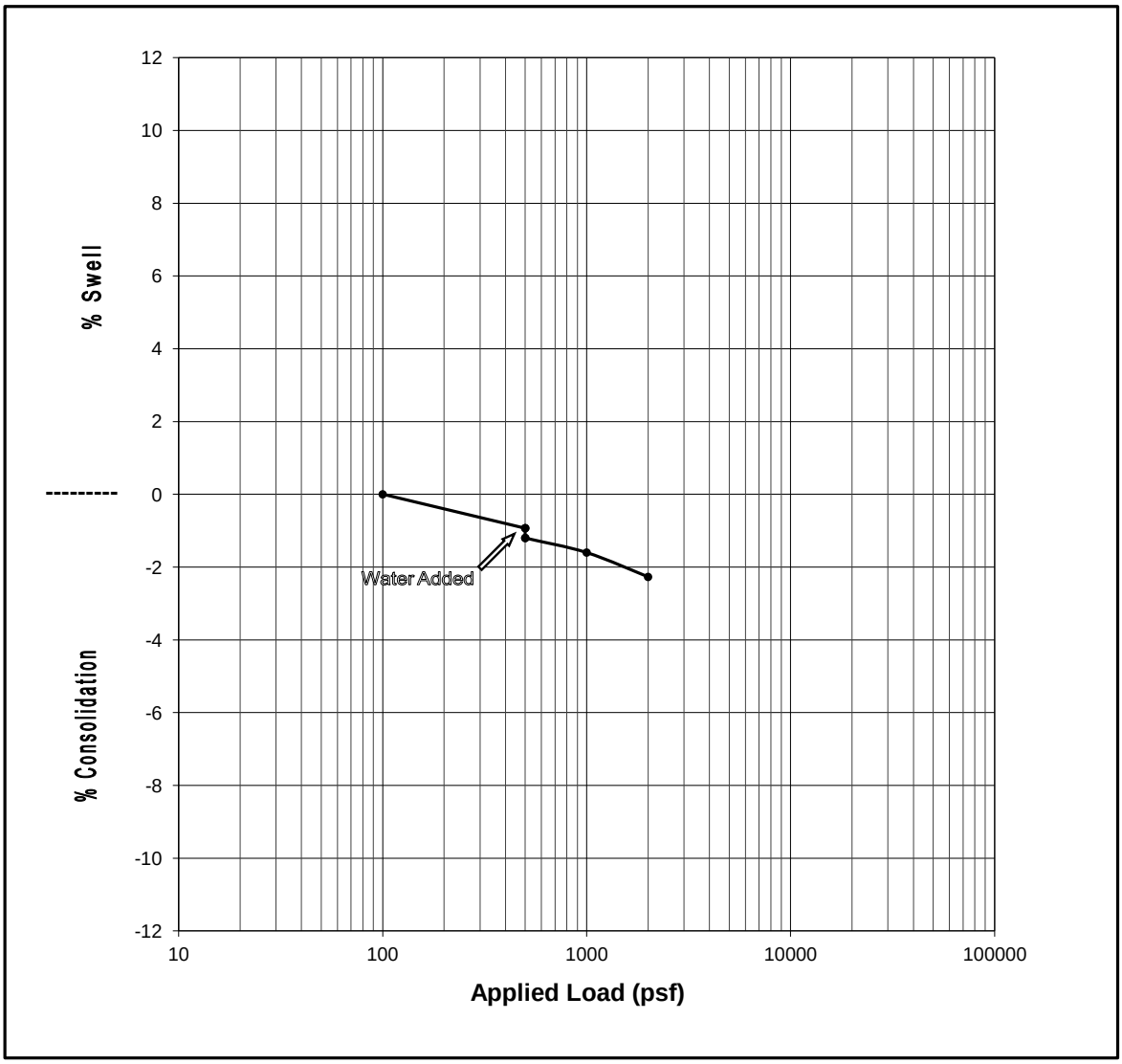
ANDALUSIA PRELIMINARY EXPLORATION

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: TP-4 @ 4'

Sample Description: Brown Silty, Clayey Sand (SC-SM)

Initial Moisture	19.4%	Liquid Limit	-
Final Moisture	17.0%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	110.8 pcf

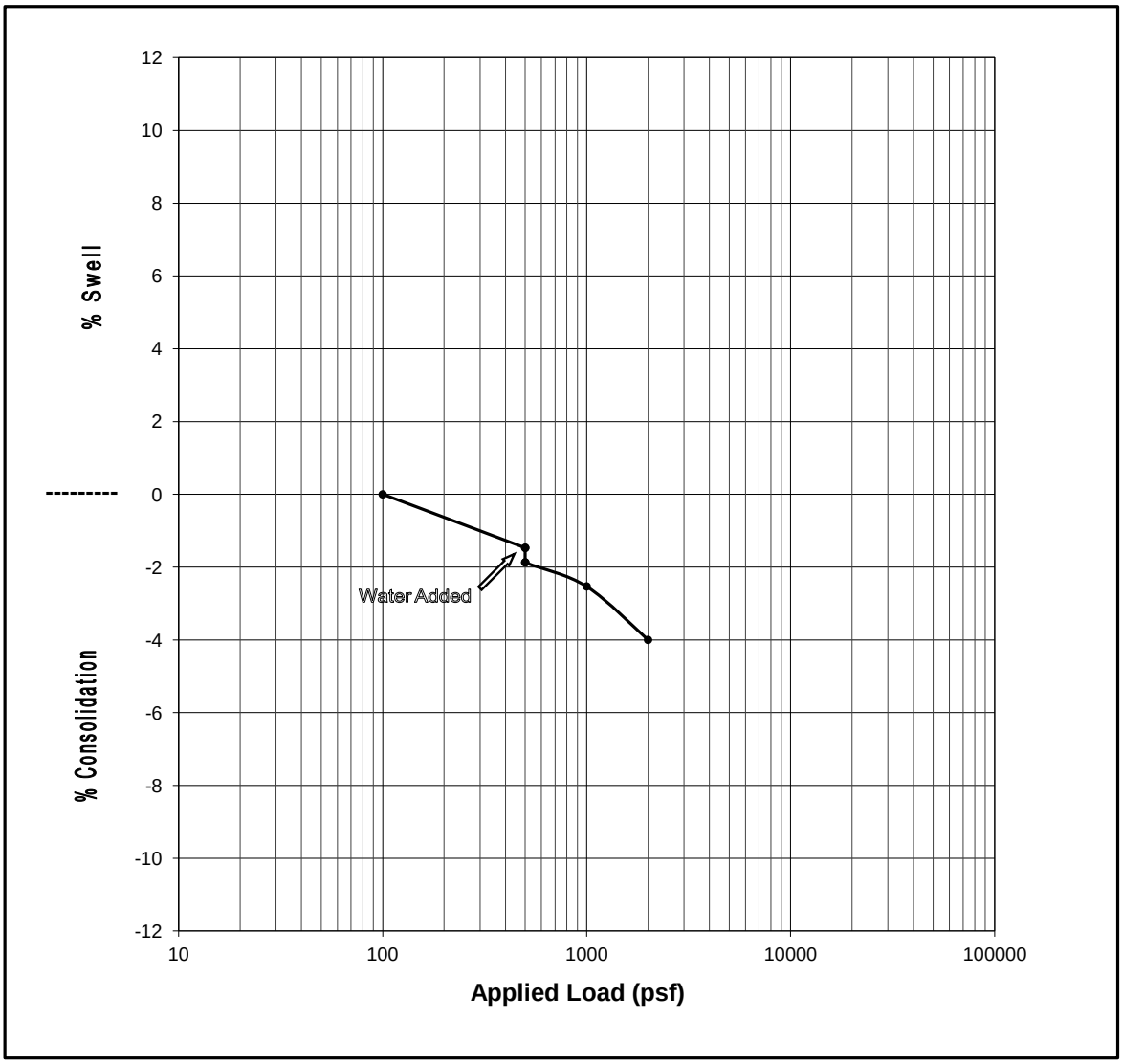
ANDALUSIA PRELIMINARY EXPLORATION

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: TP-5 @ 2'

Sample Description: Dark Brown Silty, Clayey Sand (SC-SM)

Initial Moisture	19.5%	Liquid Limit	-
Final Moisture	19.0%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	108.8 pcf

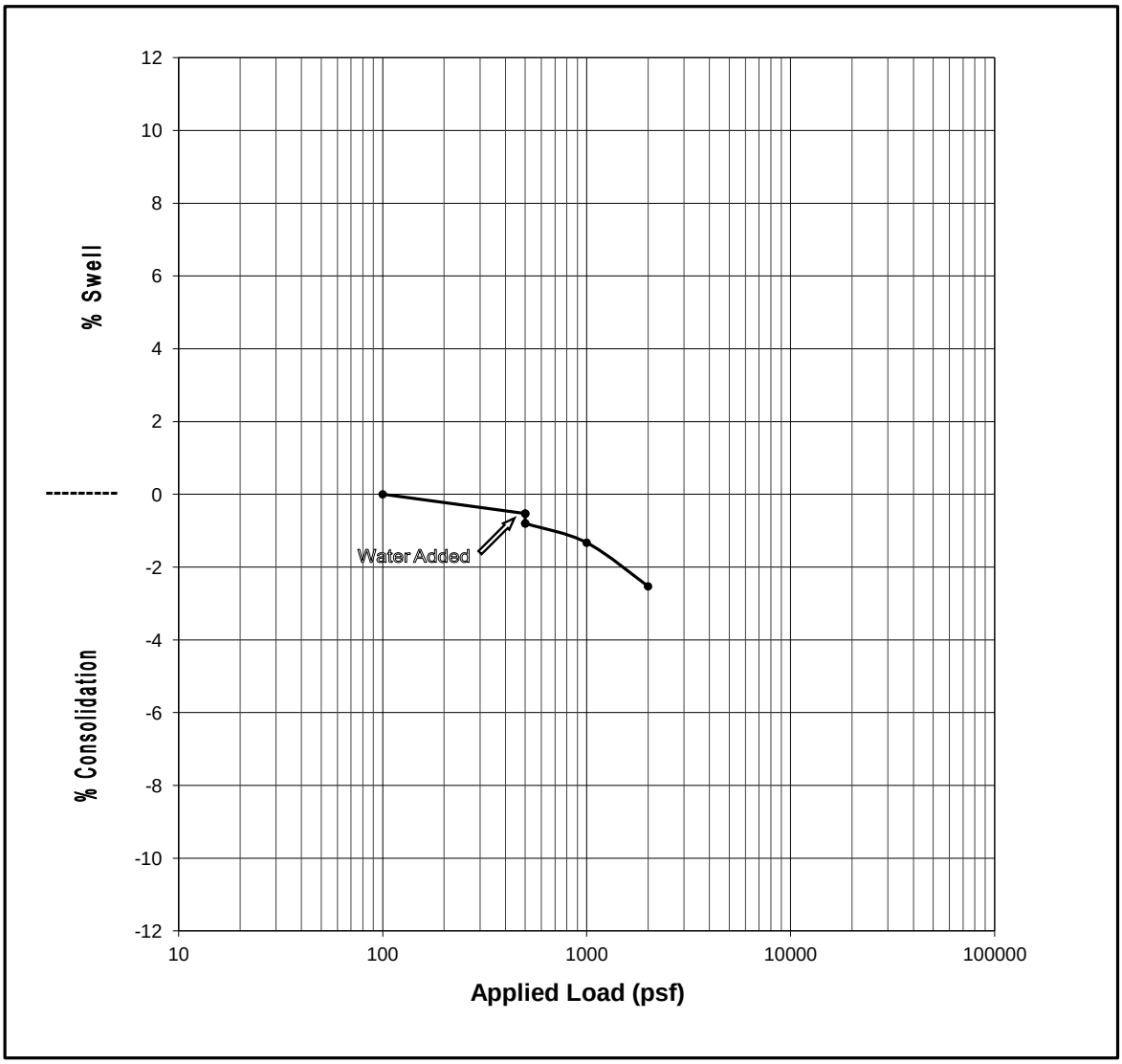
ANDALUSIA PRELIMINARY EXPLORATION

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: TP-6 @ 4'

Sample Description: Rusty Brown Sandy Lean Clay with Silty, Clayey Sand (CL w/SC-SM)

Initial Moisture	15.2%	Liquid Limit	-
Final Moisture	17.8%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	107.1 pcf

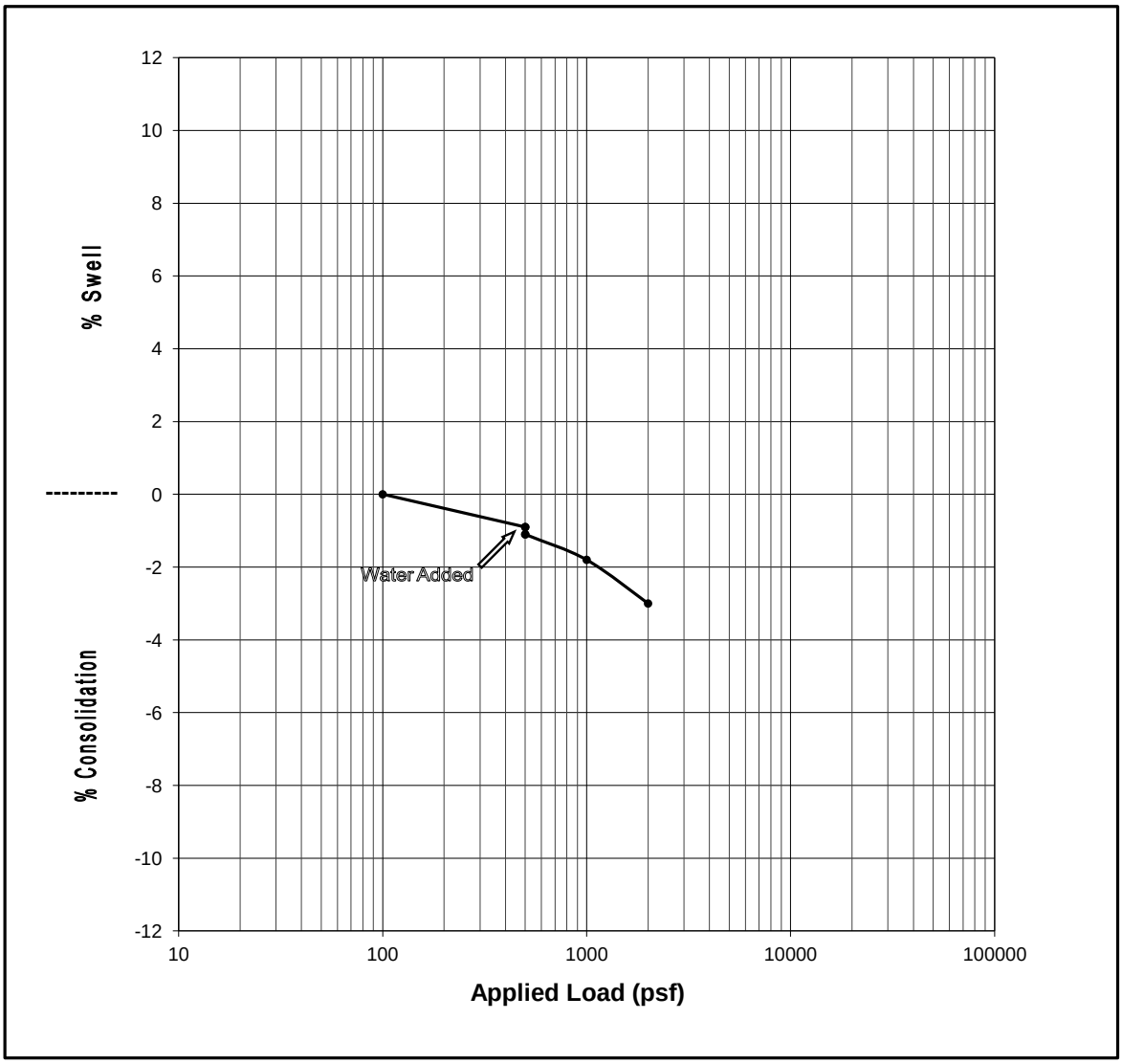
ANDALUSIA PRELIMINARY EXPLORATION

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: TP-6 @ 9'

Sample Description: Brown Clayey Sand (SC)

Initial Moisture	21.9%	Liquid Limit	-
Final Moisture	18.7%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	109.3 pcf

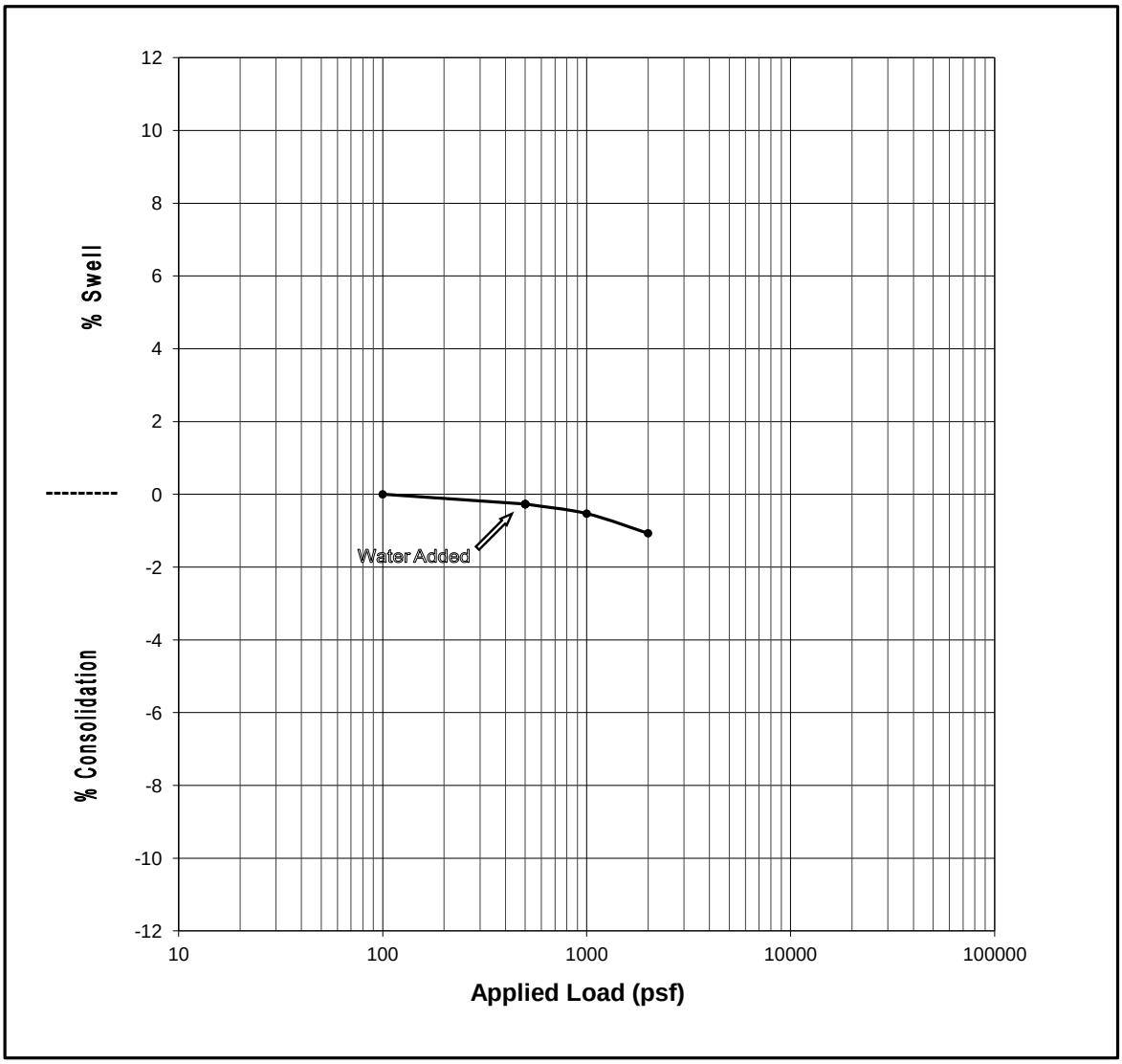
ANDALUSIA PRELIMINARY EXPLORATION

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: TP-7 @ 4'

Sample Description: Brown Silty, Clayey Sand (SC-SM)

Initial Moisture	21.1%	Liquid Limit	-
Final Moisture	19.2%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	104.1 pcf

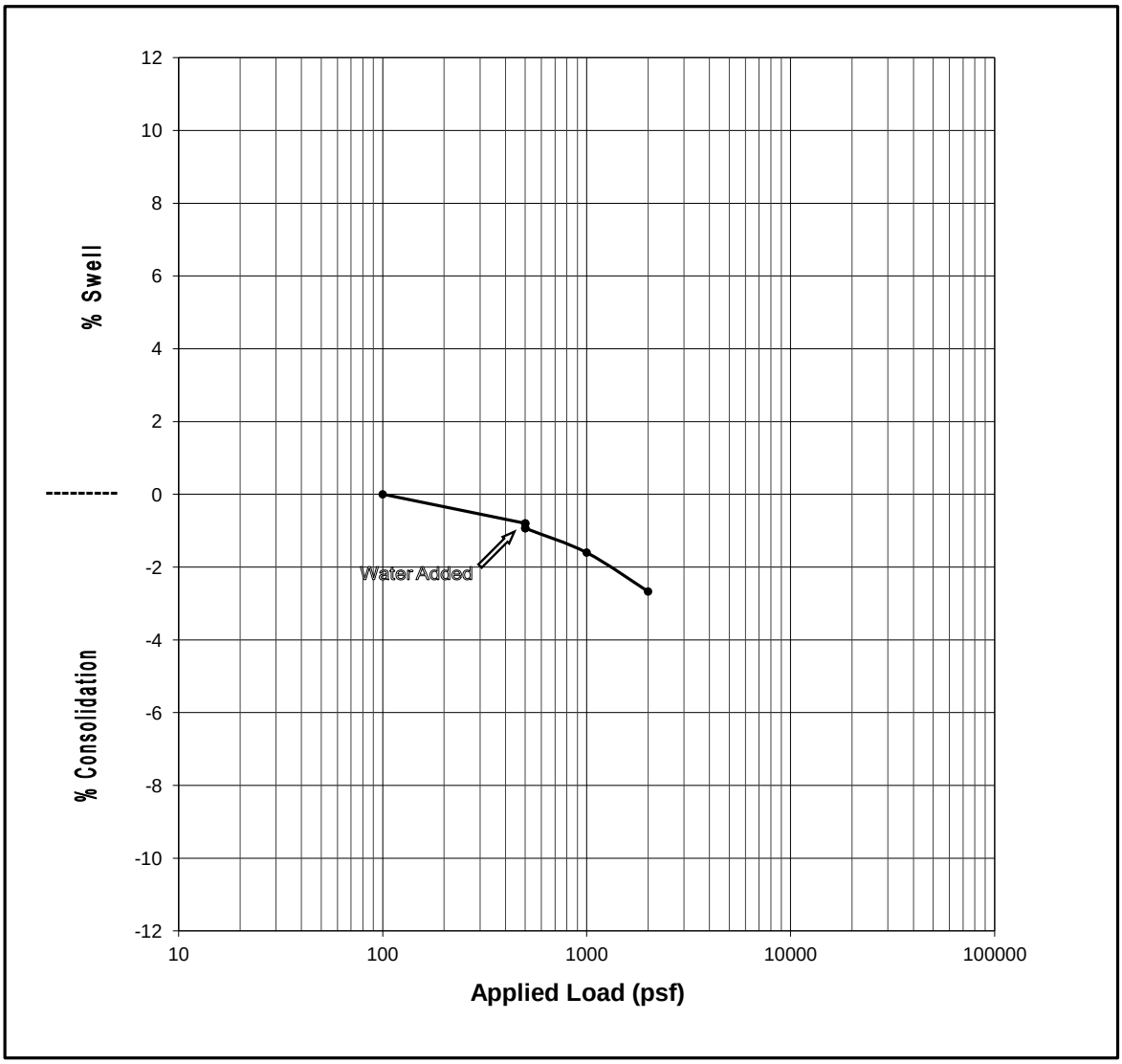
ANDALUSIA PRELIMINARY EXPLORATION

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: TP-8 @ 9'

Sample Description: Olive-Brown/Gray/Rust Siltstone/Sandstone

Initial Moisture	22.6%	Liquid Limit	-
Final Moisture	24.0%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	100.6 pcf

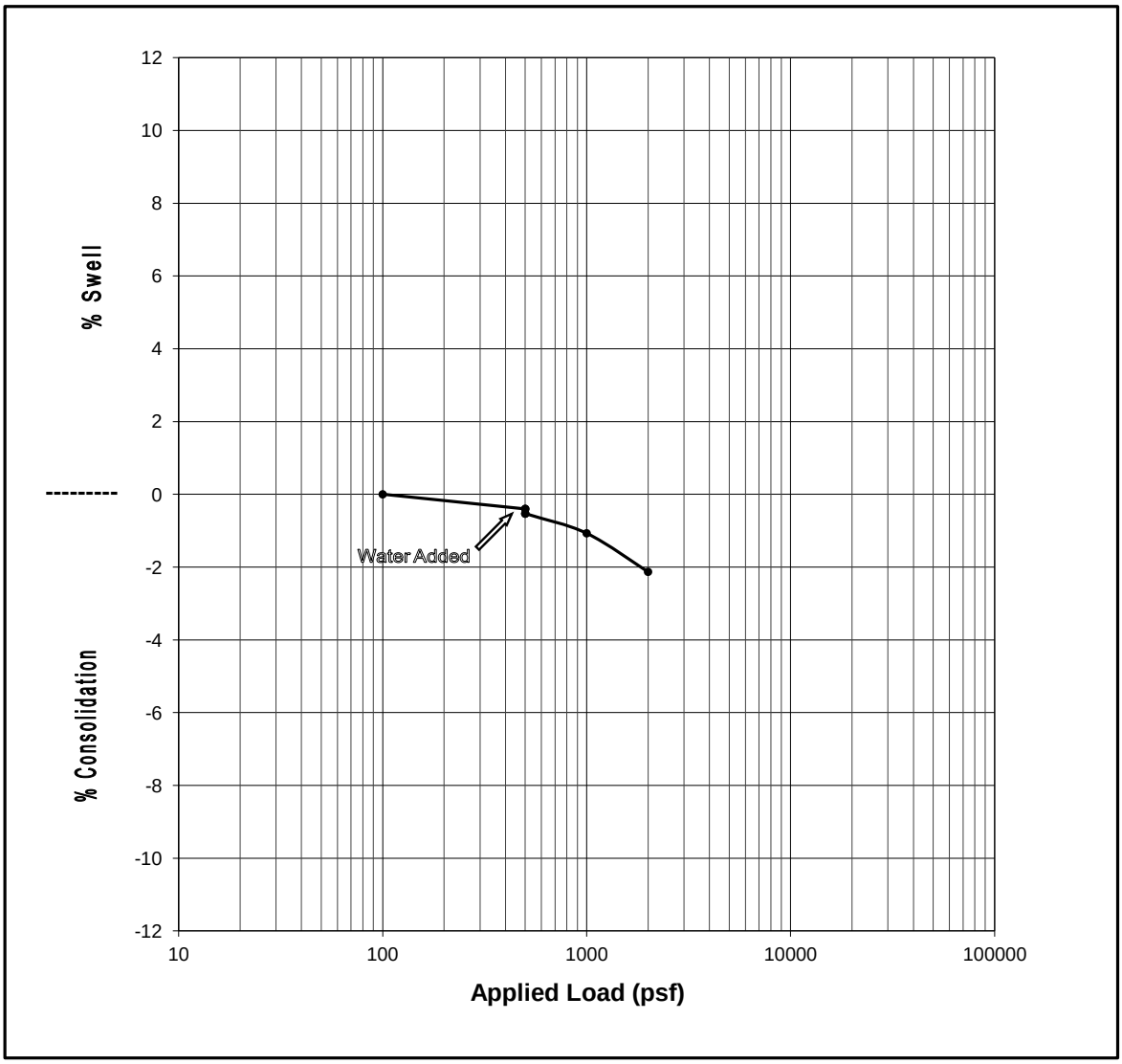
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: TP-9 @ 9'

Sample Description: Brown Sandy Lean Clay with Silty, Clayey Sand (CL w/SC-SM)

Initial Moisture	12.0%	Liquid Limit	-
Final Moisture	21.0%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	103.0 pcf

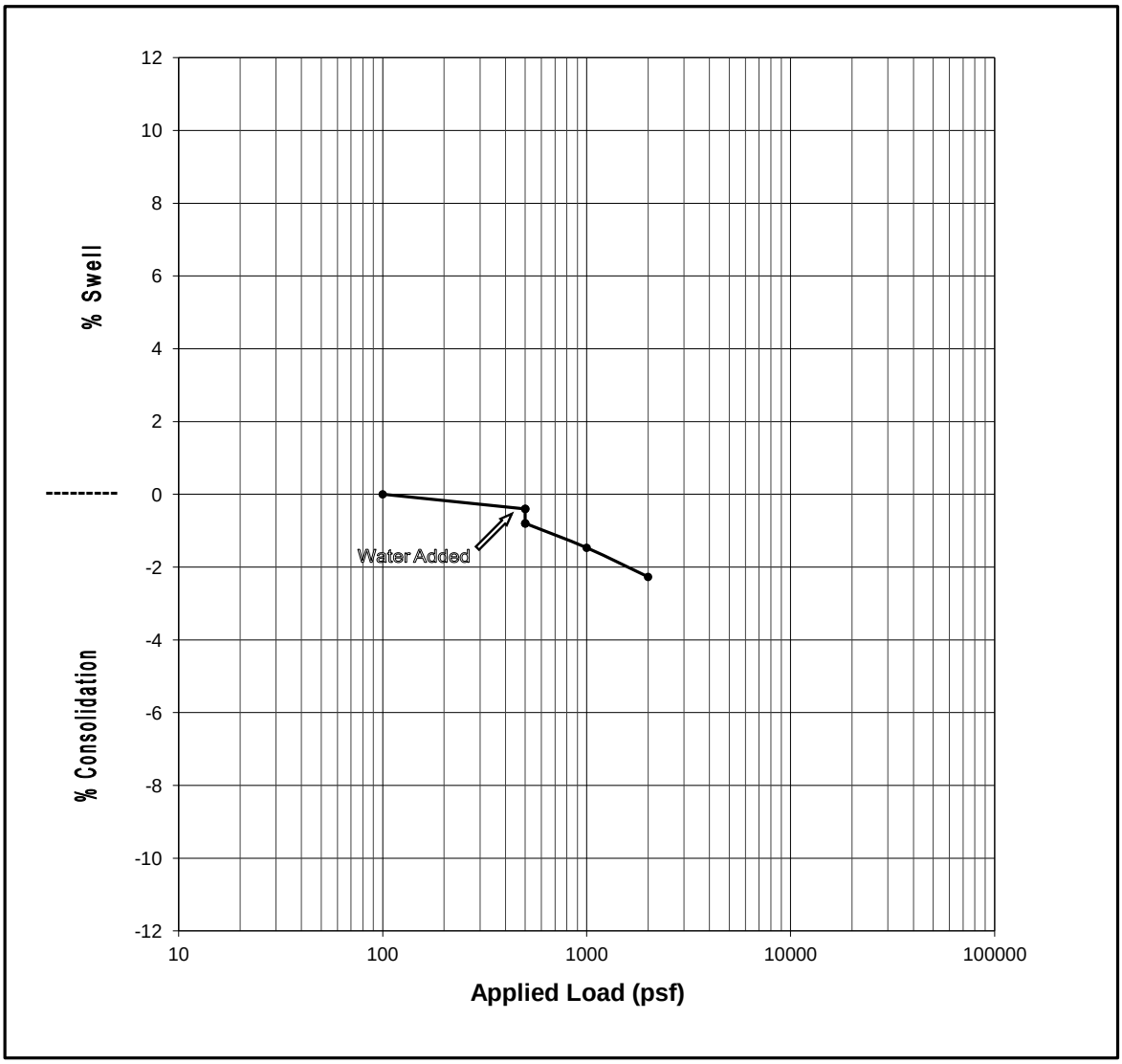
ANDALUSIA PRELIMINARY EXPLORATION

SOUTHWEST OF CO HWY 52 AND WCR 3, ERIE, COLORADO

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September 2013

SWELL/CONSOLIDATION TEST SUMMARY



Sample ID: TP-11 @ 4'

Sample Description: Brown Silty to Clayey Sand (SM to SC)

Initial Moisture	7.5%	Liquid Limit	-
Final Moisture	19.9%	Plasticity Index	-
% Swell @ 500 psf	None	% Passing #200	-
Swell Pressure	<500 psf	Dry Density	101.5 pcf

UNIFIED SOIL CLASSIFICATION SYSTEM

(USCS)

Coarse-Grained Soils more than 50% retained on No. 200 sieve	Gravels more than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines	$Cu \geq 4$ and $<Cc\leq 3$ [E]	GW	Well-graded gravel [F]
			$Cu<4$ and/or $1>Cc>3$ [E]	GP	Poorly-graded gravel [F]
		Gravels with Fines more than 12% fines	Fines classify as ML or MH	GM	Silty gravel, G,H
			Fines classify as CL or CH	GC	Clayey Gravel [F,G,H]
	Sands 50% or more coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines	$Cu \geq 6$ and $1<Cc\leq 3$ [E]	SW	Well-graded sand [I]
			$Cu<6$ and/or $1>Cc>3$ [E]	SP	Poorly-graded sand [I]
		Sands with Fines more than 12% fines	Fines classify as ML or MH	SM	Silty sand [G,H,I]
			Fines classify as CL or CH	SC	Clayey sand [G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid Limit less than 50	inorganic	PI>7 and plots on or above "A"Line [J]	CL	Lean clay [K,L,M]
			PI<4 or plots below "A"Line [J]	ML	Silt [K,L,M]
		organic	Liquid Limit - oven dried / Liquid Limit - not dried <0.75	OL	Organic clay [K,L,M,N] / Organic silt [K,L,M,O]
	Silts and Clays Liquid Limit 50 or more	inorganic	PI plots on or above "A"Line	CH	Fat clay [K,L,M]
			PI plots below "A"Line	MH	Elastic Silt [K,L,M]
		organic	Liquid Limit - oven dried / Liquid Limit - not dried <0.75	OH	Organic clay [K,L,M,P] / Organic silt [K,L,M,Q]
Highly organic soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines required dual symbols:
GW-GM well graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly-graded gravel with silt
GP-GC poorly-graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$, $Cc = \frac{(D_{30})}{D_{10} \times D_{60}}$

[F] If soil contains ≥15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-CM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name

[I] If soil contains >15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plots shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

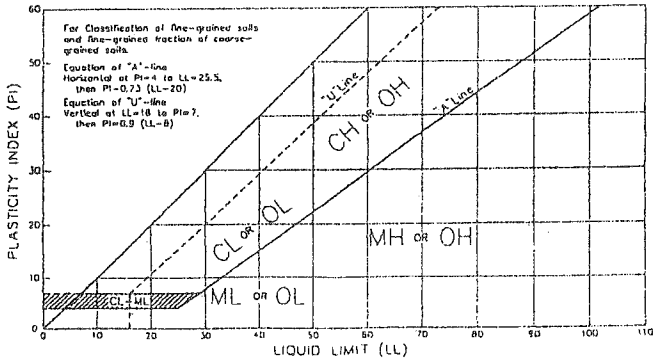
[M] If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.

[N] PI≥4 and plots on or above "A" line.

[O] PI≤4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



Fine Grained Soils		Coarse Grained Soils		Bedrock	
Qu (psf)	Consistency	Blows/ft	Relative Density	Blows/ft	Weathering
<500	Very Soft	0-4	Very Loose	0-50	Weathered
500-1000	Soft	5-8	Loose	50+	Competent
1001-2000	Medium Stiff	9-12	Slightly Dense	Degree of Weathering	
2001-4000	Stiff	13-30	Medium Dense	Slight:	Slight decomposition, possible color change
4001-8000	Very Stiff	31-50	Dense	Moderate:	Some decomposition and color change throughout
8001-16000	Very Hard	50+	Very Dense	High:	Rock highly decomposed, may be extremely broken

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1⅜" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube – 2.5" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
CS:	California Barrel - 1.92" I.D., 2.5" O.D., unless otherwise noted	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value". For 2.5" O.D. California Barrel samplers (CB) the penetration value is reported as the number of blows required to advance the sampler 12 inches using a 140-pound hammer falling 30 inches, reported as "blows per inch," and is not considered equivalent to the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling
WCI:	Wet Cave in	WD:	While Drilling
DCI:	Dry Cave in	BCR:	Before Casing Removal
AB:	After Boring	ACR:	After Casing Removal

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

FINE-GRAINED SOILS			COARSE-GRAINED SOILS			BEDROCK		
(CB) Blows/Ft.	(SS) Blows/Ft.	Consistency	(CB) Blows/Ft.	(SS) Blows/Ft.	Relative Density	(CB) Blows/Ft.	(SS) Blows/Ft.	Consistency
< 3	0-2	Very Soft	0-5	< 3	Very Loose	< 24	< 20	Weathered
3-5	3-4	Soft	6-14	4-9	Loose	24-35	20-29	Firm
6-10	5-8	Medium Stiff	15-46	10-29	Medium Dense	36-60	30-49	Medium Hard
11-18	9-15	Stiff	47-79	30-50	Dense	61-96	50-79	Hard
19-36	16-30	Very Stiff	> 79	> 50	Very Dense	> 96	> 79	Very Hard
> 36	> 30	Hard						

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Terms of Other Constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Terms of Other Constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

Phase I Environmental Site Assessment

Andalusia Property, 313 Acres within Section 6,
Township 1 North, Range 68 West,
Erie, Colorado 80516



Prepared For:
I & J Partnership
c/o Jerry Bouldin
STF Land Development Consultants, Inc.
3733 Florentine Circle
Longmont, CO 80503

WESTERN ENVIRONMENT AND ECOLOGY, INC.
2217 West Powers Avenue
Littleton, Colorado 80120
(303) 730-3452
(303) 730-3461 (fax)
westernenvironment.com

Phase I Environmental Site Assessment

Andalusia Property, 313 Acres within Section 6,
Township 1 North, Range 68 West,
Erie, Colorado 80516

Western Environment and Ecology, Inc.
Project Number: 640-001-01

June 4th, 2014

Prepared for:
I & J Partnership
c/o Jerry Bouldin
STF Land Development Consultants, Inc.
3733 Florentine Circle
Longmont, CO 80503

Prepared By:

Austin Curry
Staff Scientist

Greg D. Sherman P.G.
President

WESTERN ENVIRONMENT AND ECOLOGY, INC.
2217 West Powers Avenue
Littleton, Colorado 80120
(303) 730-3452
(303) 730-3461 (fax)
westernenvironment.com

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1.0 INTRODUCTION

The purpose of a Phase I Environmental Site Assessment is to identify, to the extent feasible, recognized environmental conditions in connection with the subject property. A Phase I Environmental Site Assessment has four components - Records Review, Site Reconnaissance, Interviews and a Report. These specific activities are further defined by the American Society for Testing and Materials (ASTM E 1527-13, Standard Practice for Environmental Site Assessments; Phase I Environmental Site Assessments, December 2013).

The U.S. Environmental Protection Agency issued a final rule governing "All Appropriate Inquiries" (AAI) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) on November 1, 2006 (40 C.F.R. Part 312). The EPA has determined that a Phase I Environmental Site Assessment prepared in accordance with ASTM 1527-13 meets the AAI requirements.

Western Environment and Ecology, Inc. (Western Environment) has previously performed several investigations on the subject property, including Phase I Environmental Site Assessments (Project #330-003-01 and #330-004-01). The results of these investigations were used in the preparation of this report.

The following document was prepared at the request of Mr. Jerry Bouldin, representative for the current owners of the property, the Moradi Family. Mr. Bouldin indicated that this Phase I Assessment was in expectation of the potential sale and residential development of the property.

On February 20th, 2014, Western Environment provided an Environmental Questionnaire to Mr. Bouldin. The questionnaire (attached), which was returned, on March 10th, 2014, stated he was unaware of any environmental issues, liens, covenants, or hazardous materials spills associated with the site. Additionally, during a telephone conversation with Western Environment on March 12th, 2014, Mr. Bouldin indicated that he was only familiar with the results of the previous Environmental Assessments performed by Western Environment. The Weld County Assessors Office records indicate that the subject property consists of five parcels. The northern parcel is currently owned by I & J Partnership LP, and the ownership of the four southern parcels is divided into multiple proportional trusts and holdings of the Moradi family.

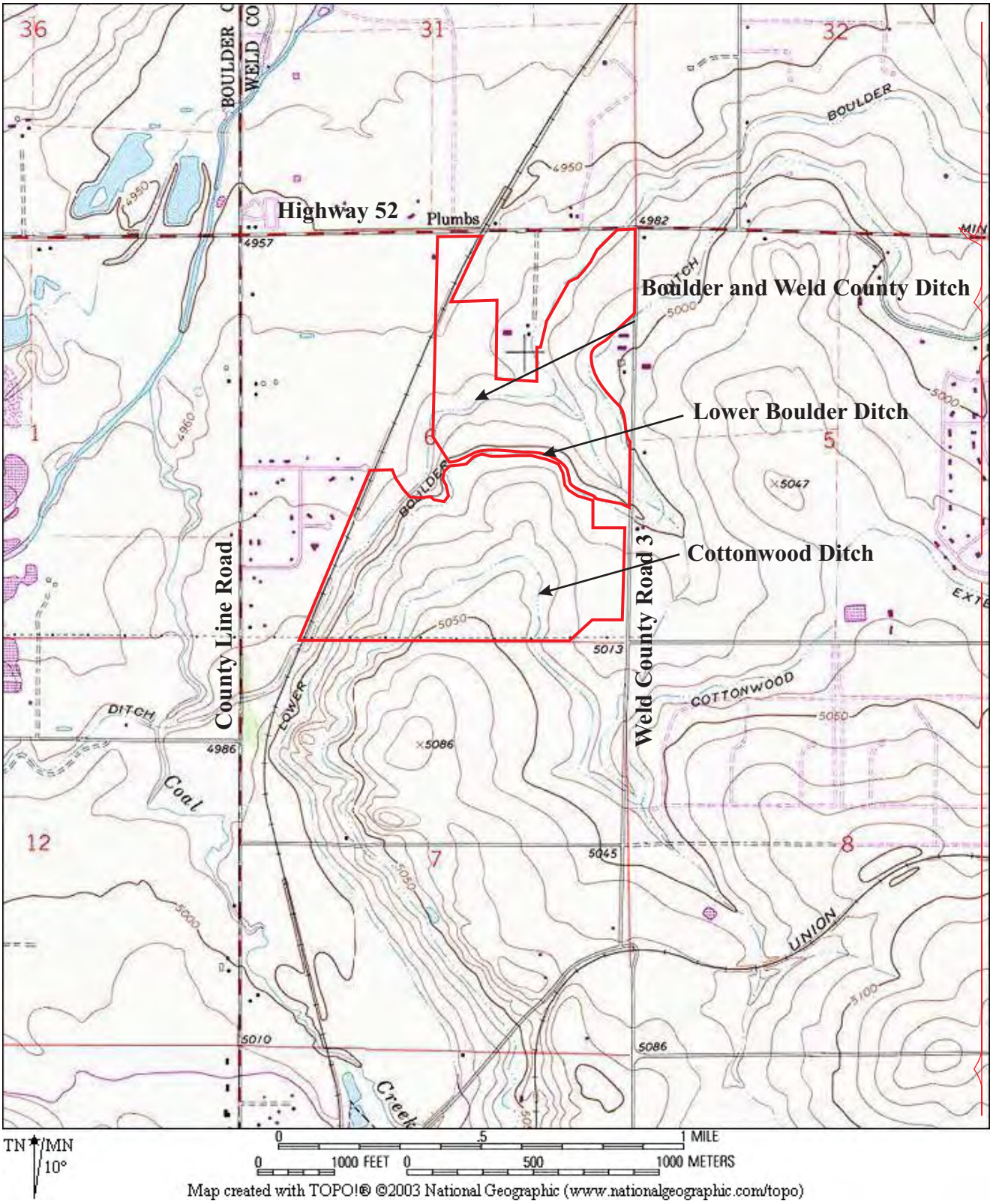
2.0 SITE DESCRIPTION

This Phase I Environmental Site Assessment was conducted for five parcels consisting of approximately 313 acres within Section 6, Township 1 North, Range 68 West, Erie, Colorado. According to the Weld County Assessors Office, the property is currently zoned for agricultural. For the purpose of this report, the property is divided into northern and southern parcels by the Lower Boulder Ditch (Figure 1).

The northern parcel of the project is surrounded by agricultural property to the north, south, and east, and west. With the exception of oil and gas production facilities, the site contains only one 2,160 ft^2 agricultural equipment building built in 2006 (Figure 2). There are large lot single family homes on the properties surrounding the site, as well as an abandoned dairy bordering the site on the east. Two irrigation ditches are located on the northern parcel. The Boulder & Weld County Ditch bisects the parcel from west to east, while the Lower Boulder Ditch comprises the southern border of the project. Twelve oil/gas wells are present in the northern parcel. Also, an abandoned Burlington Northern Railroad right of way bisects the northwest corner of the property.

The southern tract of the site is surrounded by agricultural property to the north, south, and east, and residential development to the west. Individual farm homes are located to the northwest, southeast, and east of the property. Sixteen oil/gas wells occur on the southern portion. In addition to The Boulder & Weld County Ditch occurring to the west and the Lower Boulder Ditch comprising much of the border to the north, the southern parcel is also bisected by the Cottonwood Extension Ditch (Figure 2).

Topographically, the northern parcel slopes northeast towards The Boulder & Weld County Ditch, while the southern parcel sits on an ridge and slopes downward to the north, east, and west. Soils and bedrock in this area generally consist of sandy clay soil overlying the Cretaceous Age Laramie Formation (Tweto 1979). The Colorado Division of Water Resources records indicated that a domestic use water well (Permit # 209646) is located to the west of the property at 423 Westview Road, Erie. This well is 500 foot deep and produces 7 gallons per minute from a static water level at 25 feet.



USGS Erie, CO Quadrangle, 1978

WESTERN ENVIRONMENT AND ECOLOGY, INC.
2217 West Powers Avenue
Littleton, Colorado 80120

Figure 1 - Site Location Map
Andalusia Project
313 Acres
Section 6, T1N, R68W
Erie, Colorado



Scale 1 Inch = 1500 feet

0 1500

Aerial Photo from: Weld County Assessor

WESTERN ENVIRONMENT AND ECOLOGY, INC.
2217 West Powers Avenue
Littleton, Colorado 80120

Figure 2 - Project Map
Andalusia Project
313 Acres
Section 6, T1N, R68W
Erie, Colorado

3.0 RECORDS REVIEW

The purpose of the records review is to obtain and review information that will help identify the potential for recognized environmental conditions in connection with the property. Availability of records varies from information source to information source, including governmental jurisdictions. Western Environment did not identify, obtain or review every possible record that might exist with respect to the property. Instead, record information from reasonably ascertainable standard sources was reviewed. The approximate minimum search distance utilized in the review, the resources utilized, and the number of sites found are listed below:

Lists Reviewed	ASTM Standard Minimum Search Distance	Number of Site Within Search Distance
Federal and Colorado NPL List	1.0 mile	0
Federal and State CERCLIS List	0.5 Mile	0
Federal RCRA TSD Facilities List	1.0	0
Federal RCRA Generators List	Property and Adjoining Property	0
Federal RCRA Corrective Action List	1.0	0
State Landfill and/or Solid Waste Disposal Site List	0.5	0
State Leaking UST List	0.5	0
State Registered UST List	Property and Adjoining Property	0
Colorado Brownfield / Voluntary Cleanup List	0.5	0
Federal ERNS List	Property and Adjoining Property	0

Definitions:

NPL: *National Priority List (Superfund)*
CERCLIS: *Comprehensive Environmental Response, Compensation and Liability Information System*
RCRA: *Resource Conservation and Recovery Act*
TSD: *Hazardous Waste Transport, Storage, and Disposal*
UST: *Underground Storage Tank*
ERNS: *Emergency Response Notification System*

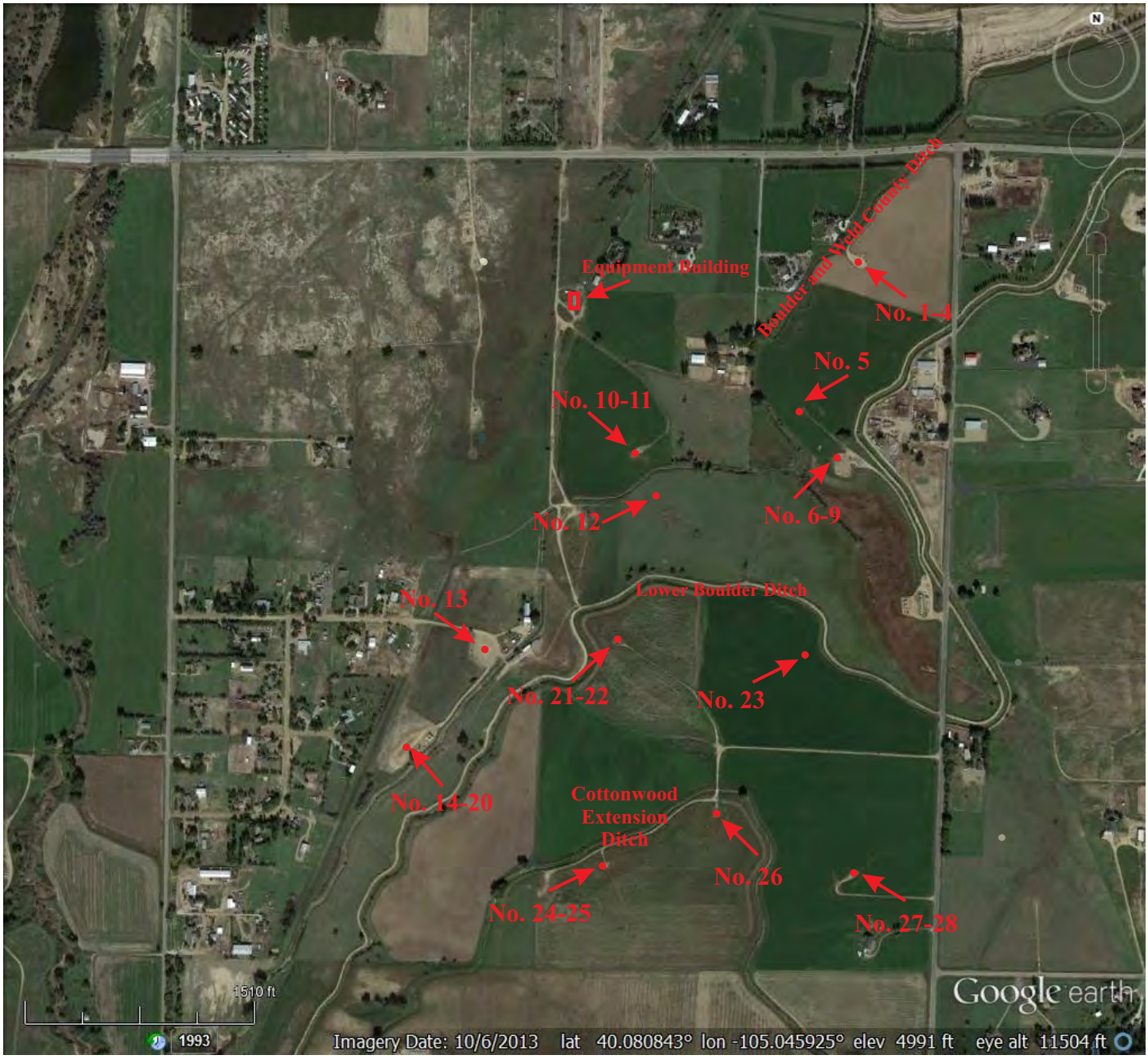
3.1 Results

No sites were located within the minimum ASTM search distances during the records review.

3.2 Colorado Oil and Gas Conservation Commission

The Colorado Oil and Gas Conservation Commission (COGCC) indicates that 28 oil/gas production wells occur on the property (Figure 3). Records for these wells, including the facility ID, name, current operator, recorded releases, and current status, are located below.

Facility ID	Facility Name	Operator	Releases	Current Status	Map Number
05-123-32921	I & J 1-6-7H	KP Kauffman Company, Inc.	None	XX	1
05-123-26881	Bulthaup 1-6	Kerr-McGee	None	Producing	2
05-123-26882	Bulthaup 27-6	Kerr-McGee	None	Producing	3
05-123-16057	Koch 41-6	KP Kauffman Company, Inc.	**6/31/1996**	Producing	4
05-123-26880	Bulthaup 17-6	Kerr-McGee	None	Producing	5
05-123-09204	Kenneth E Koch 1	KP Kauffman Company, Inc.	None	Producing	6
05-123-26879	Bulthaup 8-6	Kerr-McGee	None	Producing	7
05-123-26890	Bulthaup 24-6	Kerr-McGee	None	Producing	8
05-123-26891	Bulthaup 40-6	Kerr-McGee	None	Producing	9
05-123-26878	I & J 7-6	Kerr-McGee	None	Producing	10
05-123-26883	Bulthaup 21-6	Kerr-McGee	None	Producing	11
05-123-20489	Bulthaup 7-6	KP Kauffman Company, Inc.	None	AL	12
05-123-22162	Bearden 23-6	Encana Oil and Gas	**3/23/2010**	Producing	13
05-123-23602	Bearden 13-6	Encana Oil and Gas	None	Producing	14
05-123-34942	Bearden 2-4-6	Encana Oil and Gas	None	Producing	15
05-123-09764	Bearden 1	Encana Oil and Gas	**1/19/2005**	Producing	16
05-123-34949	Bearden 0-6-6	Encana Oil and Gas	None	Producing	17
05-123-23001	Bearden 14-6	Encana Oil and Gas	**3/23/2010**	Producing	18
05-123-34943	Bearden 2-8-6	Encana Oil and Gas	None	Producing	19
05-123-23559	Bearden 24-6	Encana Oil and Gas	None	Producing	20
05-123-26888	Bulthaup 10-6	Kerr-McGee	None	Producing	21
05-123-29465	Bulthaup 9-6	Kerr-McGee	None	Producing	22
05-123-26889	Bulthaup 9-6	Kerr-McGee	None	AL	23
05-123-26886	Bulthaup 23-6	Kerr-McGee	None	Producing	24
05-123-26887	Bulthaup 15-6	Kerr-McGee	None	Producing	25
05-123-12456	Kenneth E Koch A-1	Kerr-McGee	None	Producing	26
05-123-26885	Bulthaup 16-6	Kerr-McGee	None	Producing	27
05-123-06884	Bulthaup 39-6	Kerr-McGee	None	Producing	28



Scale 1 Inch = 1500 feet

0 1500

Aerial Photo from: Google Earth

WESTERN ENVIRONMENT AND ECOLOGY, INC.
2217 West Powers Avenue
Littleton, Colorado 80120

Figure 3 - Well Location Map
Andalusia Project
313 Acres
Section 6, T1N, R68W
Erie, Colorado

The majority of the releases reported are minor soil staining associated with leaking valves. COGCC inspectors required that the operators remove the soil. However, a significant release was reported associated with one oil/gas production facility on the northern parcel of the property. A letter from HS Resources, Inc dated June 12th, 1996 described a release from the above the Koch 41-6 Tank Battery. Remedial efforts including soil removal were performed by KP Kaufman. The June 12th letter indicated that groundwater may have been impacted by the release. However, no mention of remedial actions or additional investigations was contained within the document. During the completion of the previous assessments, Western Environment personnel attempted to contact Mr. Alan Williams of Kerr-McGee (HS Resource, Inc is now Kerr-McGee) to inquire about further investigation of soil and groundwater near the facility. Mr. Williams and Kerr McGee did not respond to these inquires. No additional information concerning this release was available with the COGCC.

Records also indicate that a release associated with the Bearden 1 Tank Battery facility has occurred on southern parcel of the property. Remedial efforts have included soil removal and groundwater removal and treatment. A letter from the Colorado Oil and Gas Conservation Commission dated May 18th, 2005 required one year of quarterly groundwater monitoring and additional groundwater sampling within the "source area". If the groundwater samples indicate contamination below the maximum contaminate levels, then the site will not require any additional investigation. On January 11th, 2006 the COGCC published a letter stating that the Bearden 1 Tank Battery had met conditions for remediation closure.

Subsequently, in March of 2013 petroleum impacted soil was discovered below a flowline near the production water tank on the Bearden Well Pad and Tank Battery. On February 12th, 2014, Encana Oil and Gas (USA), Inc. installed 10 monitoring wells on and adjacent to the Bearden Well Pad. These wells, which were drilled by Eagle Environmental Consulting Services, Inc. (Eagle), were sampled and determined to have soil and groundwater contamination above above COGCC regulatory limits. These results are presented in a report dated March 10th, 2014 (attached). Groundwater beneath the Bearden site is shallow, approximately 5-6 feet below the surface and flows to the northwest away from the proposed Andalusia project. Currently, no active remediation of soil or groundwater is occluding. However, the Eagle report does recommend that Air Sparging and Vapor Extraction be used to reduce contaminate levels to regulator limits.

3.3 Government Inquiries

On February 20th, 2014, Western Environment submitted an Environmental Issues Inquiries to the Weld County Department of Public Health and Environment and the Mountain View Fire Department regarding the subject property. LuAnn Penfold of the Mountain View Fire Department verbally responded to the inquiry on February 24th, 2014, stating that the Department was unable to find any records regarding the subject property. On February 26th, 2014, Ms. Marcela Swain of the Weld County Department of Public Health and Environment, indicated that she did not have any records of incident or complaint associated with the subject property. The inquiry letters and Ms. Swain's response are included in the appendix.

3.4 Aerial Photography Review

Aerial photography from April 29th, 1965 to October 7th, 2012 was reviewed to document previous uses of the property. In all photos reviewed, the subject property was in agricultural use. Aerial photography from April 29th, 1965 and November 7th, 1974 and show fewer residences to the west of both parcels. In photos from and earlier, the residence to the west, as well as the oil wells, were not visible. In photos from May 3rd, 2000 and earlier, the residence to the southeast is not visible. In the photo from March 30th, 2008 new gas well facilities are visible to the west, as well as a trash pit just south of the Cottonwood Extension Ditch. In the July 15th, 2010 photos, new gas well facilities and tank batteries are visible on the east end of the site property. A complete list of photos reviewed is presented in Appendix B.

4.0 SITE INSPECTION / INTERVIEWS

The purpose of a site reconnaissance is to obtain information indicating the likelihood of identifying recognized environmental conditions in connection with the property. During site visits on March 6th, 2014 and April 24th, 2014, Western Environment personnel visually and physically observed the property to the extent not obstructed by bodies of water, adjacent buildings, or other obstacles and debris. The property was inspected to identify unusual debris, chemical staining, evidence of contamination, and hazardous materials.

At the time of inspection, the northeastern area of the northern parcel contained irrigated crops, however the remainder of the of the northern parcel was used for grazing or fallow. Twelve oil/gas wells were observed throughout the northern parcel, including an older oil well labeled Koch 41-6, located in the northeast area of the site just east of the Boulder and Weld Ditch. No petroleum staining was observed associated with these facility.



One of the 28 petroleum production facilities on the project

A large currently leased equipment building was observed in the northwest corner of the property. Various agricultural equipment and heavy machinery surrounded the building. No soil staining was observed around the structure. Two cattle sheds made from underground storage tanks were observed on the property. A large cattail marsh is present in the center portion of the northen tract. Off site inspection of the residences adjoining the property indicated that they contained homes and varying numbers of buildings. The old Koch Dairy farm borders the project site to the east, and contains many sheds and abandoned vehicles parked on the property. Additionally, the residence to the northeast contained an above ground storage tank.



Leased equipment shed northwest portion of site

At the time of the inspection, the southern parcel of the subject site was also in agricultural use. Areas to the east contained irrigated crops including alfalfa hay with the western area used for grazing. Hay bales, and farm equipment were observed in the center of the property. Sixteen oil/gas wells were located throughout the southern parcel. No significant soil staining was observed adjacent to the wells. A trash burn pit for was observed on the southwest end of the property. This pit contained lumber, bailing twine tree limbs, household trash and deer and cow carcasses.



Burn pit, view to northwest

5.0 CONCLUSIONS

Western Environment and Ecology, Inc. performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E 1527-13 for 313 acres in the East ½ of Section 6, Township 1 North, Range 68 West, Weld County, Colorado. Any exceptions to, or deletions from, this practice are described in Section 5.1 of this report. **This assessment has revealed no evidence of recognized environmental conditions in connection with the subject property except**:

- **Soil and groundwater contamination from past reported releases associated with petroleum production facilities**. **According to Title 34, Article 60 (As Amended) of the "Oil and Gas Conservation Act" Section 34-06-102 the State of Colorado gives the Oil and Gas Commission legislative declaration over the development, production, and utilization of the natural resources in the state of Colorado. Moreover, this legislation gives the Commission the authority to force the operator to perform remediation activities deemed necessary in compliance with all Federal and State health regulations.** The majority of these events involve stained soil and can be considered minor. However, Western Environment did perform a Limited Phase II Environmental Site Assessment (Project # 640-001-02) of wells with reported releases (Koch 41-6 and Kenneth E Koch 1). This assessment (attached) did not identify any soil or groundwater contamination.
- **Soil and groundwater contamination associated with the Bearden Tank Battery**. This is an on-going event under the supervision of the COGCC. However, due to the groundwater flow direction, the contamination is migrating to the north and west away from the proposed Andalusia development.
- **Uncontrolled dumping and burning**. The contents of the burn pit should be removed and properly disposed of.

5.1 Deviations

Due to the site being undeveloped, records search of building departments , city directories and Sandborn Fire Maps could not be performed. It is the opinion of Western Environment that this lack of information does not constitute a Data Failure as defined by ASTM E-1527-13, Section 8.3.2.3. No other significant "Data Gaps" as defined in ASTM E-1527-13, Section 12.7 were identified.

APPENDICES

APPENDIX A

REFERENCE LISTS

Radius Report

Satellite view

Target Property:

Andalusia
Weld County, Colorado 80516

Prepared For:

Western Environment & Ecology Inc

Order #: 32891
Job #: 73086
Project #: 640-001-01
Date: 02/24/2014

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Target Property Summary

Andalusia
Weld County, Colorado 80516

USGS Quadrangle: ***Erie, CO***
Target Property Geometry: ***Area***

Target Property Longitude(s)/Latitude(s):
(-105.03708, 40.087599), (-105.03743, 40.073237), (-105.05347, 40.073167), (-105.04436, 40.087599), (-105.03722, 40.087739), (-105.03708, 40.087599)

County/Parish Covered:
Weld (CO) , Boulder (CO)

Zipcode(s) Covered:
Longmont CO: 80504
Erie CO: 80516

State(s) Covered:
CO

****Target property is located in Radon Zone 1.***
Zone 1 areas have a predicted average indoor radon screening level greater than 4 pCi/L (picocuries per liter).

This report was designed by GeoSearch to meet or exceed the records search requirements of the All Appropriate Inquires Rule (40 CFR §312.26) and the current version of the ASTM International E1527, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process or, if applicable, the custom requirements requested by the entity that ordered this report. The records and databases of records used to compile this report were collected from various federal,state and local governmental entities. It is the goal of GeoSearch to meet or exceed the 40 CFR §312.26 and E1527 requirements for updating records by using the best available technology. GeoSearch contacts the appropriate governmental entities on a recurring basis. Depending on the frequency with which a record source or database of records is updated by the governmental entity, the data used to prepare this report may be updated monthly, quarterly, semi-annually, or annually.

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Database Findings Summary

FEDERAL LISTING

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
CLANDESTINE DRUG LABORATORY LOCATIONS	CDL	0	0	0.2500
FEDERAL ENGINEERING INSTITUTIONAL CONTROL SITES	EC	0	0	0.2500
EMERGENCY RESPONSE NOTIFICATION SYSTEM	ERNSCO	0	0	0.2500
HISTORICAL GAS STATIONS	HISTPST	0	0	0.2500
HAZARDOUS MATERIALS INCIDENT REPORTING SYSTEM	HMIRSR08	0	0	0.2500
LAND USE CONTROL INFORMATION SYSTEM	LUCIS	0	0	0.2500
NO LONGER REGULATED RCRA GENERATOR FACILITIES	NLRRCRAG	0	0	0.2500
RESOURCE CONSERVATION & RECOVERY ACT - GENERATOR FACILITIES	RCRAGR08	0	0	0.2500
RESOURCE CONSERVATION & RECOVERY ACT - NON-GENERATOR FACILITIES	RCRANGR08	0	0	0.2500
RCRA SITES WITH CONTROLS	RCRASC	0	0	0.2500
TOXICS RELEASE INVENTORY	TRI	0	0	0.2500
BROWNFIELDS MANAGEMENT SYSTEM	BF	0	0	0.5000
COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION & LIABILITY INFORMATION SYSTEM	CERCLIS	0	0	0.5000
NO FURTHER REMEDIAL ACTION PLANNED SITES	NFRAP	0	0	0.5000
NO LONGER REGULATED RCRA NON-CORRACTS TSD FACILITIES	NLRRCRAT	0	0	0.5000
OPEN DUMP INVENTORY	ODI	0	0	0.5000
RESOURCE CONSERVATION & RECOVERY ACT - TREATMENT, STORAGE & DISPOSAL FACILITIES	RCRAT	0	0	0.5000
DELISTED NATIONAL PRIORITIES LIST	DNPL	0	0	1.0000
NO LONGER REGULATED RCRA CORRECTIVE ACTION FACILITIES	NLRRCRAC	0	0	1.0000
NATIONAL PRIORITIES LIST	NPL	0	0	1.0000
PROPOSED NATIONAL PRIORITIES LIST	PNPL	0	0	1.0000
RESOURCE CONSERVATION & RECOVERY ACT - CORRECTIVE ACTION FACILITIES	RCRAC	0	0	1.0000
RECORD OF DECISION SYSTEM	RODS	0	0	1.0000

SUB-TOTAL		0	0	

Database Findings Summary

STATE (CO) LISTING

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
ABOVEGROUND STORAGE TANK FACILITIES	AST	0	0	0.2500
CLANDESTINE DRUG LABORATORY LOCATIONS	CDL	0	0	0.2500
ENVIRONMENTAL REAL COVENANTS LIST	COVENANTS	0	0	0.2500
HAZARDOUS WASTE SITES- GENERATOR	HWSG	0	0	0.2500
SPILLS LISTING	SPILLS	0	0	0.2500
UNDERGROUND STORAGE TANK FACILITIES	UST	0	0	0.2500
HISTORICAL SOLID WASTE LANDFILLS	HISTSWLF	0	0	0.5000
HAZARDOUS WASTE SITES- TREATMENT, STORAGE & DISPOSAL	HWSTSD	0	0	0.5000
LEAKING STORAGE TANK FACILITIES	LST	0	0	0.5000
LEAKING UNDERGROUND STORAGE TANKS TRUST FUND SITES	LUSTTRUST	0	0	0.5000
METHANE GAS STUDY SITES	METHANESITES	0	0	0.5000
SOLID WASTE FACILITIES	SWF	0	0	0.5000
VOLUNTARY CLEANUP AND REDEVELOPMENT PROGRAM SITES	VCRA	0	0	0.5000
HAZARDOUS WASTE SITES- CORRECTIVE ACTION	HWSCA	0	0	1.0000
SUPERFUND SITES	SF	0	0	1.0000
SUB-TOTAL		0	0	

Database Findings Summary

LOCAL LISTING

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
WELD COUNTY SOLID WASTE FACILITIES	WCSWF	0	0	0.5000
SUB-TOTAL		0	0	

Database Findings Summary

TRIBAL LISTING

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
UNDERGROUND STORAGE TANKS ON TRIBAL LANDS	USTR08	0	0	0.2500
LEAKING UNDERGROUND STORAGE TANKS ON TRIBAL LANDS	LUSTR08	0	0	0.5000
OPEN DUMP INVENTORY ON TRIBAL LANDS	ODINDIAN	0	0	0.5000
INDIAN RESERVATIONS	INDIANRES	0	0	1.0000
SUB-TOTAL		0	0	
TOTAL		0	0	

Locatable Database Findings

FEDERAL LISTING

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
CDL	0.2500		0	0	NS	NS	NS	0
EC	0.2500		0	0	NS	NS	NS	0
ERNSCO	0.2500		0	0	NS	NS	NS	0
HISTPST	0.2500		0	0	NS	NS	NS	0
HMIRSR08	0.2500		0	0	NS	NS	NS	0
LUCIS	0.2500		0	0	NS	NS	NS	0
NLRRCRAG	0.2500		0	0	NS	NS	NS	0
RCRAGR08	0.2500		0	0	NS	NS	NS	0
RCRANGR08	0.2500		0	0	NS	NS	NS	0
RCRASC	0.2500		0	0	NS	NS	NS	0
TRI	0.2500		0	0	NS	NS	NS	0
BF	0.5000		0	0	0	NS	NS	0
CERCLIS	0.5000		0	0	0	NS	NS	0
NFRAP	0.5000		0	0	0	NS	NS	0
NLRRCRAT	0.5000		0	0	0	NS	NS	0
ODI	0.5000		0	0	0	NS	NS	0
RCRAT	0.5000		0	0	0	NS	NS	0
DNPL	1.0000		0	0	0	0	NS	0
NLRRCRAC	1.0000		0	0	0	0	NS	0
NPL	1.0000		0	0	0	0	NS	0
PNPL	1.0000		0	0	0	0	NS	0
RCRAC	1.0000		0	0	0	0	NS	0
RODS	1.0000		0	0	0	0	NS	0
SUB-TOTAL			0	0	0	0	0	0

Locatable Database Findings

STATE (CO) LISTING

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
AST	0.2500		0	0	NS	NS	NS	0
CDL	0.2500		0	0	NS	NS	NS	0
COVENANTS	0.2500		0	0	NS	NS	NS	0
HWSG	0.2500		0	0	NS	NS	NS	0
SPILLS	0.2500		0	0	NS	NS	NS	0
UST	0.2500		0	0	NS	NS	NS	0
HISTSWLF	0.5000		0	0	0	NS	NS	0
HWSTSD	0.5000		0	0	0	NS	NS	0
LST	0.5000		0	0	0	NS	NS	0
LUSTTRUST	0.5000		0	0	0	NS	NS	0
METHANESITES	0.5000		0	0	0	NS	NS	0
SWF	0.5000		0	0	0	NS	NS	0
VCRA	0.5000		0	0	0	NS	NS	0
HWSCA	1.0000		0	0	0	0	NS	0
SF	1.0000		0	0	0	0	NS	0
SUB-TOTAL			0	0	0	0	0	0

Locatable Database Findings

LOCAL LISTING

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
WCSWF	0.5000		0	0	0	NS	NS	0
SUB-TOTAL			0	0	0	0	0	0

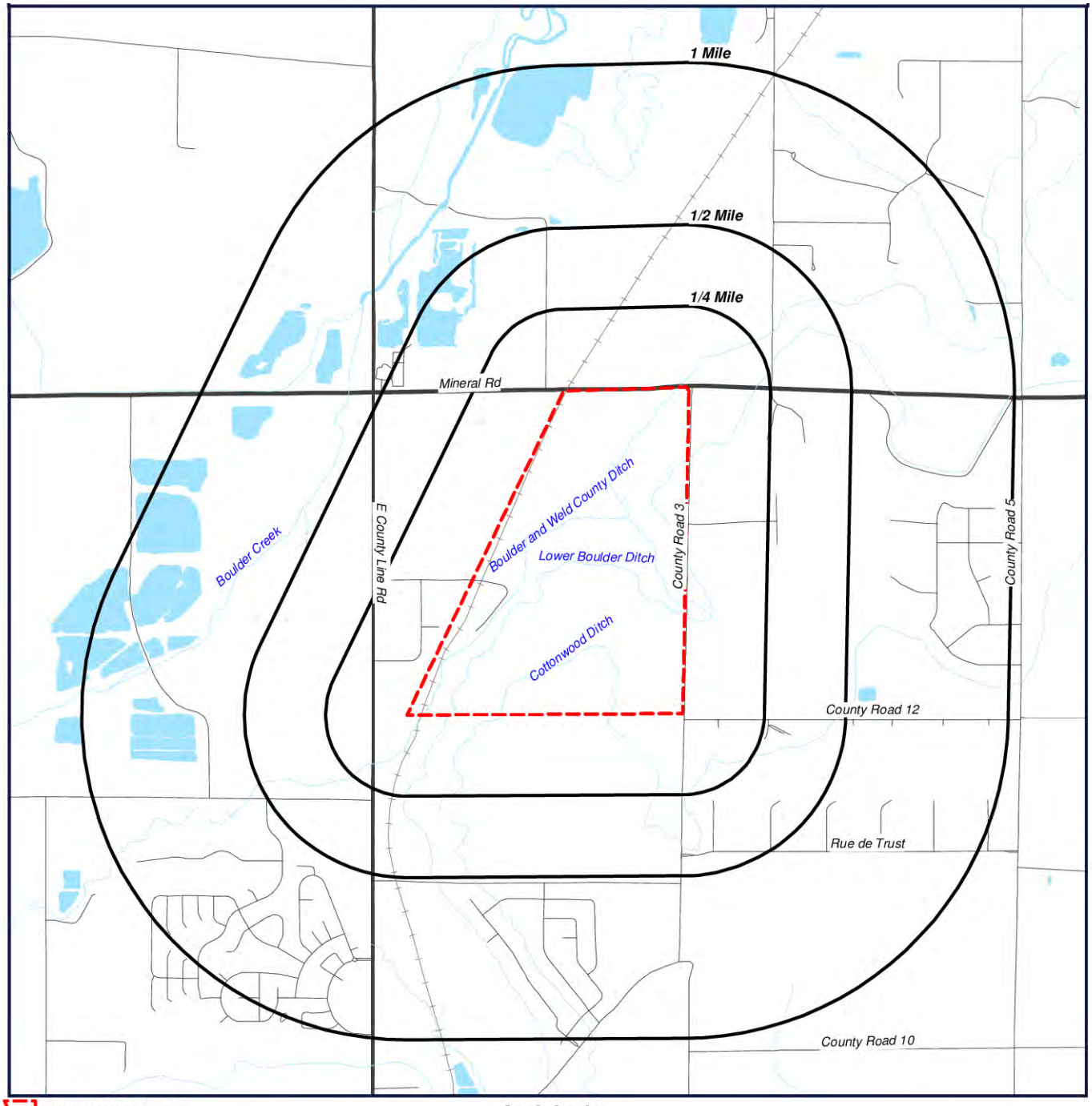
Locatable Database Findings

TRIBAL LISTING

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
USTR08	0.2500		0	0	NS	NS	NS	0
LUSTR08	0.5000		0	0	0	NS	NS	0
ODINDIAN	0.5000		0	0	0	NS	NS	0
INDIANRES	1.0000		0	0	0	0	NS	0
SUB-TOTAL			0	0	0	0	0	0
TOTAL			0	0	0	0	0	0

NOTES:
NS = NOT SEARCHED
TP/AP = TARGET PROPERTY/ADJACENT PROPERTY

Radius Map 1



Target Property (TP)

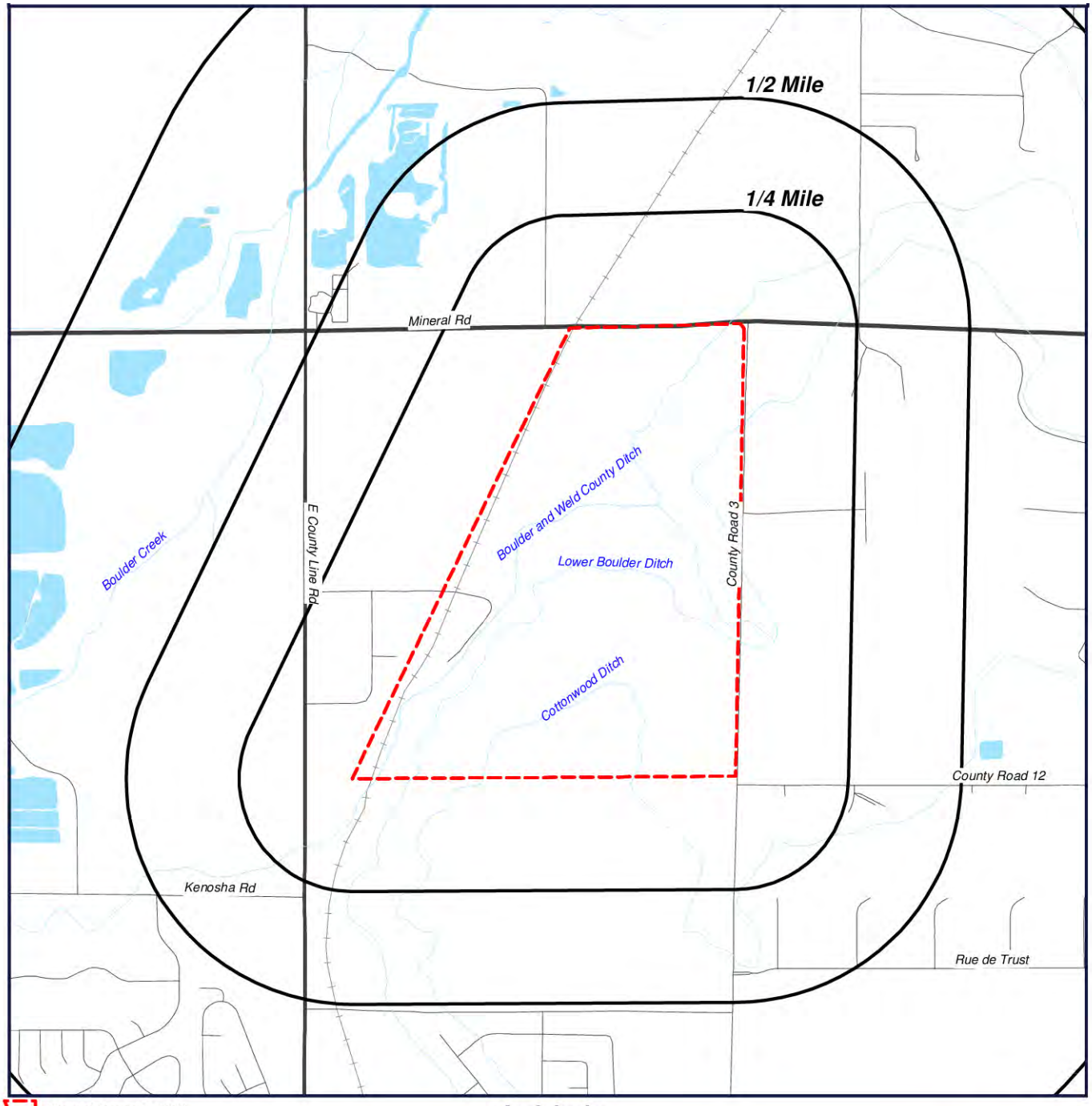
Andalusia
Weld County, Colorado
80516

N
W E
S

0' 1250' 2500' 3750'
SCALE: 1" = 2500'

[Click here to access Satelite view]

Radius Map 2



Target Property (TP)

Andalusia
Weld County, Colorado
80516

N
W E
S

0' 900' 1800' 2700'
SCALE: 1" = 1800'

[Click here to access Satelite view]

Ortho Map



Target Property (TP)

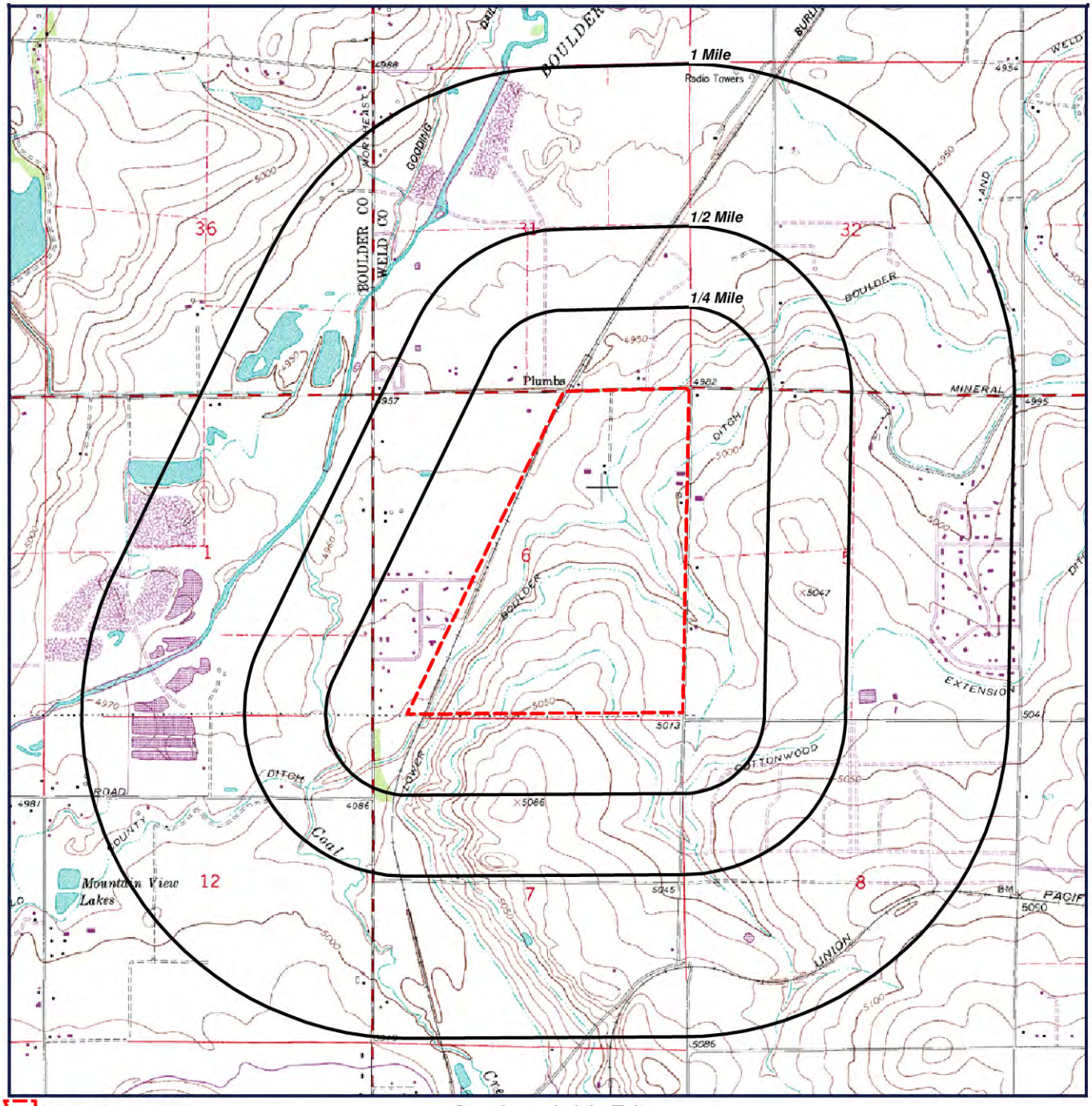
Quadrangle(s): Erie
Andalusia
Weld County, Colorado
80516

N
W E
S

0' 900' 1800' 2700'
SCALE: 1" = 1800'

[Click here to access Satelite view]

Topographic Map



Target Property (TP)

Quadrangle(s): Erie
Source: USGS, 1994
Andalusia
Weld County, Colorado
80516

N
W E
S

0' 1250' 2500' 3750'
SCALE: 1" = 2500'

[Click here to access Satelite view]

Environmental Records Definitions - FEDERAL

CDL Clandestine Drug Laboratory Locations

VERSION DATE: 09/06/13

The U.S. Department of Justice ("the Department") provides this information as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments. The Department does not establish, implement, enforce, or certify compliance with clean-up or remediation standards for contaminated sites; the public should contact a state or local health department or environmental protection agency for that information.

EC Federal Engineering Institutional Control Sites

VERSION DATE: 12/09/13

This database includes site locations where Engineering and/or Institutional Controls have been identified as part of a selected remedy for the site as defined by United States Environmental Protection Agency official remedy decision documents. A site listing does not indicate that the institutional and engineering controls are currently in place nor will be in place once the remedy is complete; it only indicates that the decision to include either of them in the remedy is documented as of the completed date of the document. Institutional controls are actions, such as legal controls, that help minimize the potential for human exposure to contamination by ensuring appropriate land or resource use. Engineering controls include caps, barriers, or other device engineering to prevent access, exposure, or continued migration of contamination.

ERNSCO Emergency Response Notification System

VERSION DATE: 12/31/12

This National Response Center database contains data on reported releases of oil, chemical, radiological, biological, and/or etiological discharges into the environment anywhere in the United States and its territories. The data comes from spill reports made to the U.S. Environmental Protection Agency, U.S. Coast Guard, the National Response Center and/or the U.S. Department of Transportation.

HISTPST Historical Gas Stations

VERSION DATE: 07/01/30

This historic directory of service stations is provided by the Cities Service Company. The directory includes Cities Service filling stations that were located throughout the United States in 1930.

HMIRSR08 Hazardous Materials Incident Reporting System

VERSION DATE: 01/10/14

The HMIRS database contains unintentional hazardous materials release information reported to the U.S.

Department of Transportation located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

LUCIS Land Use Control Information System

VERSION DATE: 09/01/06

The LUCIS database is maintained by the U.S. Navy and contains information for former Base Realignment and Closure (BRAC) properties across the United States.

NLRRCRAG No Longer Regulated RCRA Generator Facilities

VERSION DATE: 12/12/13

This database includes RCRA Generator facilities that are no longer regulated by the United States Environmental Protection Agency or do not meet other RCRA reporting requirements. This listing includes facilities that formerly generated hazardous waste.
Large Quantity Generators: Generate 1,000 kg or more of hazardous waste during any calendar month; or Generate more than 1 kg of acutely hazardous waste during any calendar month; or Generate more than 100 kg of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste during any calendar month; or Generate 1 kg or less of acutely hazardous waste during any calendar month, and accumulate more than 1kg of acutely hazardous waste at any time; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulated more than 100 kg of that material at any time.
Small Quantity Generators: Generate more than 100 and less than 1000 kilograms of hazardous waste during any calendar month and accumulate less than 6000 kg of hazardous waste at any time; or Generate 100 kg or less of hazardous waste during any calendar month, and accumulate more than 1000 kg of hazardous waste at any time.
Conditionally Exempt Small Quantity Generators: Generate 100 kilograms or less of hazardous waste per calendar month, and accumulate 1000 kg or less of hazardous waste at any time; or Generate one kilogram or less of acutely hazardous waste per calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste during any calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste.

RCRAGR08 Resource Conservation & Recovery Act - Generator Facilities

VERSION DATE: 12/12/13

This database includes sites listed as generators of hazardous waste (large, small, and exempt) in the RCRAInfo system. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act

(RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS). This database includes sites located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.
Large Quantity Generators: Generate 1,000 kg or more of hazardous waste during any calendar month; or Generate more than 1 kg of acutely hazardous waste during any calendar month; or Generate more than 100 kg of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste during any calendar month; or Generate 1 kg or less of acutely hazardous waste during any calendar month, and accumulate more than 1kg of acutely hazardous waste at any time; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulated more than 100 kg of that material at any time.
Small Quantity Generators: Generate more than 100 and less than 1000 kilograms of hazardous waste during any calendar month and accumulate less than 6000 kg of hazardous waste at any time; or Generate 100 kg or less of hazardous waste during any calendar month, and accumulate more than 1000 kg of hazardous waste at any time.
Conditionally Exempt Small Quantity Generators: Generate 100 kilograms or less of hazardous waste per calendar month, and accumulate 1000 kg or less of hazardous waste at any time; or Generate one kilogram or less of acutely hazardous waste per calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste during any calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste.

RCRANGR08 Resource Conservation & Recovery Act - Non-Generator Facilities

VERSION DATE: 12/12/13

This database identifies RCRAInfo system sites that only handle hazardous waste without generating any amount hazardous waste. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS). This database includes sites located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

RCRASC RCRA Sites with Controls

VERSION DATE: 01/14/14

This list of Resource Conservation and Recovery Act sites with institutional controls in place is provided by the U.S. Environmental Protection Agency.

Environmental Records Definitions - FEDERAL

TRI Toxics Release Inventory

VERSION DATE: 12/31/12

The Toxics Release Inventory, provided by the United States Environmental Protection Agency, includes data on toxic chemical releases and waste management activities from certain industries as well as federal facilities. This inventory contains information about the types and amounts of toxic chemicals that are released each year to the air, water, and land as well as information on the quantities of toxic chemicals sent to other facilities for further waste management.

BF Brownfields Management System

VERSION DATE: 01/13/14

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. The United States Environmental Protection Agency maintains this database to track activities in the various brown field grant programs including grantee assessment, site cleanup and site redevelopment.

CERCLIS Comprehensive Environmental Response, Compensation & Liability Information System

VERSION DATE: 10/25/13

CERCLIS is the repository for site and non-site specific Superfund information in support of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). This United States Environmental Protection Agency database contains an extract of sites that have been investigated or are in the process of being investigated for potential environmental risk.

NFRAP No Further Remedial Action Planned Sites

VERSION DATE: 10/25/13

This database includes sites which have been determined by the United States Environmental Protection Agency, following preliminary assessment, to no longer pose a significant risk or require further activity under CERCLA. After initial investigation, no contamination was found, contamination was quickly removed or contamination was not serious enough to require Federal Superfund action or NPL consideration.

NLRRCRAT No Longer Regulated RCRA Non-CORRACTS TSD Facilities

VERSION DATE: 12/12/13

This database includes RCRA Non-Corrective Action TSD facilities that are no longer regulated by the United States Environmental Protection Agency or do not meet other RCRA reporting requirements. This listing includes facilities that formerly treated, stored or disposed of hazardous waste.

Environmental Records Definitions - FEDERAL

ODI Open Dump Inventory

VERSION DATE: 06/01/85

The open dump inventory was published by the United States Environmental Protection Agency. An “open dump” is defined as a facility or site where solid waste is disposed of which is not a sanitary landfill which meets the criteria promulgated under section 4004 of the Solid Waste Disposal Act (42 U.S.C. 6944) and which is not a facility for disposal of hazardous waste. This inventory has not been updated since June 1985.

RCRAT Resource Conservation & Recovery Act - Treatment, Storage & Disposal Facilities

VERSION DATE: 12/12/13

This database includes Non-Corrective Action sites listed as treatment, storage and/or disposal facilities of hazardous waste in the RCRAInfo system. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS).

DNPL Delisted National Priorities List

VERSION DATE: 10/25/13

This database includes sites from the United States Environmental Protection Agency’s Final National Priorties List (NPL) where remedies have proven to be satisfactory or sites where the original analyses were inaccurate, and the site is no longer appropriate for inclusion on the NPL, and final publication in the Federal Register has occurred.

NLRRCRAC No Longer Regulated RCRA Corrective Action Facilities

VERSION DATE: 12/12/13

This database includes RCRA Corrective Action facilities that are no longer regulated by the United States Environmental Protection Agency or do not meet other RCRA reporting requirements.

NPL National Priorities List

VERSION DATE: 10/25/13

This database includes United States Environmental Protection Agency (EPA) National Priorities List sites that fall under the EPA's Superfund program, established to fund the cleanup of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action.

PNPL Proposed National Priorities List

VERSION DATE: 10/25/13

Environmental Records Definitions - FEDERAL

This database contains sites proposed to be included on the National Priorities List (NPL) in the Federal Register. The United States Environmental Protection Agency investigates these sites to determine if they may present long-term threats to public health or the environment.

RCRAC Resource Conservation & Recovery Act - Corrective Action Facilities

VERSION DATE: 12/12/13

This database includes hazardous waste sites listed with corrective action activity in the RCRAInfo system. The Corrective Action Program requires owners or operators of RCRA facilities (or treatment, storage, and disposal facilities) to investigate and cleanup contamination in order to protect human health and the environment. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS).

RODS Record of Decision System

VERSION DATE: 10/31/13

These decision documents maintained by the United States Environmental Protection Agency describe the chosen remedy for NPL (Superfund) site remediation. They also include site history, site description, site characteristics, community participation, enforcement activities, past and present activities, contaminated media, the contaminants present, and scope and role of response action.

Environmental Records Definitions - STATE (CO)

AST Aboveground Storage Tank Facilities

VERSION DATE: 01/27/14

The Oil and Public Safety Division of the Colorado Department of Labor and Employment maintains this list of aboveground storage tank (AST) facilities. This AST database also includes other types of storage tank facilities such as liquefied petroleum gas (LPG), vehicle tank meters (VTM), and compressed natural gas facilities.

CDL Clandestine Drug Laboratory Locations

VERSION DATE: 12/31/10

The North Metro Task Force provides this list of Methamphetamine labs seized between 2001 and 2010. The North Metro area includes the following Cities and Counties of Colorado: Adams County, Broomfield, Brighton, Commerce City, Federal Heights, Northglenn, Thornton, and Westminster. According to Section 2 of Colorado Revised Statutes: "25-18.5-103. Discovery of an illegal drug laboratory - property owner - clean-up - liability. (1) (a) Upon notification from a peace officer that chemicals, equipment, or supplies indicative of an illegal drug laboratory are located on a property, or when an illegal drug laboratory used to manufacture methamphetamine is otherwise discovered and the property owner has received notice, the owner of any contaminated property shall meet the cleanup standards for property established by the board in section 25-18.5-102".

COVENANTS Environmental Real Covenants List

VERSION DATE: 10/14/13

Senate Bill 01-145 gave authority to the Colorado Department of Public Health and Environment to approve requests to restrict the future use of a property using an enforceable agreement called an environmental covenant. These covenants, which are recorded with the deed and run with the land, provide a mechanism to ensure that institutional controls that are part of environmental remediation projects are properly implemented and that engineered structures are protected and maintained, so that implemented remedies continue to be protective of human health and the environment for as long as any residual contamination remains a risk.

HWSG Hazardous Waste Sites- Generator

VERSION DATE: 06/30/03

The Resource Conservation and Recovery Act (RCRA) was enacted by congress in 1976, followed by the promulgation of implementing regulations in 1980. In 1984, the State was authorized by EPA to implement the RCRA program in Colorado on their behalf. This facility listing includes RCRA sites listed as generators of hazardous waste (Small Quantity Generators and Large Quantity Generators) and was provided by the Colorado Department of Public Health and Environment.
Small Quantity Generators (SQG) generate, in any calendar month, more than 100 kg (220 lbs.) but less than 1,000 kg (2,200 lbs.) of RCRA hazardous waste; and generate, in any calendar month, or accumulate at any time, no more than 1 kg (2.2 lbs.) of acute hazardous waste and no more than 100 kg (220 lbs.) of material from the cleanup of a spill of acute hazardous waste; and accumulate on-site no more than 6000 kg (13,200 lbs) of hazardous waste at any one time; or, the site is a Small Quantity Generator if the site met all other criteria for a Conditionally Exempt Small Quantity Generator, but accumulated, at any time, more than 1,000 kg (2,200 lbs.) of

RCRA hazardous waste.
Large Quantity Generators (LQG) generate, in any calendar month, 1,000 kg (2,200 lbs.) or more of RCRA hazardous waste; or generate, in any calendar month, or accumulated at any time, more than 1 kg (2.2 lbs.) of RCRA acute hazardous waste; or generate, in any calendar month, or accumulated at any time, more than 100 kg (220 lbs.) of spill cleanup material contaminated with RCRA acute hazardous waste.

SPILLS Spills Listing

VERSION DATE: 10/28/13

The Colorado Department of Public Health and Environment's Division of Emergency Preparedness and Response maintains this listing of chemical spills and/or releases.

UST Underground Storage Tank Facilities

VERSION DATE: 01/27/14

The Oil and Public Safety Division of the Colorado Department of Labor and Employment maintains this list of underground storage tank facilities.

HISTSWLF Historical Solid Waste Landfills

VERSION DATE: NR

This historical solid waste landfills database contains data from the Hazardous Materials Waste Management Division (HMWMD) of the Colorado Department of Public Health and other various state and local agencies. In the early 1980s, the HMWMD conducted a survey of staff members and local agencies to compile this listing of sites that were known or thought to have waste issues. This Solid Waste Historical Data is not considered complete or verifiable and has not been maintained since the late 1980s. The HMWMD is not responsible and shall not be liable to the used for damages of any kind arising out of the use of this data or information.

HWSTSD Hazardous Waste Sites- Treatment, Storage & Disposal

VERSION DATE: 06/30/03

The Resource Conservation and Recovery Act (RCRA) was enacted by congress in 1976, followed by the promulgation of implementing regulations in 1980. In 1984, the State was authorized by EPA to implement the RCRA program in Colorado on their behalf. TSD facilities treat, store, dispose, or recycle hazardous waste on site in units and therefore are subject to RCRA permitting requirements. Historic TSDs are facilities that have completed closure and/or post-closure of the RCRA Subtitle C Regulated Unit(s) or the Treatment/Storage/Disposal Unit is no longer regulated. This database was provided by the Colorado Department of Public Health and Environment.

LST Leaking Storage Tank Facilities

VERSION DATE: 02/21/14

Environmental Records Definitions - STATE (CO)

The Oil and Public Safety Division of the Colorado Department of Labor and Employment maintains this list of leaking aboveground and underground storage tank facilities.

LUSTTRUST Leaking Underground Storage Tanks Trust Fund Sites

VERSION DATE: 01/01/00

Suspected tank leaks have been discovered at the sites included in this database, but the facility responsible for the leak has not been identified. The state's investigtion and search for responsible parties is paid for out of the state's Leaking Underground Storage Tank (LUST) Trust Fund. This database was provided by the Colorado Department of Labor & Employment, Division of Oil and Public Safety, State Fund Section and is no longer updated.

METHANESITES Methane Gas Study Sites

VERSION DATE: 01/01/81

This Investigation of Methane Gas Hazards report was prepared by the Denver Office of Emergency Preparedness in 1981. The purpose of this study was to assess the actual and potential generation, migration, explosive and related problems associated with specified landfills, and to identify existing and potential problems, suggested strategies to prevent, abate, and control such problems and recommend investigative and monitoring functions as may be deemed necessary. The Colorado Department of Health selected eight landfills as priorities due to population density and potential hazards to population and property.

SWF Solid Waste Facilities

VERSION DATE: 01/14/14

The Colorado Department of Public Health and Environment maintains this database of active solid waste disposal facilities, transfer stations, recyclers, waste tire registrants, and waste grease registrants.

VCRA Voluntary Cleanup and Redevelopment Program Sites

VERSION DATE: 09/12/13

This site listing is provided by the Colorado Department of Public Health and Environment (CDPHE) and includes both voluntary cleanup and brownfield properties. The Voluntary Cleanup and Redevelopment program was created in 1994. The objective of the program is to facilitate the redevelopment and transfer of contaminated properties. Properties that sit untouched because of their real or perceived contamination can be rehabilitated using the CDPHE's Brownfields Program in conjunction with the Voluntary Cleanup Program. Cleanup decisions are based on existing standards and the proposed use of the property. The actual cleanup and verification is the owner's responsibility.

HWSCA Hazardous Waste Sites- Corrective Action

VERSION DATE: 06/30/03

Environmental Records Definitions - STATE (CO)

The Resource Conservation and Recovery Act (RCRA) was enacted by congress in 1976, followed by the promulgation of implementing regulations in 1980. In 1984, the Hazardous and Solid Waste Amendments (HSWA) were added to RCRA providing for corrective action at facilities subject to RCRA. That same year, the State was authorized by EPA to implement the RCRA program in Colorado on their behalf. Corrective action may be implemented as part of a RCRA Hazardous Waste Permit, an Order, or a Corrective Action Plan pursuant to the Colorado Hazardous Waste Regulations. Corrective action is the process by which regulated facilities investigate and remediate, as necessary, all contamination (soil, ground water, surface water, air) associated with their releases into the environment. Historic Corrective Action Sites are facilities that have completed the RCRA Subtitle C corrective Action process. This database was provided by the Colorado Department of Public Health and Environment.

SF Superfund Sites

VERSION DATE: 06/01/03

This listing contains active, deleted and proposed "Superfund" hazardous waste sites, as well as those sites identified through the Natural Resource Damages section of Superfund legislation and one Private Non-Superfund Cleanup site. A site qualifies for the National Priorities List (NPL or Superfund list) when the U.S. Environmental Protection Agency (EPA) determines there is a release or threatened release of hazardous substances that may endanger public health, welfare or the environment. In Colorado, the lead agency for Superfund remediation may be either the EPA or the Colorado Department of Public Health and Environment.

Environmental Records Definitions - LOCAL

WCSWF	Weld County Solid Waste Facilities
VERSION DATE: 08/03/09	

This listing of solid waste facilities is provided by the Weld County Public Health Department.

Environmental Records Definitions - TRIBAL

USTR08 Underground Storage Tanks On Tribal Lands

VERSION DATE: 02/01/13

This database, provided by the United States Environmental Protection Agency (EPA), contains underground storage tanks on Tribal lands located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

LUSTR08 Leaking Underground Storage Tanks On Tribal Lands

VERSION DATE: 02/01/13

This database, provided by the United States Environmental Protection Agency (EPA), contains leaking underground storage tanks on Tribal lands located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

ODINDIAN Open Dump Inventory on Tribal Lands

VERSION DATE: 11/08/06

This Indian Health Service database contains information about facilities and sites on tribal lands where solid waste is disposed of, which are not sanitary landfills or hazardous waste disposal facilities, and which meet the criteria promulgated under section 4004 of the Solid Waste Disposal Act (42 U.S.C. 6944).

INDIANRES Indian Reservations

VERSION DATE: 01/01/00

The Department of Interior and Bureau of Indian Affairs maintains this database that includes American Indian Reservations, off-reservation trust lands, public domain allotments, Alaska Native Regional Corporations and Recognized State Reservations.

APPENDIX B

AIR PHOTO DOCUMENTATION

Table 1: Colorado Aerial Photo Service Photos, 9/2/2005

PHOTO DATE	FRAMES
6/6/2005	13, 14
5/3/2000	32, 33
6/26/1995	232, 233
9/24/1991	12, 13
11/18/1984	92, 93
6/3/1979	114
11/7/1974	141 - 46
4/29/1965	120-0

APPENDIX C

ENVIRONMENTAL ISSUES INQUIRIES

and SUPPORTING DOCUMENTATION

8. Are you aware or have you ever been notified that another property around yours has caused or had an environmental impact to your property.

_____

If yes, please describe which property and a brief description of the issue: _____

_____

_____

9. Are there any prior environmental reports (Phase 1 Environmental Site Assessments) concerning the subject property or related addresses? _____

If yes, can you provide copies of these reports or know where there are copies of these reports? _____

_____

Additional Information

How long have you owned the subject property? _____

Description of current activity on the subject property? _____

_____

Do you have any knowledge of past ownership or activity on the subject property that would be of environmental concern? _____

_____

What is the reason the Phase I is being conducted? _____

List all parties who will rely on the Phase I ESA report:

_____

_____

Completed by:

Signature: Jerry Bouldin

Printed Name: Jerry Bouldin

Date: 3-10-14

Western Environment and Ecology, Inc.
User Questionnaire for a Phase I Environmental Site Assessment, ASTM 1527-05

Subject Property Address or Description:

313 Acre Andalusia Property, East ½ of Section 6, Township 1 North, Range 68 West, Weld County, Colorado

In order to qualify for one of the Landowner Liability Protections (LLPs) offered by the Small Business Liability Relief and Brownfields Revitalization Act of 2001, The user of a Phase I Environmental Site Assessment must provide the following information (if available) to the environmental professional. Failure to provide this information could result in a determination that "all appropriate inquiry" is not complete.

1. Environmental cleanup liens that are filed or recorded against the site:

Are you aware of any environmental cleanup liens against the subject property that are filed or recorded under federal, tribal, state, or local law? No, none I am aware of.

If yes, please describe the lien and provide supporting documentation:

_____

_____

_____

2. Activity and land use limitations (AULs) that are in place on the site or that have been filed or recorded in a registry:

Are you aware of any AULs, such as engineering controls, land use restrictions, or institutional controls that are in place at the subject property and/or have been filed or recorded in a registry under federal, tribal, state, or local law? No, none I am aware of.

If yes, please describe the AUL and provide supporting documentation:

_____

_____

_____

3. Specialized knowledge or experience of the person seeking to qualify for the LLP

As the potential user of the subject property, do you have any specialized knowledge or experience related to the subject property or nearby properties? For example, are you involved in the same line of business as the current or former occupants of the property or adjoining property so that you would have specialized knowledge of the chemicals, processes, etc., used by this type of business?

No, none I am aware of

If yes, please describe this specialized knowledge or experience:

4. Relationship of the purchase price to the fair market value of the subject property if it were not contaminated.

Has the purchase price of this property been lowered below fair market value because of any contamination or some type of environmental issue? No

If yes, please describe the reasons for the lower purchase price:

5. Commonly known or reasonably ascertainable information about the property.

Are you aware of commonly known or reasonably ascertainable information about the property that would help the environmental professional to identify conditions indicative of releases or threatened releases?

A. Do you know the past uses of the property? (if "Yes", what?)

Yes. Dairy farming, crops and oil & gas wells

B. Do you know of chemicals that are present or once were present at the property? No, but probably normal pesticides associated with farming, and potentially oil and/or petroleum products associated with standard farming practices and oil/gas well exploration.

C. Do you know of any petroleum based products that are present or were once present on the subject property (in 5-gal or greater size containers, barrels, or tanks)? Yes. Active oil & gas wells and holding tanks.

D. Do you know of any spills or other chemical releases that have taken place at the property? Told there may have been an oil spill at one of the oil wells, but it was contained.

E. Do you know of any environmental cleanups that have taken place at the property? Clean-up of oil spill on one of the oil well pads.

If yes, please describe the information:

Told by land owner there may have been a minor oil / petroleum release / spill at one of the oil well sites, but that it was contained on the oil pad (well site pad) and was cleaned-up by the well operator.

6. Do you know of any special permits need for the operation of the business or businesses that have occupied the subject property? Oil & gas well drilling permit.

- **Waste water discharge permit?** No - not aware of any.
- **Air emissions permit?** No - not aware of any.
- **Any other type of permits?** No - not aware of any.

7. The degree of obviousness of the presence of contamination at the property, and the ability to detect the contamination by appropriate investigation.

As the potential user of the subject property, based on your knowledge and experience related to the property, are there any obvious indicators that point to the presence or likely presence of contamination at the property?

No - just standard oil & gas well operations described herein.

If yes, please describe the information:

8. Are you aware or have you ever been notified that another property around the subject site has caused or had an environmental impact to the property.

No

If yes, please describe which property and a brief description of the issue: _____

9. Are there any prior environmental reports concerning the subject property or related addresses? No, not that I am aware of.

If yes, can you provide copies of these reports or know where there are copies of these reports? _____

Additional Information

How long have you had interest in acquiring the subject property?

3 months

Description of current activity on the subject property? Farming, oil & gas well operations

Do you have any knowledge of past ownership or activity on the subject property that would be of environmental concern? No, just the farming, oil & gas well activity on the property described herein.

What is the reason the Phase I is being conducted? We plan to aquire, develop and sell lots to builders for a residential community

List all parties who will rely on the Phase I ESA report:

Completed by:

Signature: _____

Printed Name: Brock Chapman

Date: 2/21/19

WESTERN ENVIRONMENT AND ECOLOGY, INC

February 20, 2014

Lu Ann Penfold
Mountain View Fire Rescue
9119 East County Line Road
Longmont, Colorado 80501

Subject: **Environmental Issues Inquiry, 313 Acre Andalusia Property, East ½ of Section 6, Township 1 North, Range 68 West, Weld County, Colorado**

Dear Ms Penfold,

As a requirement for a Phase I Environmental Site Assessment, I respectively submit this request for an environmental records search of the subject properties by your office. I am especially interested in any records of environmental releases, chemical recovery, responses, above ground and/or underground storage tanks, hazardous materials storage, incidents, landfills, etc., which may be, or are impacting the site.

I look forward to receiving your response. If you have any questions about these properties, do not hesitate to contact me at 303-730-3452. Faxed (303-730-3461) or emailed response of your review would be more than sufficient. Thank you very much for your time in this matter.

Sincerely,
WESTERN ENVIRONMENT AND ECOLOGY, INC.

Austin Curry
Staff Scientist

cc. File

2217 WEST POWERS AVENUE * LITTLETON, COLORADO 80120
PHONE (303)730-3452 * FAX (303)730-3461
WWW.WESTERNENVIRONMENT.COM

WESTERN ENVIRONMENT AND ECOLOGY, INC

February 20, 2014

Weld County
Department of Public Health and Environment
1555 North 17th Avenue
Greeley, Colorado 80631
mswain@co.weld.co.us

Subject: **Environmental Issues Inquiry, 313 Acre Andalusia Property, East ½ of Section 6, Township 1 North, Range 68 West, Weld County, Colorado.**

Dear Ms. Swain,

As a requirement for a Phase I Environmental Site Assessment, I respectively submit this request for an environmental records search of the subject properties and adjacent properties by your office. I am especially interested in any records of environmental releases, chemical recovery, responses, above ground and/or underground storage tanks, hazardous materials storage, incidents, landfills, etc., which may be, or are, impacting the site.

I look forward to receiving your response. If you have questions about these properties, do not hesitate to contact me at 303-730-3452. Faxed or emailed responses of your review would be more than sufficient. Thank you very much for your time in this matter.

Sincerely,
WESTERN ENVIRONMENT AND ECOLOGY, INC.

Austin Curry
Staff Technician

cc. File

2217 WEST POWERS AVENUE * LITTLETON, COLORADO 80120
PHONE (303)730-3452 * FAX (303)730-3461
WWW.WESTERNENVIRONMENT.COM

WESTERN ENVIRONMENT AND ECOLOGY, INC

June 3, 2014

I & J Partnership
c/o Jerry Bouldin
STF Land Development Consultants, Inc.
3733 Florentine Circle
Longmont, CO 80503

Subject: Limited Phase II Environmental Site Assessment Andalusia PUD, 313 Acres in Section 6 Township 1 North Range 68 West Erie Colorado. Western Environment and Ecology, Inc. Project Number 640-001-02.

Dear Mr. Bouldin:

In accordance with Western Environment and Ecology, Inc's. (Western Environment) Proposal Number P14-15, and in response to the conclusions presented in Phase I Environmental Site Assessment prepared by Western Environment (Project #'s 330-003-01 and 330-004-01) we are pleased to present you with the following Limited Phase II Environment Site Assessment of the above referenced property (Figure 1). The purpose of this investigation is to determine if soil and /or groundwater contamination as a result of petroleum production activities has occurred. The focus of the assessment was on releases reported to the Colorado Oil and Gas Conservation Commission from two wells located on the property. These wells, Koch 41-6 and Kenneth E Koch 1 , are shown on Figure 2.

On March 6th, 2014, Western Environment personnel drilled six borings on the subject property. The borings were completed with a 7730 Track Mounted GeoProbe using 2 inch drive rods. Continuous soil samples were taken from each boring to a maximum depth of 18.9 feet. Boring logs and well completion diagrams were constructed of the holes using USCS soil classification system (attached). The extracted soil samples were screened with a Photo Ionization Detector (PID) and visually for evidence of contamination. Using PID data and visual and geologic criteria, soil samples from each boring were selected for analysis. These samples were taken, using appropriate quality assurance and quality control methods and transported, under chain of custody controls, to Technology Laboratories in Fort Collins, Colorado. The samples were analyzed for benzene, toluene, ethyl-benzene and xylene (BTEX) and Total Recoverable Petroleum Hydrocarbons (TRPH) utilizing EPA Methods 8260 and 418.1 respectively.

After completing the borings, two groundwater monitoring wells were constructed. The wells consist of screw-type 1" PVC pipe extended to an estimated maximum depth of 18.9 feet below the surface. Five (5) feet of 20 slot screen with 10/20 silica sand was placed from the bottom of the borings to approximately 2 feet above the screened interval. Bentonite "crumbles" were then placed to the surface and hydrated.

On March 11th, 2014, Western Environment returned to the site to measure the static water level in the wells and evaluate water quality in preparation of acquiring samples for analysis. Groundwater was encountered in the two wells at 18.36 and 10.40 feet below grade. Water quality values including dissolved oxygen, temperature, conductivity and pH were collected in each well and are presented in this report. The wells were then developed and sampled on March 12th in compliance with US EPA Guidance Document SW-846 for BTEX and TRPH's and also transported to Technology Laboratories in Fort Collins. A surface water sample (TB-SW), was acquired from directly west side of the tank battery located adjacent to Weld County Road 3 (Figure 2). These samples were also analyzed for BTEX and TRPH.

2217 WEST POWERS AVENUE * LITTLETON, COLORADO 80120
PHONE (303)730-3452 * FAX (303)730-3461
WWW.WESTERNENVIRONMENT.COM

On March 27th, 2014 Western Environment received the analytical results from the soil and water samples. The results (attached) were all non-detect for BTEX and TRPH.

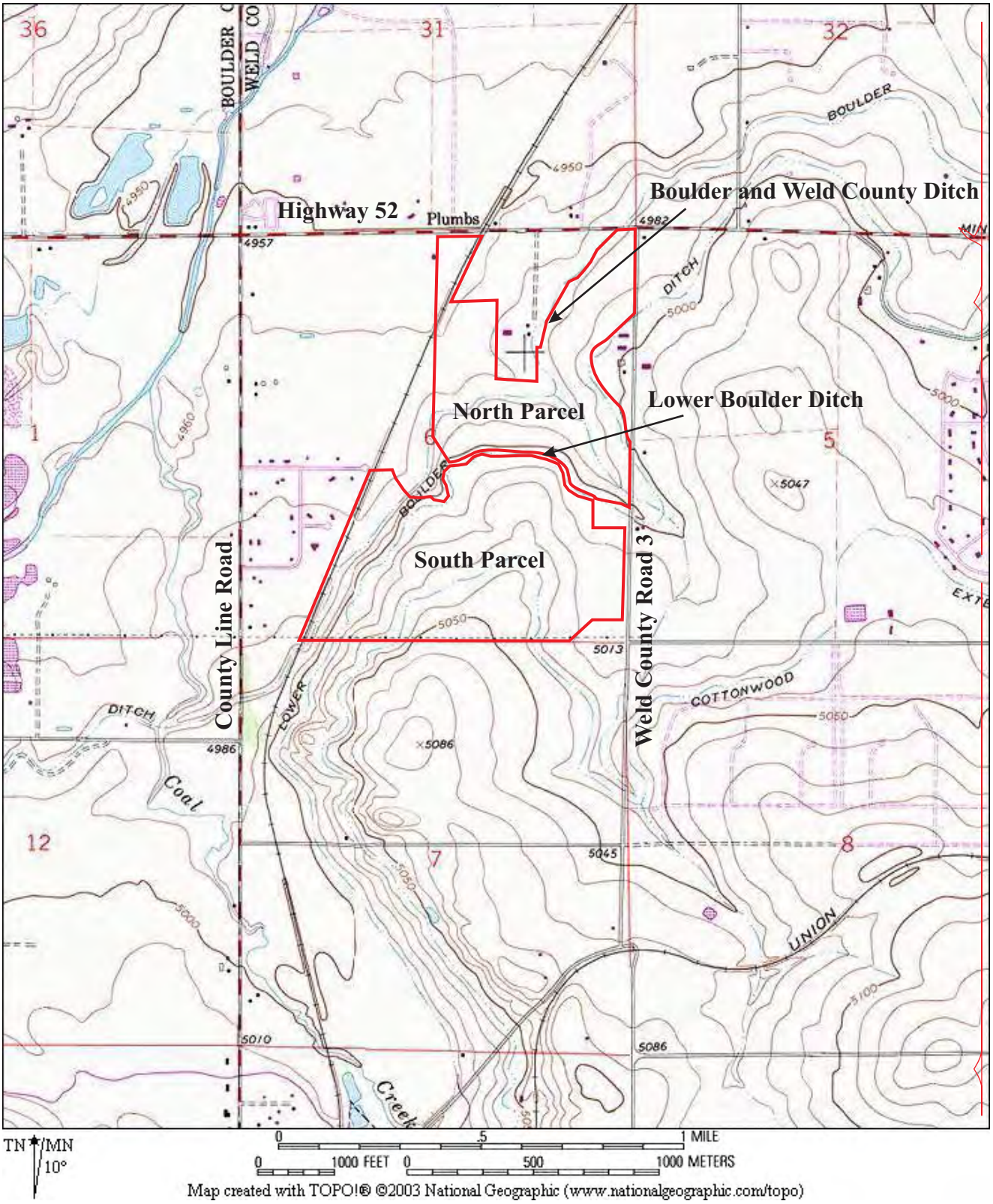
Based upon the results of the soil and water analysis it is the opinion of Western Environment and Ecology, Inc. that contamination as a result of petroleum production from wells Koch 41-6 and Kenneth E Koch 1, is not likely to occur.

We appreciate the opportunity to provide you with this assessment. Please feel free to contact us if you have any questions or comments.

Sincerely,
WESTERN ENVIRONMENT AND ECOLOGY, INC.

Greg D. Sherman P.G.
President

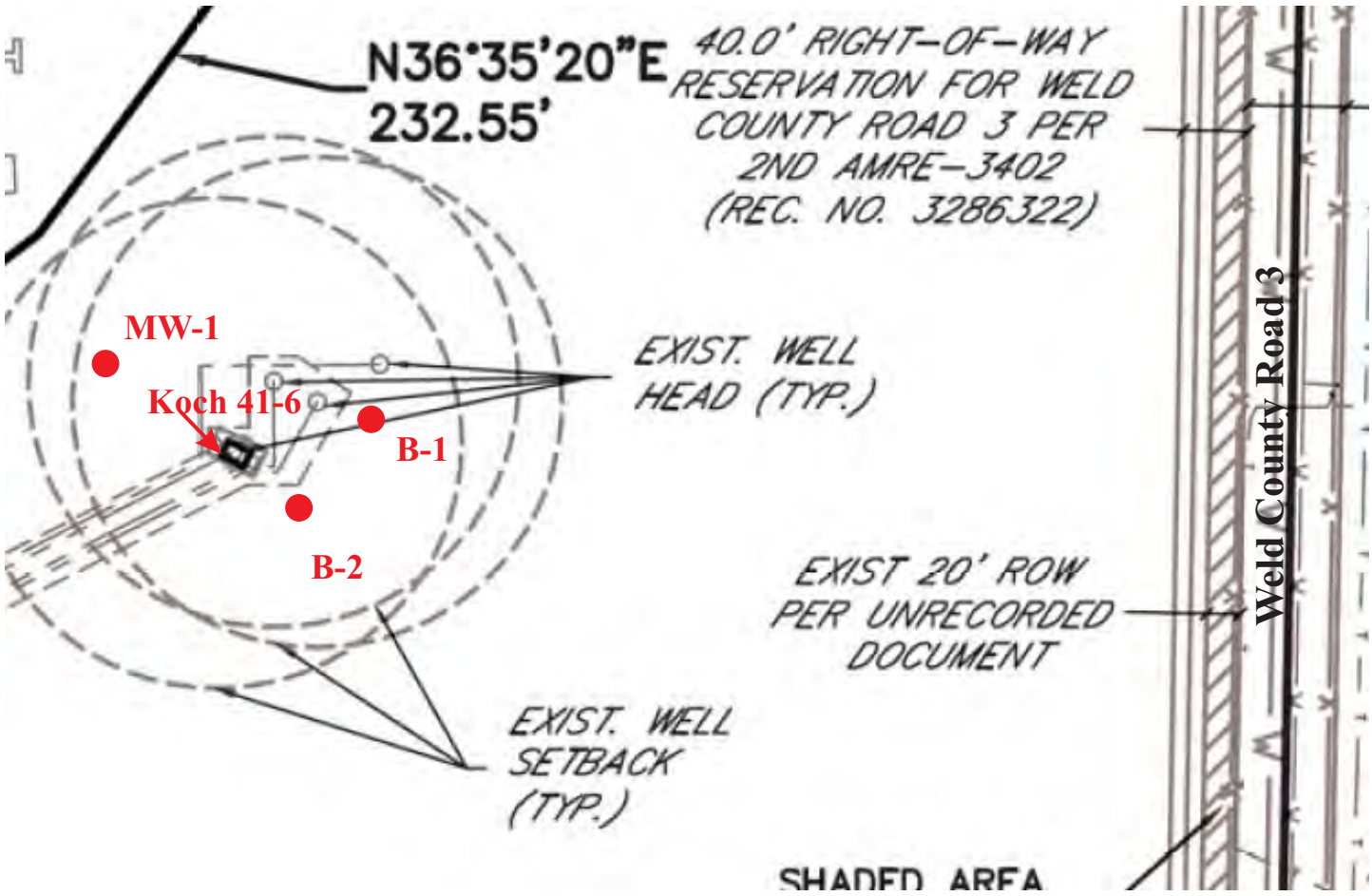
att.



USGS Erie, CO Quadrangle, 1978

WESTERN ENVIRONMENT AND ECOLOGY, INC.
2217 West Powers Avenue
Littleton, Colorado 80120

Figure 1 - Site Location Map
Andalusia Project
313 Acres
Section 6, T1N, R68W
Erie, Colorado

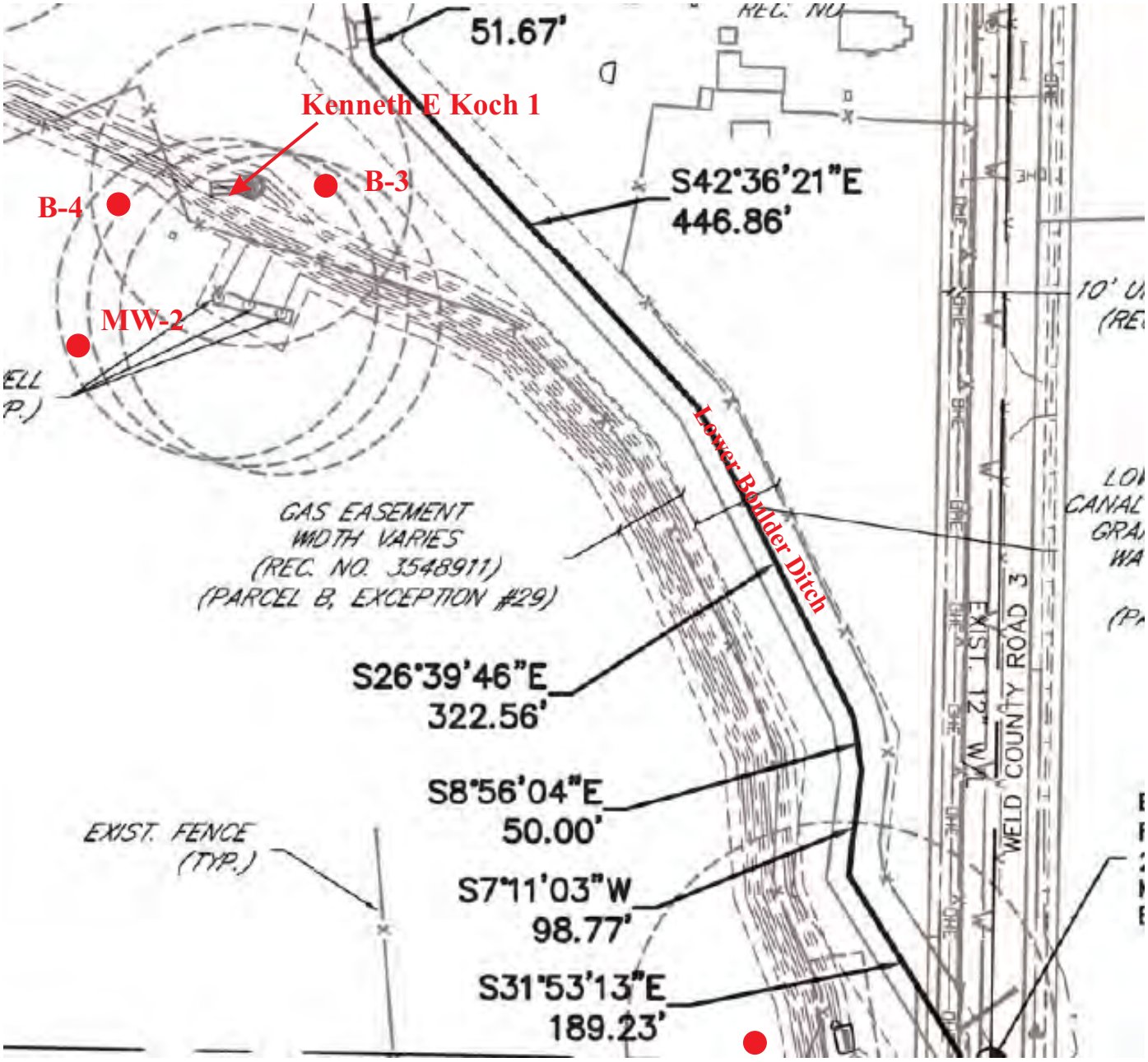


Scale in feet

0 100

WESTERN ENVIRONMENT
AND ECOLOGY, INC.
2217 West Powers Avenue
Littleton, Colorado 80120

Figure 2 - Boring Location Map
Koch 41-6 Well
Andalusia Property
Section 6, T1N, R68W
Erie, Colorado



WESTERN ENVIRONMENT AND ECOLOGY, INC. 2217 West Powers Avenue Littleton, Colorado 80120	Figure 2 - Boring Location Map Kenneth E Koch 1 Well Andalusia Property Section 6, T1N, R68W Erie, Colorado

western environment and ecology inc.

Lithologic Log and Construction of Monitoring Well

Client	I&J Partnership LP	Drilling Information	
Project Number	640-001-02	Date Started 3/6/14	Date Completed 3/6/14
Project Location	Andalusia \	Method 2" GeoProbe	Total Depth 18.9'
Boring No.	MW-1	Well Completion Information	
Logged by	G. Sherman	Screen/Casing Diameter 1"	Screen Length 5'
Approved by	Greg Sherman	Slot Size 20	Casing Length 17'
Drilled by	Site Services	Top of Casing Elevation NA	Type PVC

Depth (ft)	Description	PID	Sample Interval/ Sample Type	Soil Classification	Blow Count	Well Completion	Water Level
	Medium to dark brown clay and sand, moist.	0 ppm	CS	SC			
5	Light brown fine to medium grained sand.	0 ppm		SP			
	Medium brown clay.	0 ppm		CL			
10	Light brown fine grained sand.	0 ppm		SP			
	Medium brown clay.	0 ppm		CL			
15	Moist at 14.5'						
	Light brown fine grained sand.	0 ppm		SP			
	(sample at 17.5')						
	Refusal at 18.9'						
20	Total depth 18.9'						
25							
30							

18.36'
3/11/14

Legend

Concrete
Bentonite
Sand 10/20

Sample Type
SS - Split Spoon
ST - Pressed Shelby Tube
CS - Continuous Sampler
CBS - California Barrel Sampler

western environment and ecology inc.

Lithologic Log and Construction of Monitoring Well

Client I&J Partnership LP	Drilling Information		
Project Number 640-001-02	Date Started 3/6/14	Date Completed 3/6/14	
Project Location Andalusia \	Method 2" GeoProbe	Total Depth 18.9'	
Boring No. B-1	Well Completion Information		
Logged by G. Sherman	Screen/Casing Diameter	Screen Length NA	
Approved by Greg Sherman	Slot Size NA	Casing Length NA	
Drilled by Site Services	Top of Casing Elevation NA	Type NA	

Depth (ft)	Description	PID	Sample Interval/ Sample Type	Soil Classification	Blow Count	Well Completion	Water Level
	Light brown fine to medium grained sand.	0 ppm	CS	SP			
5							
	Medium to dark brown clay and sand, moist.	0 ppm		SC			
10	Light brown fine grained sand.						
	(sample at 12.0')	0 ppm		SP			
	Light brown fine grained quartzose sandstone.	0 ppm					
15	Total depth 13.8'						
20							
25							
30							

Legend

Concrete
Bentonite
Sand 10/20

Sample Type
SS - Split Spoon
ST - Pressed Shelby Tube
CS - Continuous Sampler
CBS - California Barrel Sampler

western environment and ecology inc.

Lithologic Log and Construction of Monitoring Well

Client I&J Partnership LP	Drilling Information		
Project Number 640-001-02	Date Started 3/6/14	Date Completed 3/6/14	
Project Location Andalusia	Method 2" GeoProbe	Total Depth 13.0'	
Boring No. B-2	Well Completion Information		
Logged by G. Sherman	Screen/Casing Diameter	Screen Length NA	
Approved by Greg Sherman	Slot Size NA	Casing Length NA	
Drilled by Site Services	Top of Casing Elevation NA	Type NA	

Depth (ft)	Description	PID	Sample Interval/ Sample Type	Soil Classification	Blow Count	Well Completion	Water Level
5	Light brown fine to medium grained sand.	0 ppm	CS	SP			
10	Medium to dark brown clay and sand, moist.	0 ppm		SC			
	Light brown fine grained sand. (sample at 12.5')	0 ppm		SP			
15	Light brown fine grained quartzose sandstone.	0 ppm					
20	Total depth 14.5'						
25							
30							

Legend

Concrete
Bentonite
Sand 10/20

Sample Type
SS - Split Spoon
ST - Pressed Shelby Tube
CS - Continuous Sampler
CBS - California Barrel Sampler

western environment and ecology inc.

Lithologic Log and Construction of Monitoring Well

Client	I&J Partnership LP	Drilling Information	
Project Number	640-001-02	Date Started 3/6/14	Date Completed 3/6/14
Project Location	Andalusia	Method 2" GeoProbe	Total Depth 13.0'
Boring No.	B-3	Well Completion Information	
Logged by	G. Sherman	Screen/Casing Diameter	Screen Length NA
Approved by	Greg Sherman	Slot Size NA	Casing Length NA
Drilled by	Site Services	Top of Casing Elevation NA	Type NA

Depth (ft)	Description	PID	Sample Interval/ Sample Type	Soil Classification	Blow Count	Well Completion	Water Level
	Light brown clay and sand.			SC			
	Light brown fine to medium grained sand moist.		CS				
5		0 ppm		SP			
	(sample at 9.0')						
10	(saturated at 9.5')	0 ppm					
	Light greenish gray fine grained quartzose sandstone.	0 ppm					
	Total depth 13.0'						
15							
20							
25							
30							

Legend

Concrete
Bentonite
Sand 10/20

Sample Type
SS - Split Spoon
ST - Pressed Shelby Tube
CS - Continuous Sampler
CBS - California Barrel Sampler

western environment and ecology inc.

Lithologic Log and Construction of Monitoring Well

Client	I&J Partnership LP	Drilling Information	
Project Number	640-001-02	Date Started 3/6/14	Date Completed 3/6/14
Project Location	Andalusia	Method 2" GeoProbe	Total Depth 14.0'
Boring No.	B-4	Well Completion Information	
Logged by	G. Sherman	Screen/Casing Diameter	Screen Length NA
Approved by	Greg Sherman	Slot Size NA	Casing Length NA
Drilled by	Site Services	Top of Casing Elevation NA	Type NA

Depth (ft)	Description	PID	Sample Interval/ Sample Type	Soil Classification	Blow Count	Well Completion	Water Level
	Light brown clay and sand.			SC			
	Light brown fine to medium grained sand moist.		CS				
5		0 ppm					
	(sample at 6.5')	0 ppm		SP			
	(saturated at 7.0')						
10							
	Light greenish gray fine grained quartzose sandstone.	0 ppm					
15	Total depth 14.0'						
20							
25							
30							

Legend

Concrete
Bentonite
Sand 10/20

Sample Type
SS - Split Spoon
ST - Pressed Shelby Tube
CS - Continuous Sampler
CBS - California Barrel Sampler

western environment and ecology inc.

Lithologic Log and Construction of Monitoring Well

Client	I&J Partnership LP	Drilling Information	
Project Number	640-001-02	Date Started 3/6/14	Date Completed 3/6/14
Project Location	Andalusia \	Method 2" GeoProbe	Total Depth 18.9'
Boring No.	MW-2	Well Completion Information	
Logged by	G. Sherman	Screen/Casing Diameter 1"	Screen Length 5'
Approved by	Greg Sherman	Slot Size 20	Casing Length 10'
Drilled by	Site Services	Top of Casing Elevation NA	Type PVC

Depth (ft)	Description	PID	Sample Interval/ Sample Type	Soil Classification	Blow Count	Well Completion / Water Level
5	Light brown clay and sand, gravel at 2.5(fill).	0 ppm	CS	SC		
10	Dark brown clay with sand (roots). (sample at 7.5')	0 ppm		SC		
15	Light brown fine grained sand saturated. (sample at 11.0')	0 ppm		SP		10.40' 3/11/14
20	Total depth 13.0'					
25						
30						

Legend

Concrete
Bentonite
Sand 10/20

Sample Type
SS - Split Spoon
ST - Pressed Shelby Tube
CS - Continuous Sampler
CBS - California Barrel Sampler

TECHNOLOGY LABORATORY, INC.

CENTRE PROFESSIONAL PARK

1012 Centre Avenue
Fort Collins, Colorado 80526
(970) 490-1414

CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/06/14
Received: 03/12/14

Sample ID: MW-1, 17.5'
Laboratory ID B1032-01

Project No.: 640-001-02
Matrix: Soil

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
71-43-2	Benzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
108-88-3	Toluene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
100-41-4	Ethylbenzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
1330-20-7	Total Xylenes	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
N/A	HEM	< 50	mg/Kg	50	EPA-9071B	03/20/14

QA/QC SURROGATE RECOVERIES

Compound	% Recovery	% Rec. Limits
Dibromofluoromethane	102	68-120
Toluene-d8	101	81-128
Bromofluorobenzene	99	70-113

The results contained in this report relate only to those items tested.

TECHNOLOGY LABORATORY, INC.

CENTRE PROFESSIONAL PARK

1012 Centre Avenue
Fort Collins, Colorado 80526
(970) 490-1414

CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/06/14
Received: 03/12/14

Sample ID: MW-2, 11.0'
Project No.: 640-001-02

Laboratory ID B1032-02
Matrix: Soil

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
71-43-2	Benzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
108-88-3	Toluene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
100-41-4	Ethylbenzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
1330-20-7	Total Xylenes	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
N/A	HEM	< 50	mg/Kg	50	EPA-9071B	03/20/14

QA/QC SURROGATE RECOVERIES

Compound	% Recovery	% Rec. Limits
Dibromofluoromethane	101	68-120
Toluene-d8	102	81-128
Bromofluorobenzene	96	70-113

The results contained in this report relate only to those items tested.

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CENTRE PROFESSIONAL PARK

1012 Centre Avenue
Fort Collins, Colorado 80526
(970) 490-1414

CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/06/14
Received: 03/12/14

Sample ID: MW-2, 7.5'
Project No.: 640-001-02

Laboratory ID B1032-03
Matrix: Soil

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
71-43-2	Benzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
108-88-3	Toluene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
100-41-4	Ethylbenzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
1330-20-7	Total Xylenes	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
N/A	HEM	< 50	mg/Kg	50	EPA-9071B	03/20/14

QA/QC SURROGATE RECOVERIES

Compound	% Recovery	% Rec. Limits
Dibromofluoromethane	103	68-120
Toluene-d8	100	81-128
Bromofluorobenzene	97	70-113

The results contained in this report relate only to those items tested.

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CENTRE PROFESSIONAL PARK

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Fort Collins, Colorado 80526
(970) 490-1414

CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/06/14
Received: 03/12/14

Sample ID: B-1, 12.0'
Project No.: 640-001-02

Laboratory ID B1032-04
Matrix: Soil

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
71-43-2	Benzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
108-88-3	Toluene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
100-41-4	Ethylbenzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
1330-20-7	Total Xylenes	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
N/A	HEM	< 50	mg/Kg	50	EPA-9071B	03/20/14

QA/QC SURROGATE RECOVERIES

Compound	% Recovery	% Rec. Limits
Dibromofluoromethane	101	68-120
Toluene-d8	101	81-128
Bromofluorobenzene	98	70-113

The results contained in this report relate only to those items tested.

TECHNOLOGY LABORATORY, INC.

CENTRE PROFESSIONAL PARK

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Fort Collins, Colorado 80526
(970) 490-1414

CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/06/14
Received: 03/12/14

Sample ID: B-2, 12.5'
Project No.: 640-001-02

Laboratory ID B1032-05
Matrix: Soil

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
71-43-2	Benzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
108-88-3	Toluene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
100-41-4	Ethylbenzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
1330-20-7	Total Xylenes	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
N/A	HEM	< 50	mg/Kg	50	EPA-9071B	03/20/14

QA/QC SURROGATE RECOVERIES

Compound	% Recovery	% Rec. Limits
Dibromofluoromethane	101	68-120
Toluene-d8	102	81-128
Bromofluorobenzene	97	70-113

The results contained in this report relate only to those items tested.

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CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/06/14
Received: 03/12/14

Sample ID: B-3, 9.0'
Project No.: 640-001-02

Laboratory ID B1032-06
Matrix: Soil

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
71-43-2	Benzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
108-88-3	Toluene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
100-41-4	Ethylbenzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
1330-20-7	Total Xylenes	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
N/A	HEM	< 50	mg/Kg	50	EPA-9071B	03/20/14

QA/QC SURROGATE RECOVERIES

Compound	% Recovery	% Rec. Limits
Dibromofluoromethane	102	68-120
Toluene-d8	101	81-128
Bromofluorobenzene	97	70-113

The results contained in this report relate only to those items tested.

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CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/06/14
Received: 03/12/14

Sample ID: B-4, 6.5'
Project No.: 640-001-02

Laboratory ID B1032-07
Matrix: Soil

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
71-43-2	Benzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
108-88-3	Toluene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
100-41-4	Ethylbenzene	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
1330-20-7	Total Xylenes	< 0.01	mg/Kg	0.01	EPA-8260B	03/14/14
N/A	HEM	< 50	mg/Kg	50	EPA-9071B	03/20/14

QA/QC SURROGATE RECOVERIES

Compound	% Recovery	% Rec. Limits
Dibromofluoromethane	100	68-120
Toluene-d8	102	81-128
Bromofluorobenzene	100	70-113

The results contained in this report relate only to those items tested.

TECHNOLOGY LABORATORY, INC.

CENTRE PROFESSIONAL PARK

1012 Centre Avenue
Fort Collins, Colorado 80526
(970) 490-1414

CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/12/14
Received: 03/12/14

Sample ID: MW-2 (1L)
Laboratory ID B1032-08

Project No.: 640-001-02
Matrix: Water

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
N/A	HEM	< 5.0	mg/L	1.4	EPA-1664A	03/25/14

The results contained in this report relate only to those items tested.

TECHNOLOGY LABORATORY, INC.

CENTRE PROFESSIONAL PARK

1012 Centre Avenue
Fort Collins, Colorado 80526
(970) 490-1414

CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/12/14
Received: 03/12/14

Sample ID: MW-1
Laboratory ID B1032-09

Project No.: 640-001-02
Matrix: Water

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
71-43-2	Benzene	< 0.001	mg/L	0.001	EPA-8260B	03/26/14
108-88-3	Toluene	< 0.001	mg/L	0.001	EPA-8260B	03/26/14
100-41-4	Ethylbenzene	< 0.001	mg/L	0.001	EPA-8260B	03/26/14
1330-20-7	Total Xylenes	< 0.001	mg/L	0.001	EPA-8260B	03/26/14

QA/QC SURROGATE RECOVERIES

Compound	% Recovery	% Rec. Limits
Dibromofluoromethane	93	68-120
Toluene-d8	101	81-128
Bromofluorobenzene	96	70-113

The results contained in this report relate only to those items tested.

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Fort Collins, Colorado 80526
(970) 490-1414

CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/12/14
Received: 03/12/14

Sample ID: MW-2 (VOA)
Laboratory ID B1032-10

Project No.: 640-001-02
Matrix: Water

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
71-43-2	Benzene	< 0.001	mg/L	0.001	EPA-8260B	03/25/14
108-88-3	Toluene	< 0.001	mg/L	0.001	EPA-8260B	03/25/14
100-41-4	Ethylbenzene	< 0.001	mg/L	0.001	EPA-8260B	03/25/14
1330-20-7	Total Xylenes	< 0.001	mg/L	0.001	EPA-8260B	03/25/14

QA/QC SURROGATE RECOVERIES

Compound	% Recovery	% Rec. Limits
Dibromofluoromethane	95	68-120
Toluene-d8	110	81-128
Bromofluorobenzene	95	70-113

The results contained in this report relate only to those items tested.

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Fort Collins, Colorado 80526
(970) 490-1414

CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/12/14
Received: 03/12/14

Sample ID: TB-SW (1L)
Project No.: 640-001-02

Laboratory ID B1032-11
Matrix: Water

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
N/A	HEM	< 5.0	mg/L	1.4	EPA-1664A	03/25/14

The results contained in this report relate only to those items tested.

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CERTIFICATE OF ANALYSIS

Western Environment & Ecology
2217 W. Powers Ave
Littleton, CO 80120

Sampled: 03/12/14
Received: 03/12/14

Sample ID: TB-SW (VOA)
Laboratory ID B1032-12

Project No.: 640-001-02
Matrix: Water

CAS Number	Parameter	Result	Units	MDL	Method	Date Analyzed
71-43-2	Benzene	< 0.001	mg/L	0.001	EPA-8260B	03/25/14
108-88-3	Toluene	< 0.001	mg/L	0.001	EPA-8260B	03/25/14
100-41-4	Ethylbenzene	< 0.001	mg/L	0.001	EPA-8260B	03/25/14
1330-20-7	Total Xylenes	< 0.001	mg/L	0.001	EPA-8260B	03/25/14

QA/QC SURROGATE RECOVERIES

Compound	% Recovery	% Rec. Limits
Dibromofluoromethane	99	68-120
Toluene-d8	110	81-128
Bromofluorobenzene	97	70-113

The results contained in this report relate only to those items tested.

TECHNOLOGY LABORATORY, INC.
1012 CENTRE AVENUE
FORT COLLINS, CO 80526
Phone: (970)490-1414 Fax: (970)472-5488
www.techlabusa.com info@techlabusa.com

W.O. NUMBER B1032

CHAIN-OF-CUSTODY REPORT

COMPANY NAME: Western Environment & Ecology
PROJECT MANAGER: Chris Sherman
PROJECT NUMBER: 640-001-02
PROJECT LOCATION OR NAME: Andalusia
SAMPLER'S SIGNATURE:

	SAMPLE ID	DATE/TIME SAMPLED	SAMPLE MATRIX: SOIL (S) AIR (A) AQUEOUS (W) OTHER (O)	NUMBER OF CONTAINERS	ANALYSIS REQUESTED: BTEX / MTBE / TVPH	TEPH (DRO)	OIL & GREASE	VOC 624 / 8260 (TOTAL / TCLP)	SVOC 625 / 8270 / PAH (TOTAL / TCLP)	pH / TSS / TDS	RCRA 8 METALS (TOTAL / TCLP / DISSOLVED)	React. / Ignite. / Corr. / Paint Filt.	BTEX/TVPH Emissions Vapor	BTEX Soil Vapor	TO-14 / TO-15 / TVPH Vapor	NITRATE / NITRITE / AMMONIA	BOD / COD	PCBs	TRPH 418.1	OTHER	OTHER	OTHER	OTHER	OTHER	OTHER	HOLD AFTER ANALYSIS	HOLD, DON'T ANALYZE
01	MW-1, 17.5'	3-6-14, 1035	S	1	X														X								
02	MW-3, 11.0'	3-6-14, 1252	S	1	X														X								
03	MW-2, 7.5'	3-6-14, 1240	S	1	X														X								
04	B-1, 12.0'	3-6-14, 1152	S	1	X														X								
05	B-2, 12.5'	3-6-14, 1214	S	1	X														X								
06	B-3, 9.0'	3-6-14, 1329	S	1	X														X								
07	B-4, 6.5'	3-6-14, 1339	S	1	X														X								
08	MW-2 (1L)	3-12-14, 1155	W	1															X								
09	MW-1	3-12-14, 1140	W	1	X																						
10	MW-2 (VOA)	3-12-14, 1155	W	1	X																						
11	TB-SW	3-12-14, 1220	W	1	X																						
12	TB-SW	3-12-14, 1220	W	1															X								

PAGE 1 OF 1

TURNAROUND TIME
- [X] Normal (≤10 Working Days)
- [ ] 3 Day (1.5 x Normal Rates)
- [ ] Next Day (2 x Normal Rates)
- [ ] Same Day (4 x Normal Rates)

NPDES PERMIT? ____YES ____NO

COMMENTS:

LOGGED IN BY: SW

Sample Preservative: [X] ≤ 6° C [ ] Acid [ ] None [ ] Filtered [ ] Other

RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE: 3/12/14
COMPANY: Western	TIME:	COMPANY: TLI	TIME: 2:45pm
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE:
COMPANY:	TIME:	COMPANY:	TIME:

APPENDIX D

Western Environment and Ecology Inc.

Statement of Qualifications

"We declare that, to the best of our professional knowledge and belief, we meet the definition of Environmental professional as defined in 40 CFR 312 and we have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. We have developed and performed the appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312."

REAL ESTATE TRANSFER ENVIRONMENTAL AUDITS

(RETA)

In response to provisions contained within the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA), lending institutions, firms and individuals involved with property transfers have become painfully aware of the costs associated with environmental liabilities. In an attempt to make informed decisions and potentially avail themselves of the "innocent purchaser defense" as defined in CERCLA, lending institutions are requiring the completion of an environmental audit. Previously, the completeness and the thoroughness of these audits varied as greatly as the cost. However, in late 1992, the American Society of Testing and Materials (ASTM) adopted specific standards for completion of Phase I audits. The ASTM standards (E-1527 and E-1528) are quite specific as to the level of investigation necessary to complete the audit. **WESTERN ENVIRONMENT AND ECOLOGY, INC.** has performed Real Estate Transfer Environmental Audits to ASTM standards long before the standards were adopted. Additionally, **WESTERN ENVIRONMENT AND ECOLOGY, INC.** personnel have provided training to FDIC regional offices on environmental compliance and financial institution liabilities. This familiarity with lending institutions and more than fifteen years of experience in performing RETA's allows **WESTERN ENVIRONMENT AND ECOLOGY, INC.** to provide efficient and complete reports meeting short time frame requirements.

SERVICES

- Historical Photo Records Search
- Environmental Records Search
- Interviews
- On-site Inspection
- Lead-Based Paint Survey
- Asbestos Survey
- Radon Survey
- PCB Survey

SELECTED CLIENT LIST

Community Development Group Denver, Colorado
City of Aurora, Aurora, Colorado
City of Wheat Ridge, Colorado
Shively, Strommen & Holst, Longmont, Colorado
Town of Lyons, Colorado

GREG D. SHERMAN, P.G.

President

PROFESSIONAL CAPABILITIES:

Mr. Sherman has more than 39 years of professional experience. He is currently President of **WESTERN ENVIRONMENT AND ECOLOGY, INC.** Prior to his current position, he was the Principal Geologist with SEACOR in its Lakewood, Colorado office and Project Director with Roy F. Weston also in Lakewood.

Duties performed in these capacities involved responsibility for CERCLA RI/FS studies and RCRA investigations. His professional assignments include project management and technical direction of the design and installation of the 2,000-foot long the 881 Hillside Groundwater Interception trench at the Rocky Flats Nuclear Weapons Plant in Jefferson County, Colorado. Mr. Sherman was Field Operations Manager for the installation of 75 groundwater extraction wells and vapor extraction and sparging points. This work was completed on the Stanford Research Park Superfund site in Palo Alto, California. Recently, he has concentrated on VOC remediation system design and installation utilizing on-site re-injection of treated groundwater and enhanced oxygenation systems. Mr. Sherman was lead investigator for the City of Wheat Ridge regarding the characterization of the Jay Street Park. This project, which was submitted to the Colorado Voluntary Clean-Up Program, received a grant from the Colorado Department of Public Health and Environment for innovative use of a Brownsfields site. Mr. Sherman and Western Environment and Ecology, Inc. was selected by the Cities of Aurora and Lakewood as their approved USEPA Brownsfields contractor.

Mr. Sherman is past Chairman of the Rocky Mountain Section of the Association of Engineering Geologists. He has served as Chairman of Executive Enterprises Seminars on Sampling and Data Analysis. He has extensive experience in geotechnical and geological investigations, groundwater studies, UST testing and evaluation, construction materials testing and mineral resource evaluation.

Mr. Sherman is recognized in the region as one of the leading experts in underground storage tank management and mine subsidence. He has placed special emphasis on the application of geophysical techniques to environmental and geotechnical investigations. Clients for these projects range from Federal, state and local governments to private industry and commercial developments. The project types included petroleum distribution facilities, nuclear power plants, highways and streets, dams and reservoirs, transmission lines, sewage treatment plants and sewage systems, hazardous and industrial waste disposal areas, and mining facilities, as well as residential and commercial developments. Mr. Sherman has performed geotechnical and geological investigations in Alaska, Arizona, California, Colorado, Idaho, Illinois, Montana, New Mexico, New York, Nevada, North Dakota, South Dakota, Texas, Utah and Wyoming. Additionally, he has international evaluation experience in the Middle East and Mexico.

REGISTRATION/CERTIFICATION

Wyoming Professional Geologist #2296
Indiana Certified Geologist #786
Certified Professional Geologist, CPG #6586
Petro Tite Training Course, 1986
40-Hour OSHA Training Course, 1987
8-Hour OSHA Supervisor Course, 1987
Nuclear Density Gauge Operation and Safety Training Course, 1984
NRC Quality Assurance Training, 1978
Asbestos Inspector, 1996

EXPERIENCE

Western Environment and Ecology, Inc., Littleton, Colorado; President, 1994.
SEACOR, Inc., Lakewood, Colorado; Principal Scientist, 1992-1993.
Roy F. Weston, Inc., Lakewood, Colorado; Principal Geologist, 1990-1992.
ATEC Associates, Inc., Denver, Colorado; Environmental Division Manager, 1985-1990.
Tierra Consultants, Inc., Denver, Colorado; President, 1982-1985.
Apache Energy and Minerals, Denver, Colorado; Senior Project Geologist, 1979-1982.
Dames and Moore, Denver, Colorado; Project Geologist, 1977-1979.
Resource Associates of Alaska, Fairbanks, Alaska; Staff Geologist, 1976.
Uranerez U.S.A., Inc., Casper, Wyoming; Staff Geologist, 1975-1976.
Amoco Production Company, Denver, Colorado; Lab Technician, 1974.
Cities Service Company, Durango, Colorado; Field Technician, 1973.

EDUCATION

B.S., Geology, University of Northern Colorado, 1975
Graduate Studies, New Mexico Institute of Mining and Technology, 1977

AWARDS

Rocky Mountain Associate of Geologists, Outstanding Senior, 1975
Who's Who in the West, 1988
Colorado Wildlife Federation, 1996 Conservationist of the Year (Owl Mountain Partnership)

PROFESSIONAL ASSOCIATIONS

Association of Engineering Geologists

American Institute of Professional Geologists

Senior Scientist Colca Canyon Scientific Expedition, 1990

Colorado School of Mines, Non-facility Senior Design Team Advisor

PUBLICATIONS/PRESENTATIONS

Sherman Greg D.,"Mine Subsidence Assessment, Boulder-Weld Coal Field, Using British National Coal Board Methods" The Mountain Geologist, Volume 46, Number 1 January 2009.

Sherman Greg D. and Brian R. Partington., "Abandoned Mine Subsidence Prediction Using British National Coal Board Methods, Boulder/Weld Coal Field, Denver, Colorado"

Proceedings for the International Association of Engineering Geologists, 2006 Meeting Nottingham, United Kingdom. September 2006.

Sherman, Greg D., "Sampling and Data Analysis"; Executive Enterprises Seminar, Chairman, May 1992.

Sherman, Greg D., "Statistical Design of Sampling Plans"; Executive Enterprises Seminar, June 1990.

Sherman, Greg D., "Impact of the EPA UST Regulations"; Tri-State Petroleum Marketer, December 1988.

Sherman, Greg D., "Variables Effecting Volumetric Leak Detection Methods for Underground Storage Tanks"; Paper given to the Colorado Section, American Society of Civil Engineers, 1988.

Sherman, Greg D., "The Impact of Underground Storage Tank Regulations on Industry"; Extended Abstracts, American Institute of Chemical Engineers, National Meeting, 1988.

Sherman, Greg D., "Assessment of Subsidence Damage to Existing Structures in Louisville, Lafayette, Colorado"; Proceedings of the Colorado Governor's Conference on Subsidence, 1985.

Sherman, Greg D., "Geology and Mining History of the Boulder/Weld Coal Field"; Paper given at Denver Coal Club Meeting, 1985.

Sherman, Greg D., "The New Mexico Gold Belt Regional Structural Implications"; Proceedings of the Western Mining Association, 1982 Convention.

Sherman, Greg D., "Colorado Front Range Uranium Deposits, A Possible Origin": in review.

Sherman, Greg D., "Origin of Monoclinal Folding Near Livermore, Colorado"; The Mountain Geologist, April 1976.

3-15-2026
Harry Brennan | Senior Planner
Town of Erie / Planning & Development
645 Holbrook Street | P.O. Box 750 | Erie, CO 80516
Phone: 720-745-1022

Re: Spring Hill - Preliminary Plat NBHD Meeting

Meeting overview

- Date/time/location: March 2, 2026, 6:00–7:00 p.m., Erie Recreation Center. Meeting ended ~7:15 p.m.
- Attendance: 8–10 neighbors in attendance; 8 signed in. Applicant team attendees: John Prestwich (PCS), Chris Elliott (E5X), Sarah Hunsche (E5X), Jonathan Adkins (E5X), and Nolan Kamm (E5X).
- Purpose: Provide an update on project progress, review changes since prior neighborhood meetings, confirm previously stated commitments, and address resident questions and concerns.

Presentation and project updates

- Master Plan overview: Chris Elliott presented the most current Master Plan and explained that recent modifications have been primarily offsite and technical in nature rather than changes to on-site land use or lot layout. Key offsite items discussed:
  - Offsite drainage channel: design refinements to better manage offsite runoff; the channel will run through the property and then head north under Highway 52 with new culverts, the channel will run all the way to Boulder Creek.
  - County Road 3 / Highway 52 intersection: CDOT has indicated a preference for a roundabout rather than a conventional traffic signal. The master plan reflects this change in intersection design.
- Reaffirmed commitments: The applicant reiterated previously communicated commitments to:
  - Provide a trail connection to the west that links the development to adjacent open space/circulation networks.
  - Construct landscaped berms and install vegetation buffers to screen and soften views from neighboring properties.
  - Provide perimeter fencing where previously agreed with adjacent property owners.
  - Maintain open-space areas and protect drainage/irrigation ditch corridors that fall outside the development area.

| 200 Kalamath St. Denver, CO 80223 | (303) 531-4905 | www.pcsgroupco.com

Discussion topics and resident concerns

- Southwest property drainage: Neighbors raised concerns about existing drainage issues in the southwest portion of the property located between two irrigation ditches. Clarifications provided:
    - That specific area is planned to remain open space and is not slated for development or direct disturbance under the current plan.
    - The development's proposed grading and stormwater infrastructure are designed to avoid worsening existing conditions; offsite drainage work is intended to improve overall hydrology in coordination with local drainage authorities.
    - Applicant committed to continue coordination with the irrigation ditch owners/ operators and with town engineering staff through the final construction document design.
- Highway 52 improvements and roundabout concerns:
    - Residents asked when Highway 52 improvements (including the potential roundabout at County Road 3) will occur and expressed preference/concern about a signalized intersection vs. a roundabout.
    - Applicant response: CDOT controls the design, phasing, and timing of state highway improvements. The development will participate financially in required intersection and roadway improvements and will construct acceleration/deceleration lanes as required by CDOT. Final design and schedule will follow CDOT direction and permitting.
- Wells and site remediation:
    - Applicant confirmed all on-site wells have been plugged and abandoned (P&A).
    - Residents noted remaining cleanup activities. Applicant clarified that P&A has been completed by operators, but additional remediation and site cleanup tasks remain to fully close out environmental/site work; the operators will follow state/local environmental procedures to complete those actions.
- Fencing, lot-level design, and construction timing:
    - After project-level questions, discussion shifted to individual lot needs: residents asked about fence styles/options and where fencing will be placed relative to lot lines and open space.
    - Applicant noted that final fence type and placement will be coordinated with adjacent homeowners as part of the final design and construction, and that neighbors will be consulted regarding aesthetics where prior commitments exist.
    - On timing: the applicant shared an anticipated schedule assuming favorable approvals: if Preliminary Plat hearings proceed positively, the team would prepare Final construction documents (Final CDs) and seek permits with the intention of beginning land development work in spring/summer of 2027. Home construction could follow roughly nine months after earthwork and infrastructure are underway, depending on market and permitting conditions.

Action items and follow-up

- Applicant commitments:
  - Continue coordination with local stormwater authorities and irrigation ditch operators to verify that offsite drainage modifications will not adversely impact neighbors.
  - Complete remaining site cleanup/remediation steps and communicate progress/status to neighbors.
  - Coordinate fence styles and placement with adjacent property owners as part of the final design process.
  - Provide updates to the neighborhood following significant project milestones (Preliminary Plat hearing outcomes, Final CD submittal, permitting milestones).
- Neighbor requests:
  - Additional clarification and updates on Highway 52 schedule and CDOT design decisions as information becomes available.
  - Confirmation of final drainage solutions for the southwest open-space area.
  - Notification before any on-site work begins and opportunities to review lot-level fencing/landscaping plans.

Summary conclusion

- The March 2 meeting functioned as an informational update and opportunity for dialog. The applicant reaffirmed prior commitments to trails, berming, landscaping, and fencing; clarified the limited scope of recent changes (primarily offsite design and CDOT-driven intersection concepts); and addressed neighbor concerns about drainage, CDOT's intersection decisions, well decommissioning, and fencing. The team committed to continued coordination, follow-up on site cleanup and drainage details, and ongoing communication regarding schedule and design as the project advances.

Sincerely,

John Prestwich

John Prestwich - RLA, President
President, PCS Group, Inc.

NEIGHBORHOOD MEETING SIGN IN SHEET

Date: 3-2-2026

Time: 6:00

Elkman_Love@Hotmail.com

Name – Please print	Address	Phone	Email
MIKE THEM	698 STATE HWY 52	720-563-7540	m-a-them@yahoo.com
Bob Love	423 Westview Rd	720 319 4256	ELKman_Love. Hotmail.com
Larry Fiegland	308 Westview Rd	303-257-7116	larryfiegland@gmail.com
Matthew Gross	0 HWY 52	717-487-1684	MLGross05@gmail.com
Jessica Fiegland	308 westview rd	3035969308	jesfiegland@gmail.com
Sandi & Chris Nieves	626 St. Hwy 52	3-834-0022 0027	chrisgnieves@gmail.com
Tim Carry	882 St HWY 52	720-695-4446	tjcarry@gmail.com



SPRING HILL

ILLUSTRATIVE PLAN

ERIE, CO 12-18-2025

LAND SUMMARY CHART	
LOT OR PRODUCT SIZE	TOTAL UNITS
21' X 77' (T-HOME)	70
20' X 60' (DUPLEX)	148
45' X 110'	112
50' X 110'	151
60' X 110'	107
65' X 120'	44
TOTAL	632

*361 HOMES BACK TO OR FRONT OPEN SPACE / PARKS

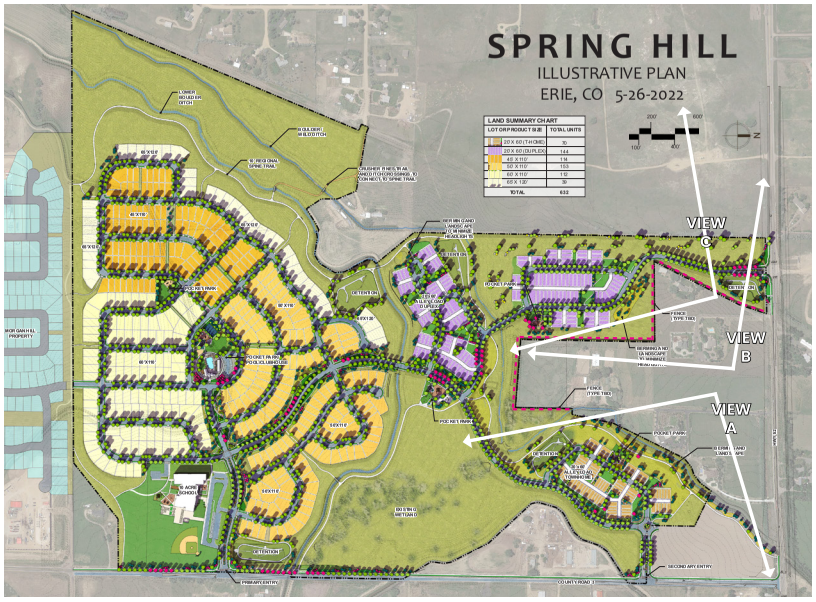
100' 50' 0 100' 200' 300' N

LOWER BOULDER DITCH
BOULDER / WELD DITCH
10' REGIONAL SPINE TRAIL
CRUSHER FINES TRAIL AND DITCH CROSSINGS TO CONNECT TO SPINE TRAIL
65'X120'
45'X110'
POCKET PARK
DETENTION
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60'X110'
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MORGAN HILL PROPERTY
10ACRE SCHOOL SITE
EXISTING WETLAND
PRIMARY ENTRY
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FENCE (TYPE TBD)
BERMING AND LANDSCAPE TO MINIMIZE HEADLIGHTS
21'X77' ALLEY LOAD TOWNHOME
BERMING AND LANDSCAPE
HWY 52
SECONDARY ENTRY
COUNTY ROAD 3



SPRING HILL Erie, Colorado
NBHD Meeting Images, May - 2022

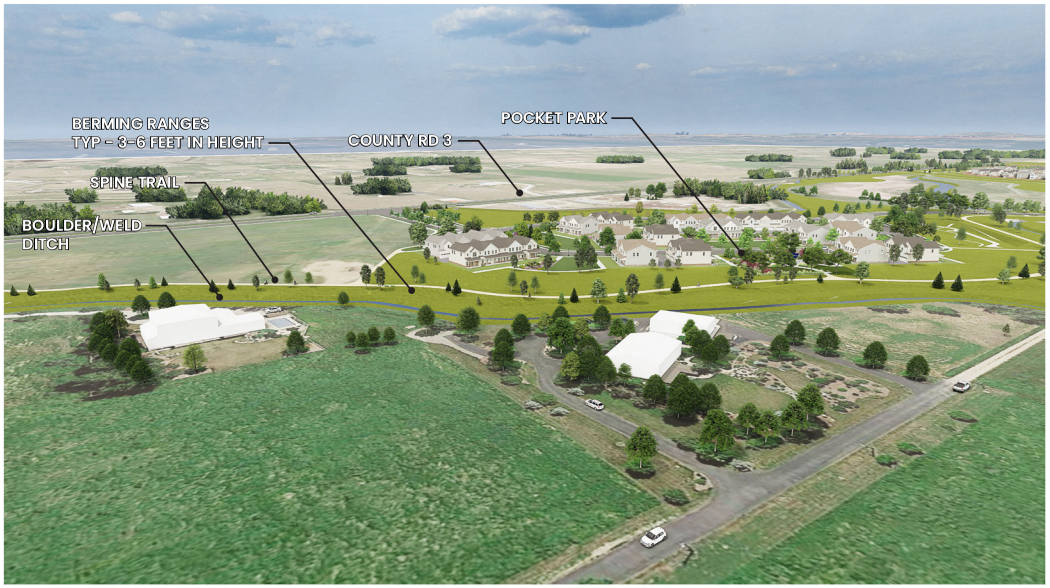
pcs group



SPRING HILL Erie, Colorado
Illustrative Air View, May - 2022

VICINITY MAP/ILLUSTRATIVE MASTER PLAN

pcs group



SPRING HILL Erie, Colorado
Illustrative Air View, May - 2022

NORTH EAST CORNER - VIEW A

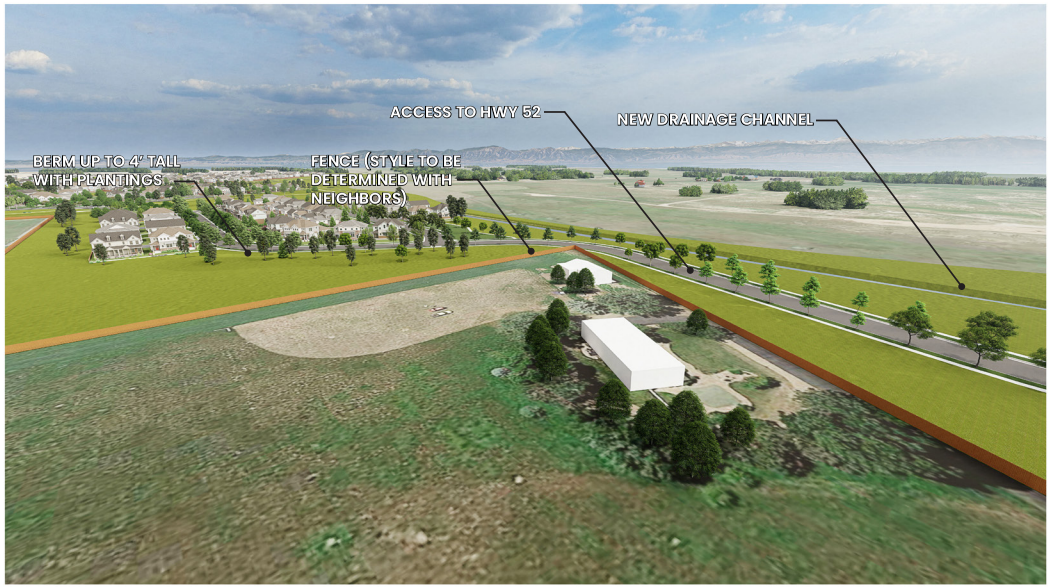
pcs group



SPRING HILL Erie, Colorado
Illustrative Air View, May - 2022

NORTH LOOKING WEST - VIEW B

pcs group

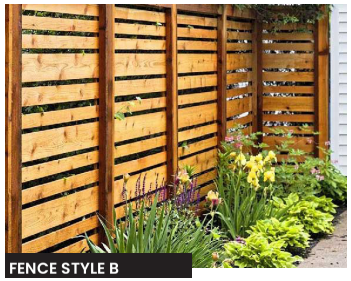


SPRING HILL Erie, Colorado
Illustrative Air View, May - 2022

NORTH LOOKING SOUTH - VIEW C

pcs group


FENCE STYLE A


FENCE STYLE B


FENCE STYLE C


FENCE STYLE D


FENCE STYLE E

SPRING HILL Erie, Colorado
May - 2022

FENCE STYLES FOR DISCUSSION PURPOSES

pcs group


FENCE STYLE F


FENCE STYLE G

SPRING HILL Erie, Colorado
May - 2022

FENCE STYLES FOR DISCUSSION PURPOSES

pcs group

pcs group

7-30-2024
Harry Brennan | Senior Planner
Town of Erie / Planning & Development
645 Holbrook Street | P.O. Box 750 | Erie, CO 80516
Phone: 720-745-1022

Re: Spring Hill- PD and Preliminary Plat NBHD Meetings

As requested please find enclosed a summary of the Neighborhood Meetings that have taken place for the Spring Hill community.

October 11, 2021 - summary below, ZOOM Meeting
October 17, 2021 - Follow up Conference Call
Mid-October thought December, 2021 - ongoing calls and email correspondence
January 4, 2022 - Neighborhood Meeting at the Erie Recreation Center
January 6, 2022 - Client Team voluntarily delays BOT hearing
January 13, 2022 - Morning - Meeting with Western and some Northern property owners on site
January 13, 2022 - Afternoon - Meeting with Northern property owners on site

As part of these meetings we modified the design of the Preliminary Plat to include a trail connection including two bridges across the existing ditches that will provide access to the SPine Trail for the Western neighbors. Increased the buffer from the existing homes in the northern portion of the property to the proposed Townhomes. Modified the design of the Paired Homes in the northern part of the community to increase buffers to existing homes. Voluntarily worked with existing neighbors to allow them to decide what type of fencing they would like installed, increased buffer plantings and added berming.

We have included a summary of the design revisions based on Neighborhood input is at the end of this summary.

Over the last approximately 18 months our client team has been working with the Town, CDOT, and Wright Water Engineers to develop an acceptable design solution for some regional drainage issues that the Spring Hill community will assist with. Our client team has kept in contact with the Neighborhood residents but has not had additional formal meetings.

MEETING NOTES FROM OCTOBER 11 MEETING

Audem Gonzales
Senior Planner, Planning & Development
Town of Erie
645 Holbrook Street | P.O. Box 750 Erie, CO 80516
Phone: 303-926-2778
agonzales@erieco.gov| www.erieco.gov/planning

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The meeting was attended by approximately a dozen people, we requested that everyone sign up in the chat function of the Zoom meeting; however, only 4 people signed up in the chat. The applicant gave an approximately 15 minute presentation, the slides are attached to these meeting notes.

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Not sure who asked this - question was what is the difference between dedicated and non-dedicated open space. Response was that the Town has criteria for land that they will accept for dedication, and we have worked with Parks and Open Space to identify the land that the Town wants to own. The other open space areas will be maintained by the Spring Hill Metro District or HOA, but not by the Town.

Sincerely,

John Prestwich - RLA, President
President, PCS Group, Inc.



PROPERTY HISTORY

MARCH - 2014

Annexation and Zoning

Following a process that started in 2006, in March of 2014 the property was Annexed to the Town of Erie, and Zoned as Low Density Residential.

APRIL to AUGUST - 2014

Andalusia Previous Plan

Our team has reviewed the comments that were made on the Preliminary Plat submittal that was made in August of 2014, and we have incorporated these comments into the new planning for the property.

MID – 2019 -2021

Andalusia PD & Preliminary Plat

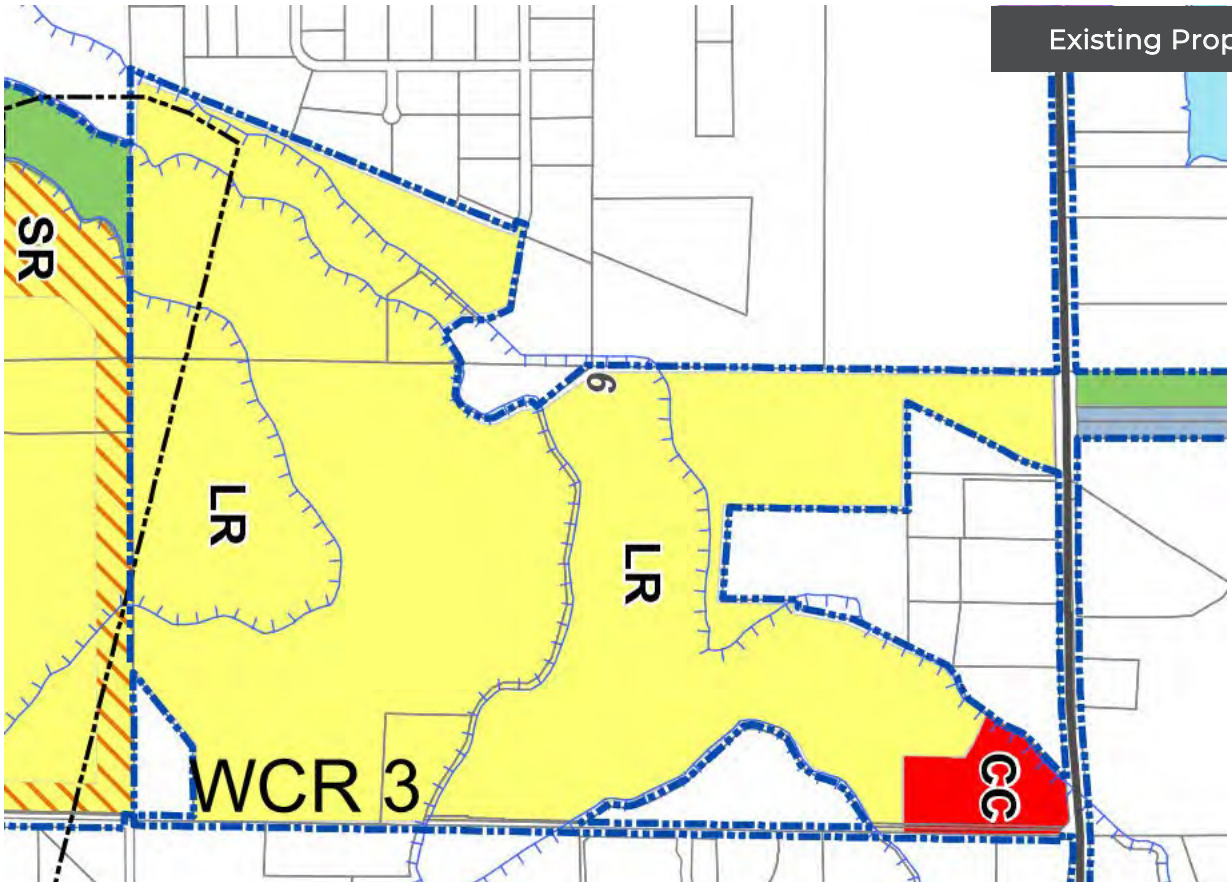
Our team has spent the last couple of years refining the plan and working with the Oil & Gas operators to get agreements to plug and abandon most of the existing wells on the property.

OCTOBER - 2021

Spring Hill PD & Preliminary Plat

This evening we are presenting the PD Zoning for the Spring Hill community, as well as the Preliminary Plat.

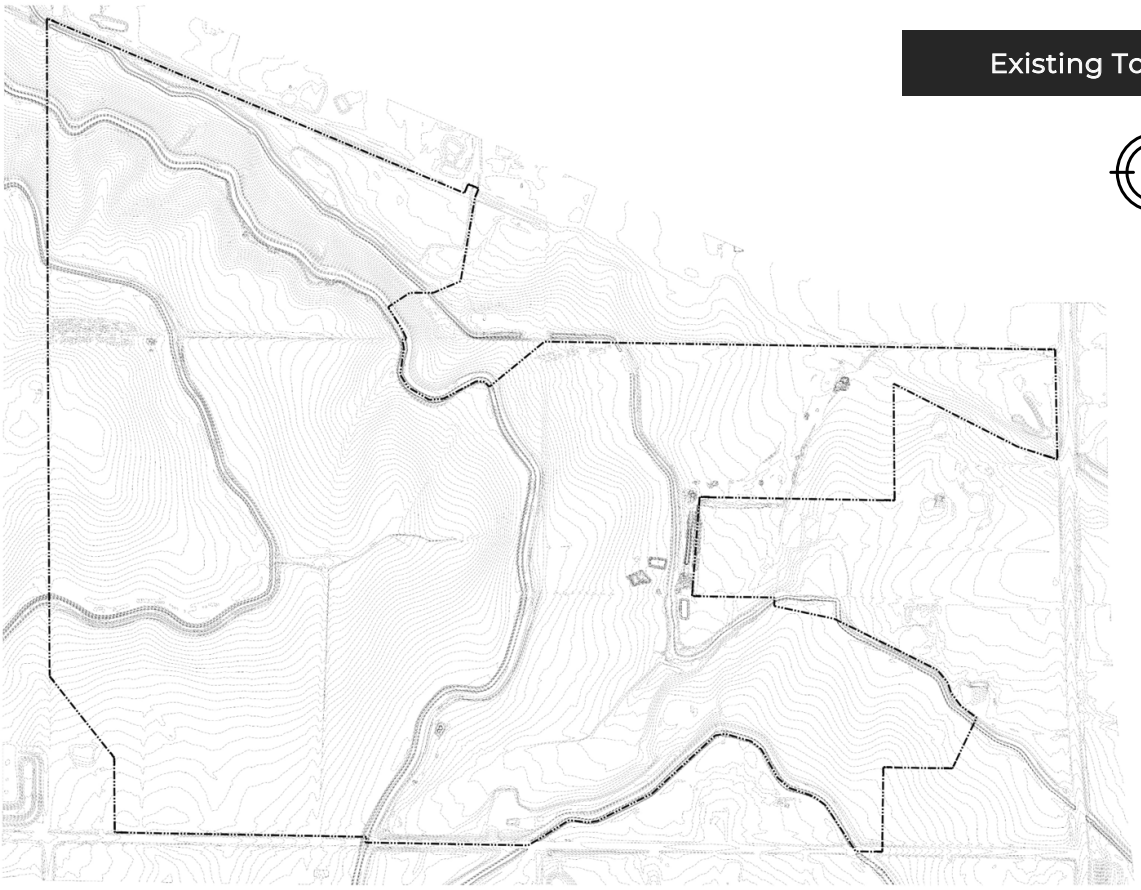
Existing Property Zoning



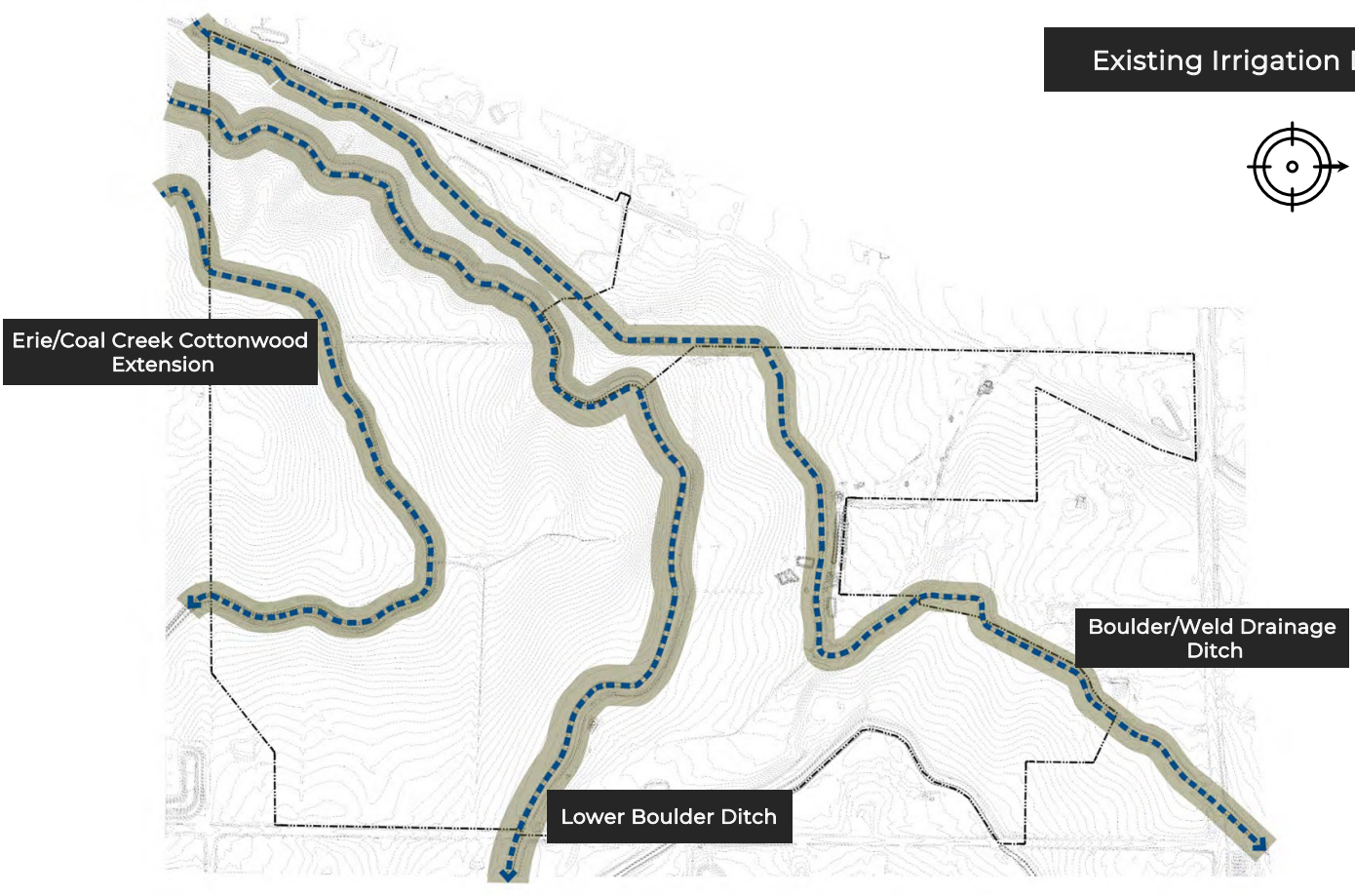
North



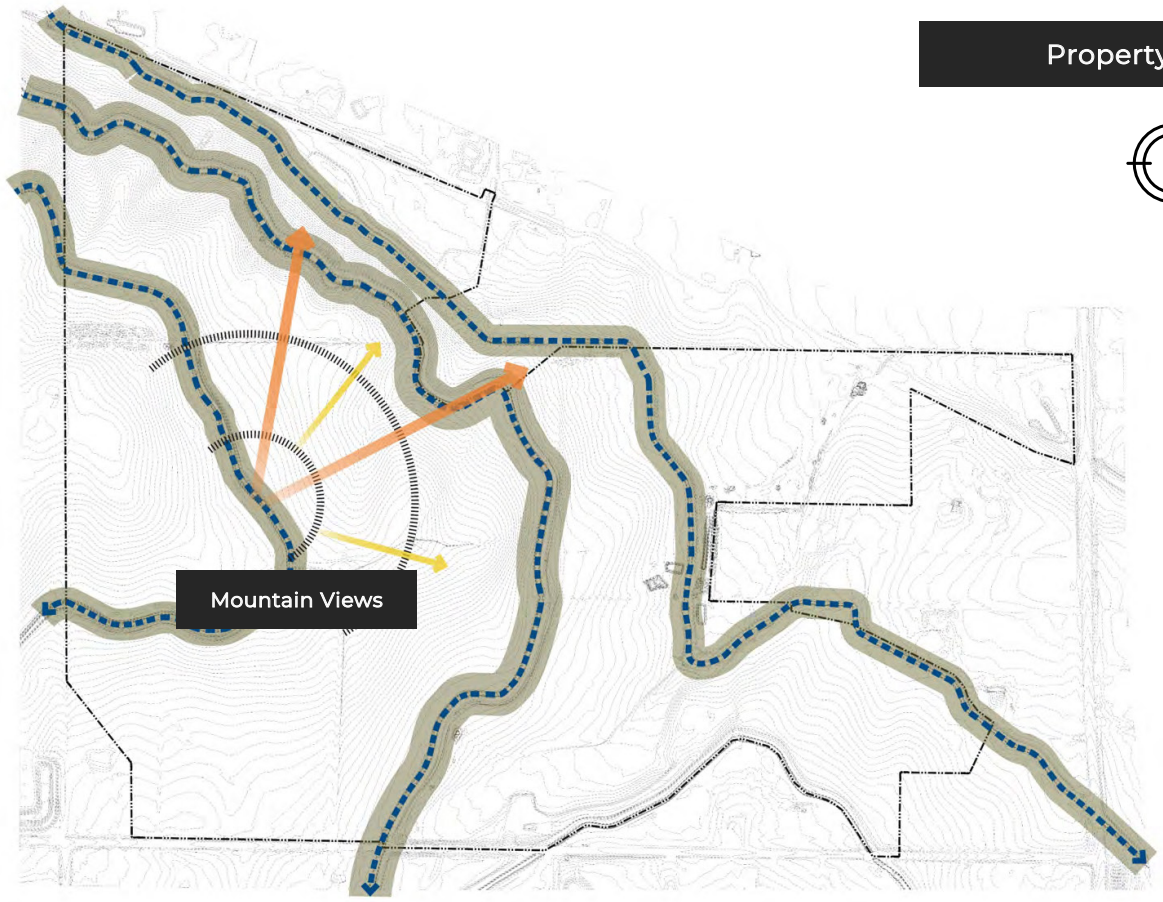
Existing Topography



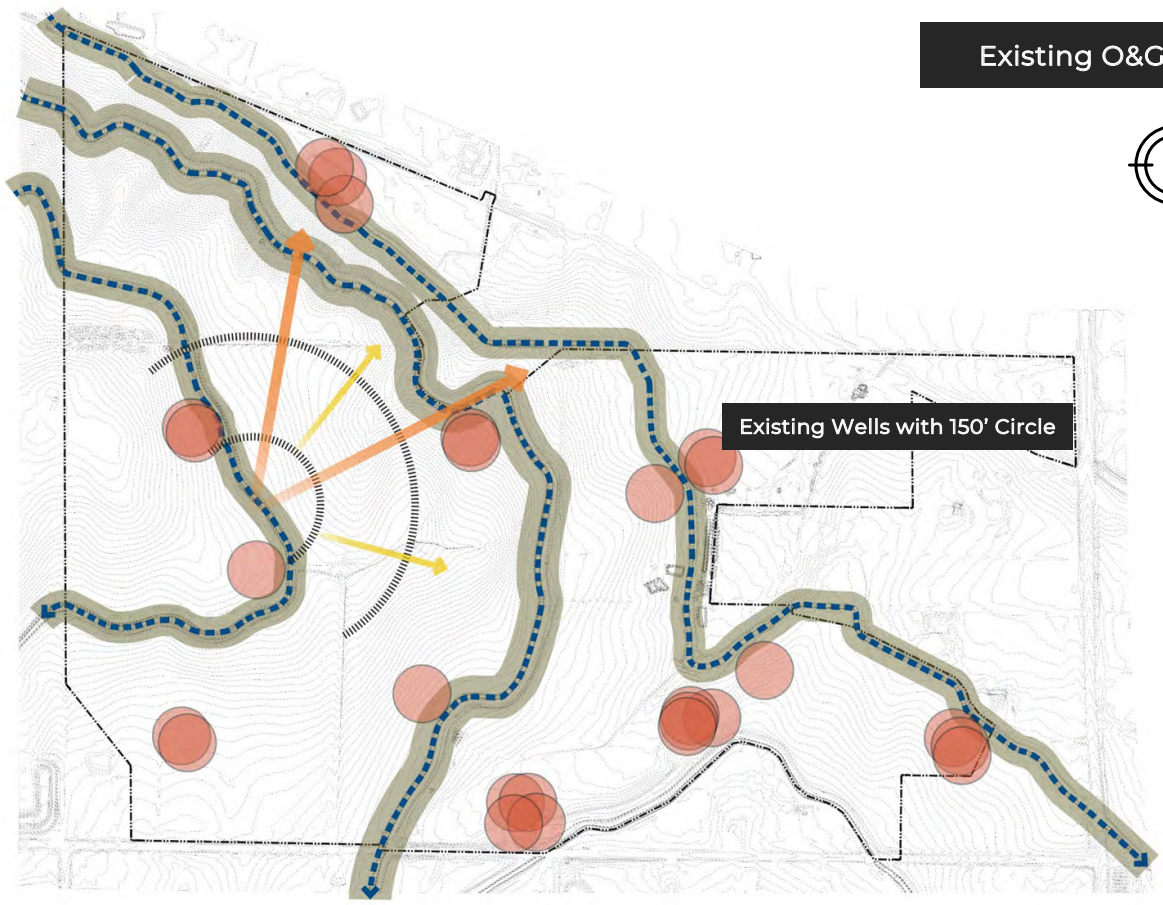
Existing Irrigation Ditches



Property Views



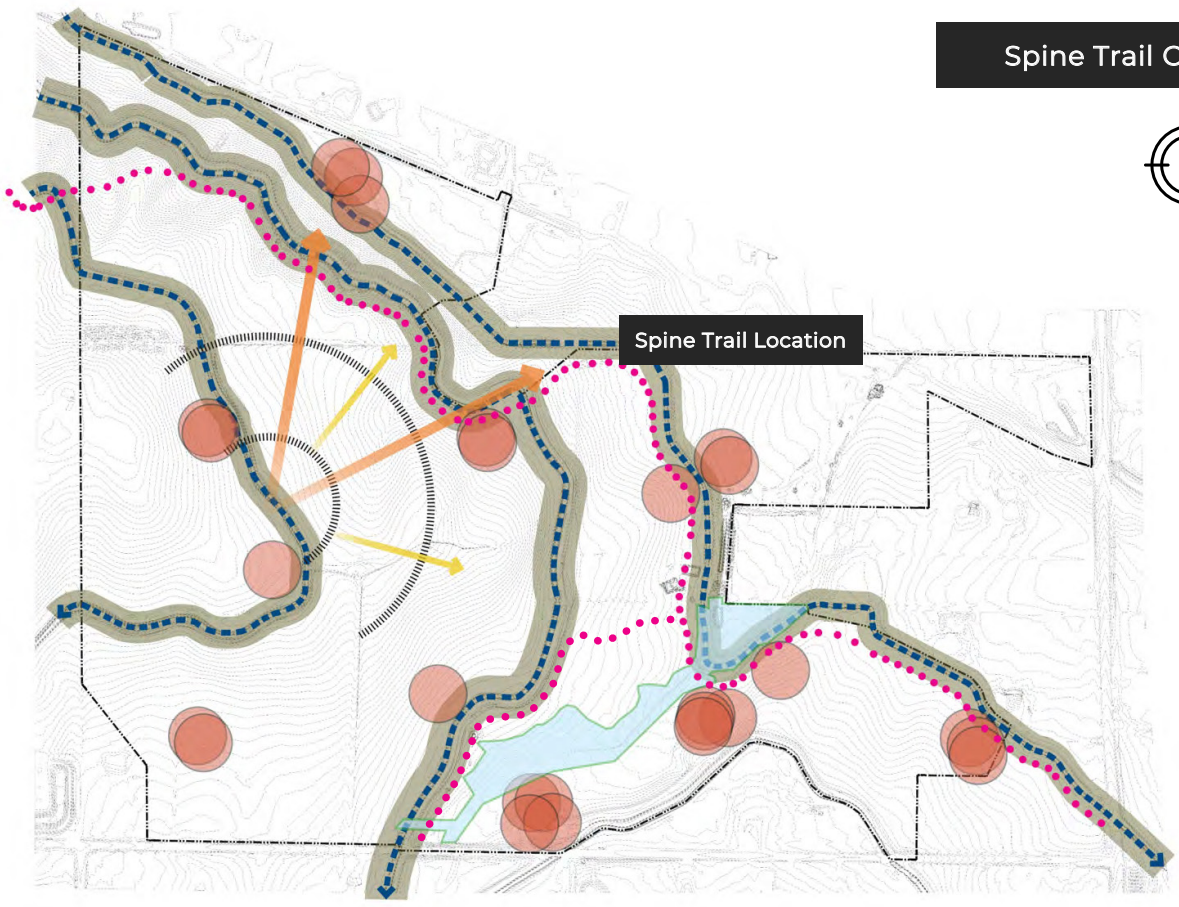
Existing O&G Operations



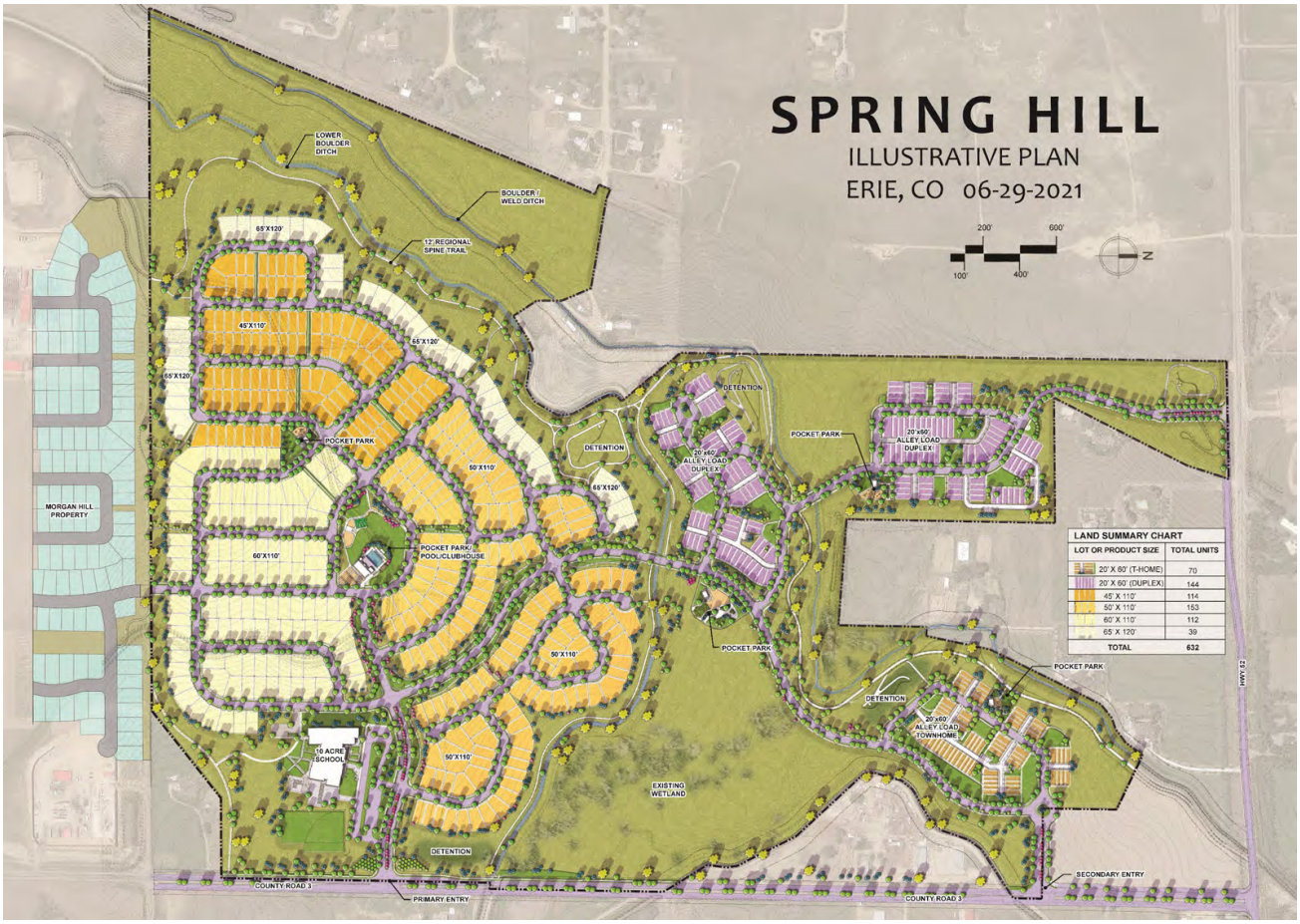
Wetland Location



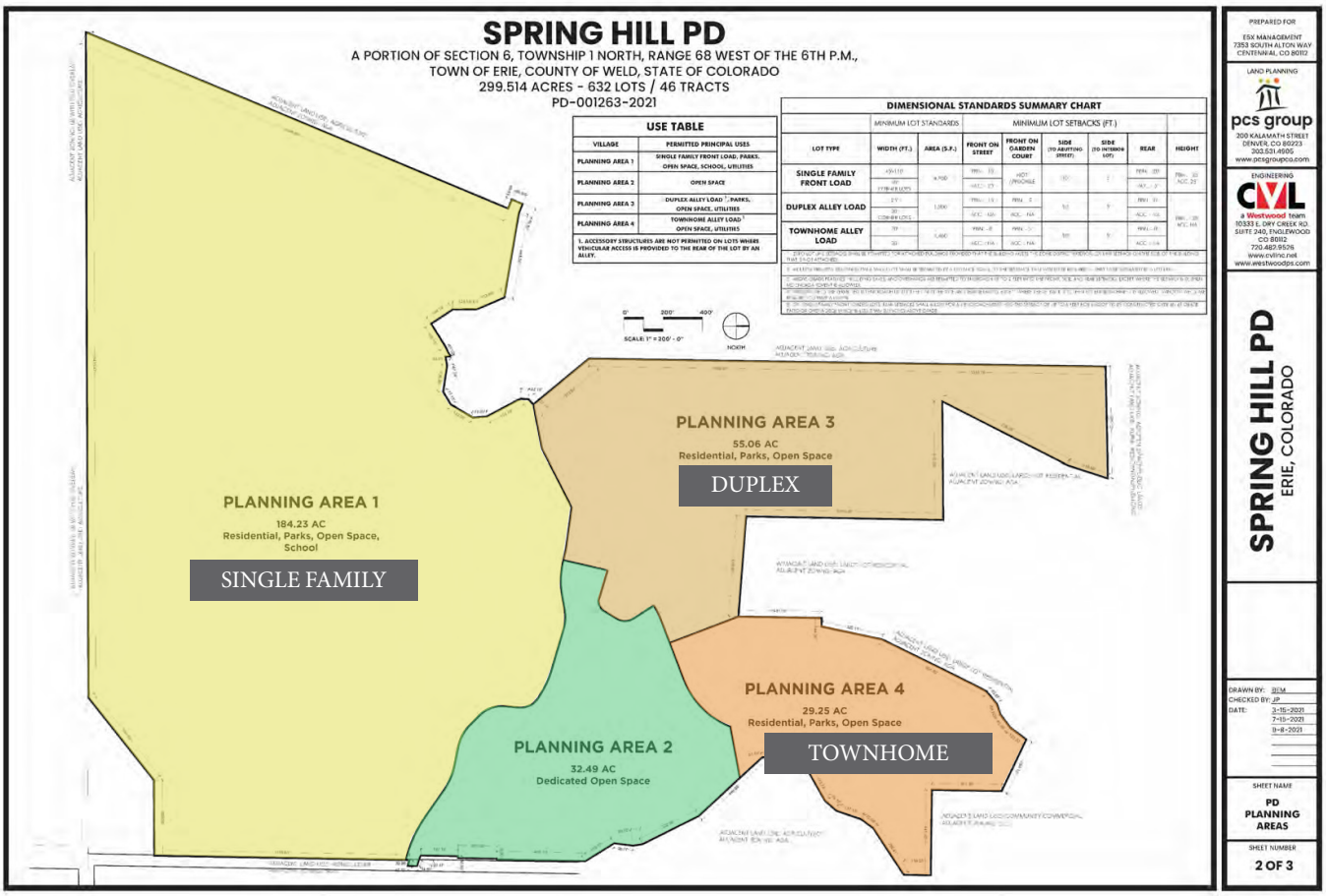
Spine Trail Opportunity



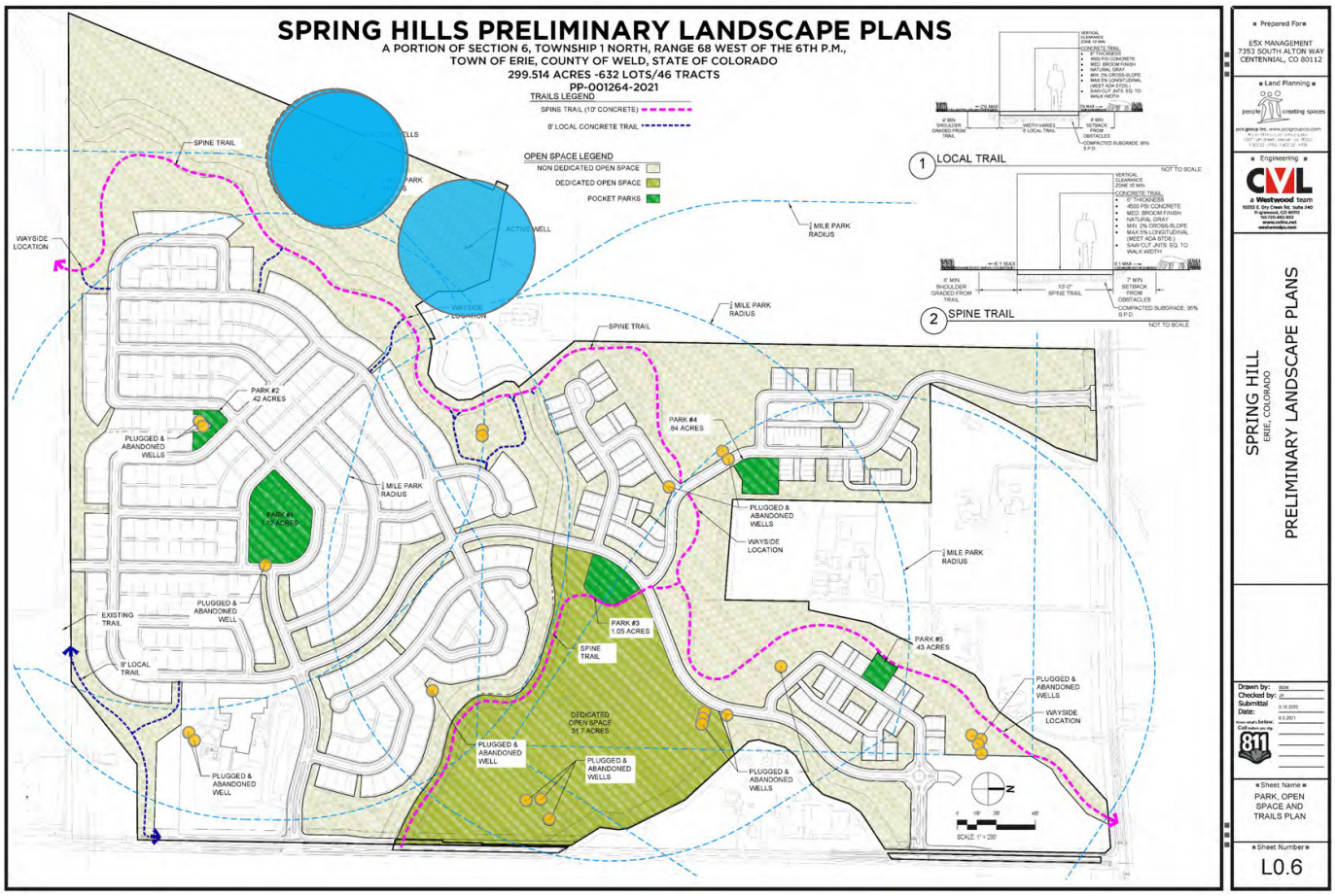
ILLUSTRATIVE MASTER PLAN



PD ZONING AREAS



OVERALL PLAN WITH PARK AREAS



PRIMARY PARK AREA WITH POOL

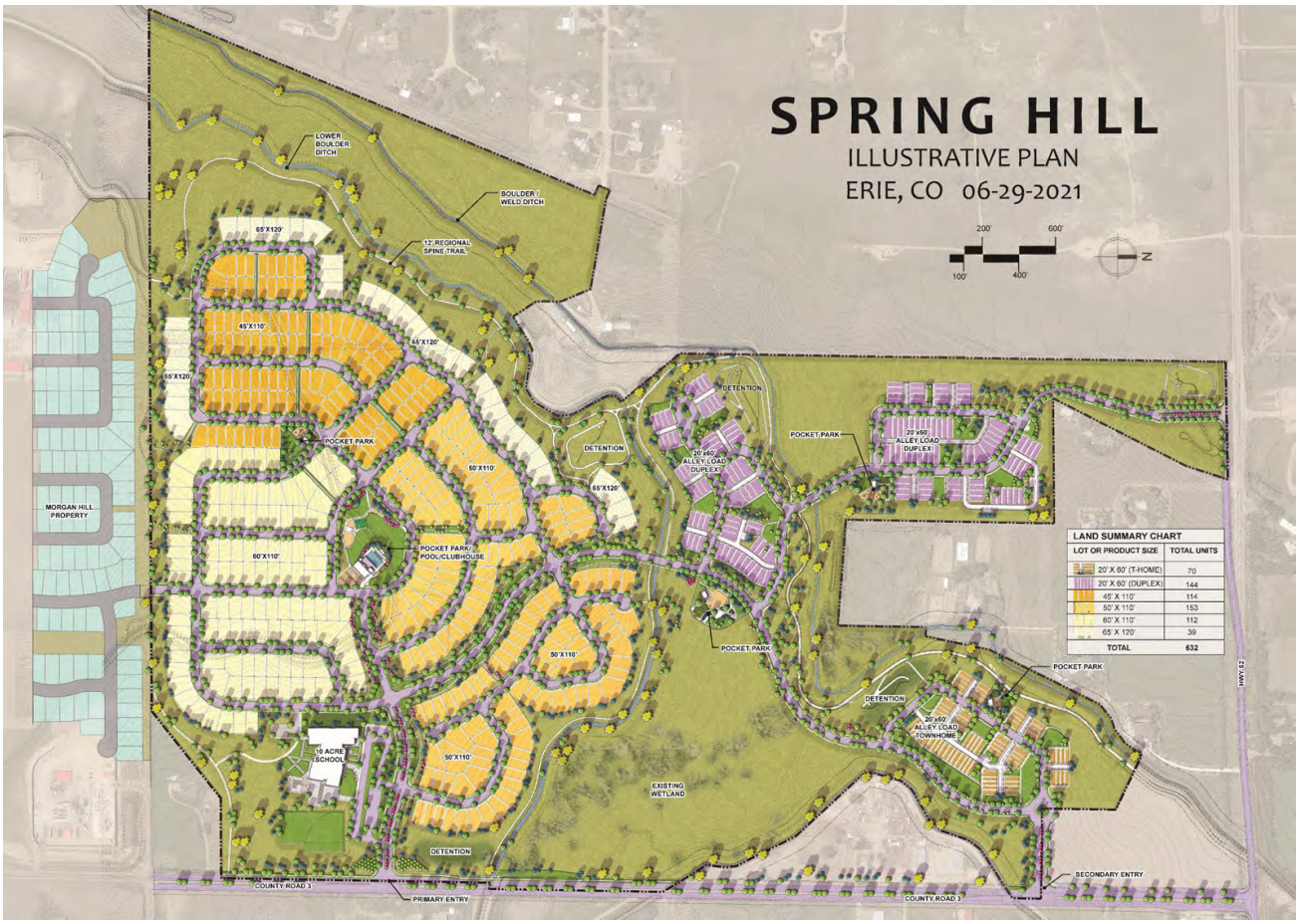


PRIMARY PARK AREA WITH POOL



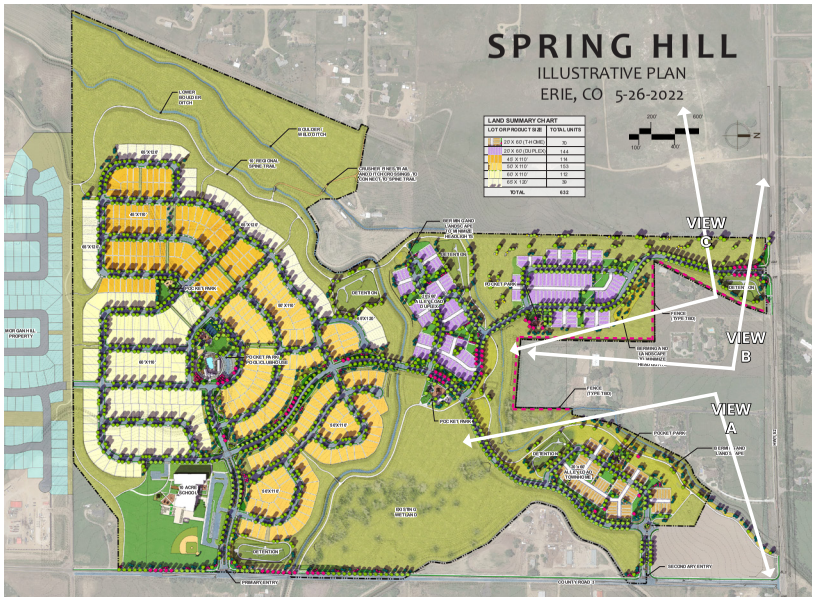
PRIMARY PARK AREA WITH POOL




SPRING HILL
ILLUSTRATIVE PLAN
ERIE, CO 06-29-2021
200'
600'
100'
400'
N
LOWER BOULDER DITCH
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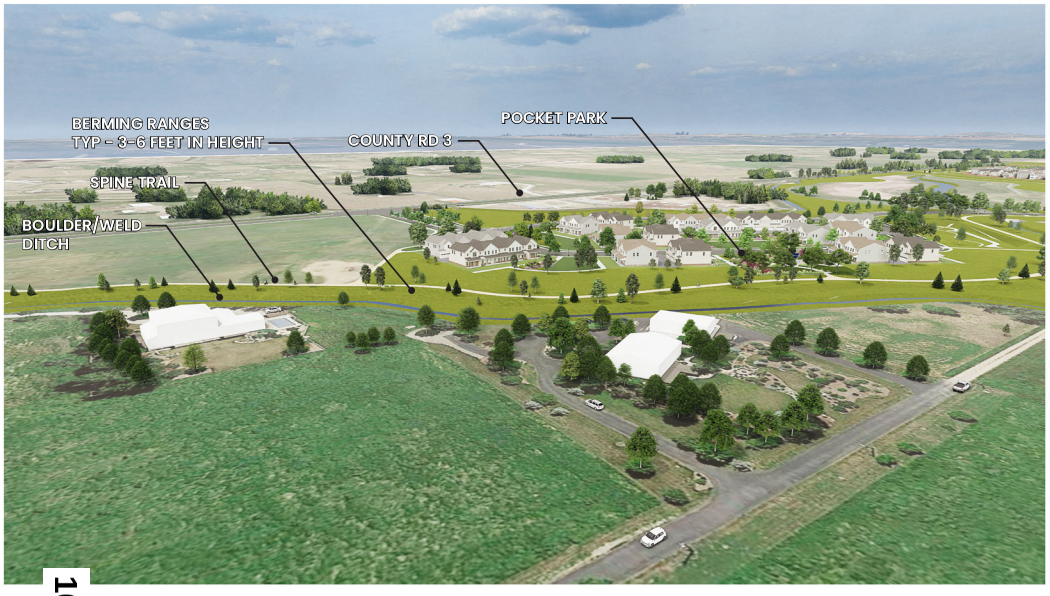


SPRING HILL Erie, Colorado
NBHD Meeting Images, May - 2022



SPRING HILL Erie, Colorado
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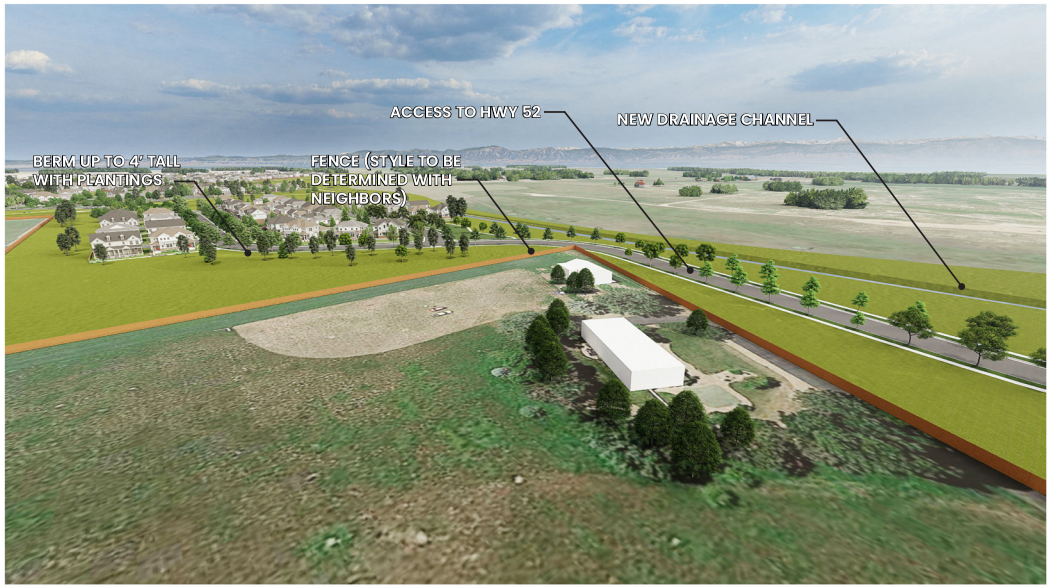
SPRING HILL Erie, Colorado
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NORTH EAST CORNER - VIEW A



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NORTH LOOKING WEST - VIEW B

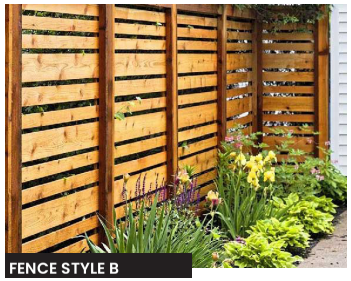


SPRING HILL Erie, Colorado
Illustrative Air View, May - 2022

NORTH LOOKING SOUTH - VIEW C

pcs group


FENCE STYLE A


FENCE STYLE B


FENCE STYLE C


FENCE STYLE D


FENCE STYLE E

SPRING HILL Erie, Colorado
May - 2022

FENCE STYLES FOR DISCUSSION PURPOSES

pcs group


FENCE STYLE F


FENCE STYLE G

SPRING HILL Erie, Colorado
May - 2022

FENCE STYLES FOR DISCUSSION PURPOSES

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pcs group

10-29-2021, 2021
Audem Gonzales
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| 200 Kalamath St. Denver, CO 80223 | (303) 531-4905 | www.pcsgroupco.com

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Matt Janke from the Client team responded to the question of timeline, he stated that the hope is that development approvals would be completed next summer, and then there would be 6-9 months of land construction before there is any vertical construction.

Chris Johnson - lives across from the proposed townhomes, question was are the townhomes proposed as 2 or 3 story, and how close are they to the property line. Response was that we are not sure at this point if they are 2 or 3 story; however, the building height maximum is 35' whether they are 2 or 3 story. This is consistent with all areas in the Town with LR Zoning, and 2 Story Single Family homes are typically right around that same height. In regards to proximity there is a no build zone of 75' where the ditch runs along the property line so the Townhomes are setback in excess of 75' because the spine trail is also between your house and the townhomes.

Not sure who asked this - question was what is the difference between dedicated and non-dedicated open space. Response was that the Town has criteria for land that they will accept for dedication, and we have worked with Parks and Open Space to identify the land that the Town wants to own. The other open space areas will be maintained by the Spring Hill Metro District or HOA, but not by the Town.

Sincerely,

John Prestwich - RLA, President
President, PCS Group, Inc.



PROPERTY HISTORY

MARCH - 2014

Annexation and Zoning

Following a process that started in 2006, in March of 2014 the property was Annexed to the Town of Erie, and Zoned as Low Density Residential.

APRIL to AUGUST - 2014

Andalusia Previous Plan

Our team has reviewed the comments that were made on the Preliminary Plat submittal that was made in August of 2014, and we have incorporated these comments into the new planning for the property.

MID – 2019 -2021

Andalusia PD & Preliminary Plat

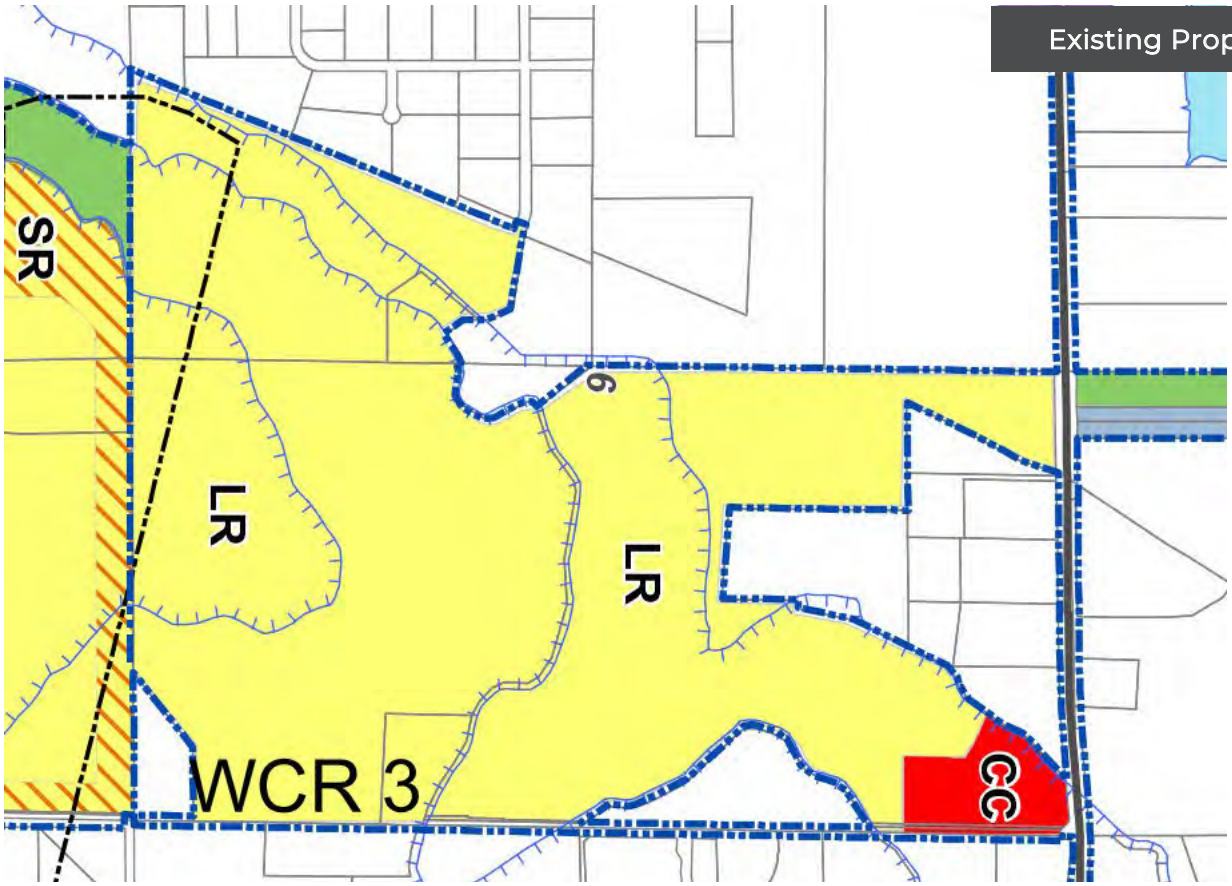
Our team has spent the last couple of years refining the plan and working with the Oil & Gas operators to get agreements to plug and abandon most of the existing wells on the property.

OCTOBER - 2021

Spring Hill PD & Preliminary Plat

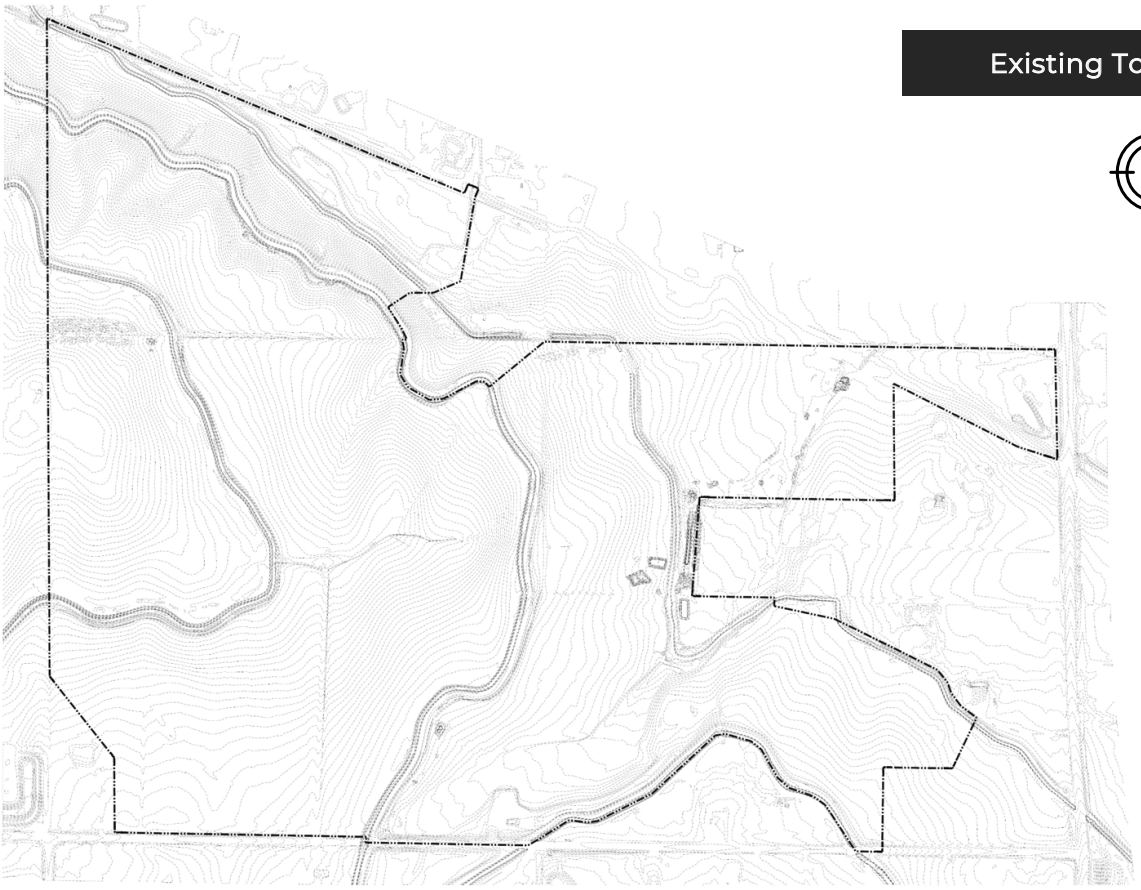
This evening we are presenting the PD Zoning for the Spring Hill community, as well as the Preliminary Plat.

Existing Property Zoning

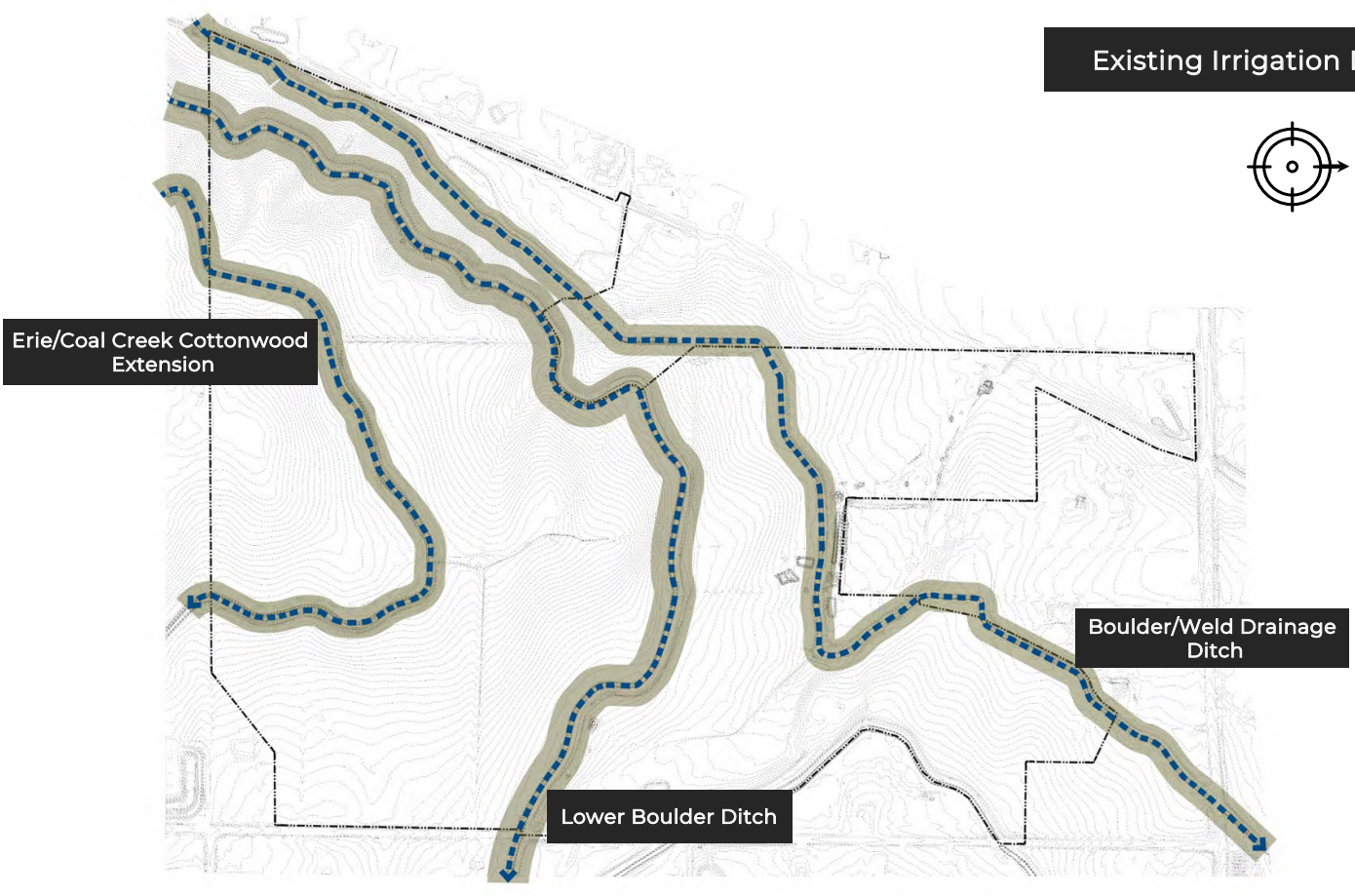




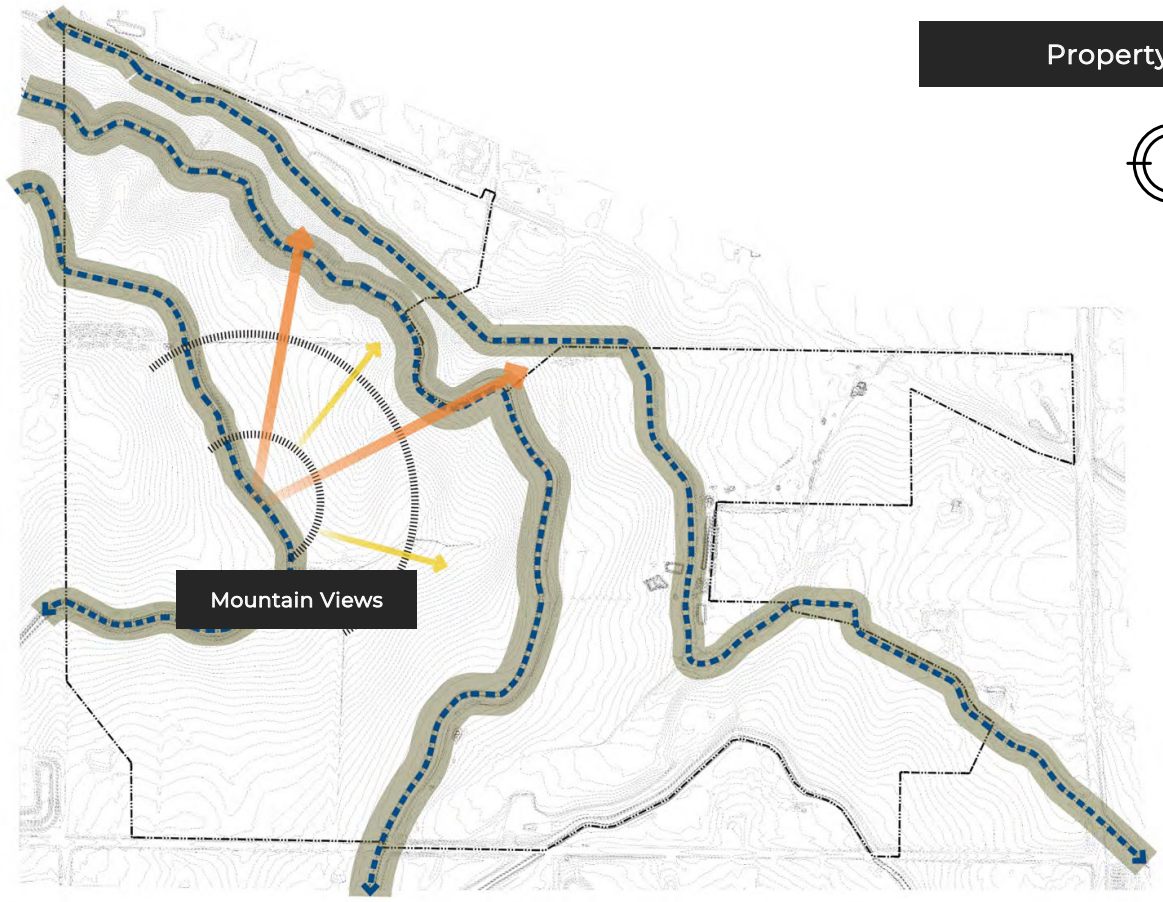
Existing Topography



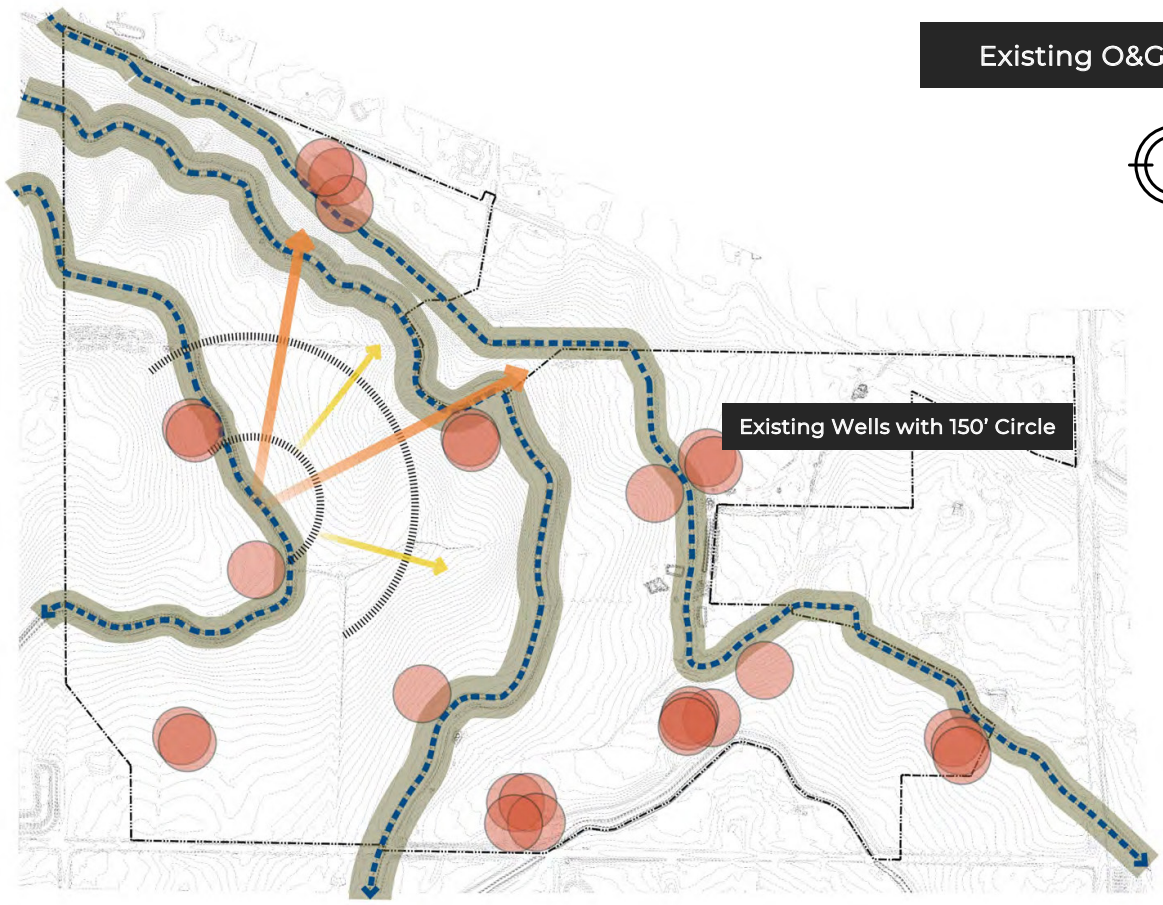
Existing Irrigation Ditches



Property Views



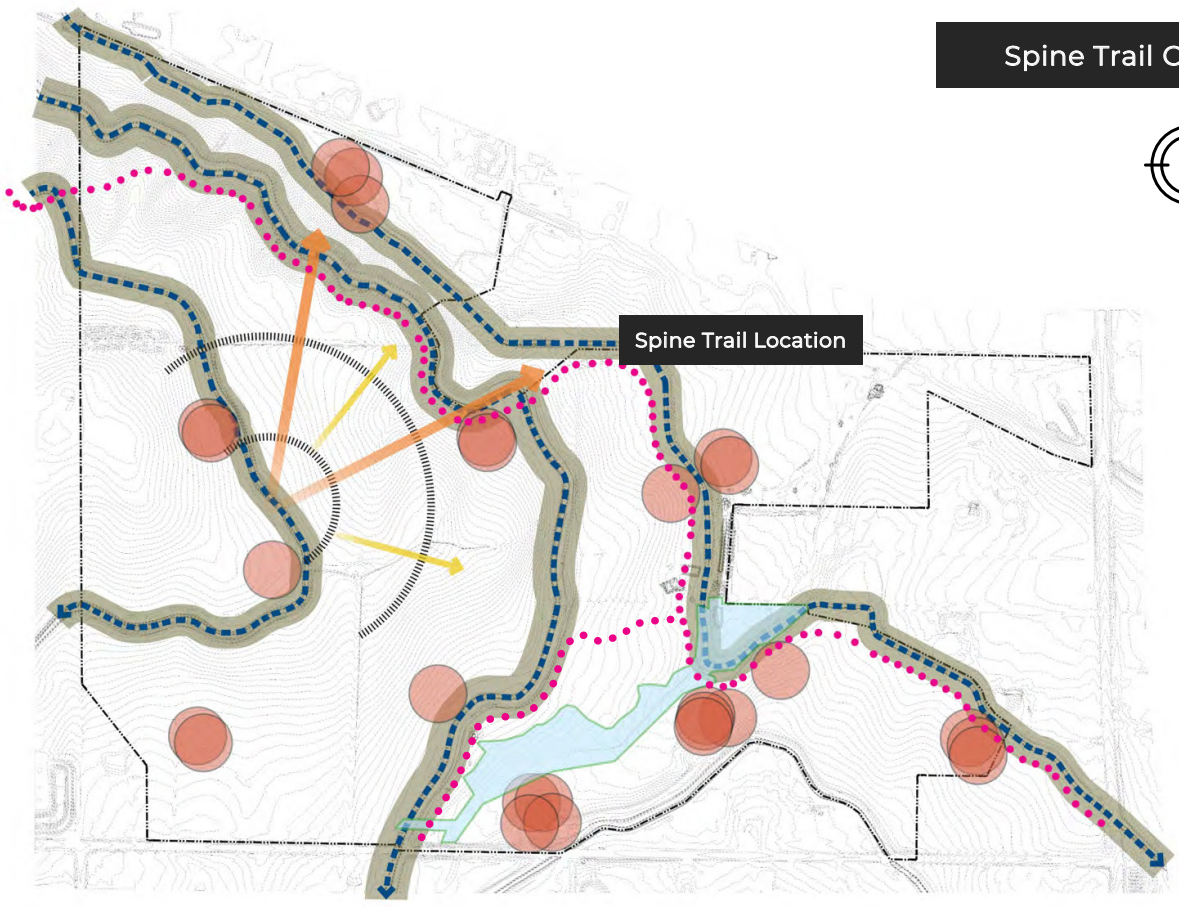
Existing O&G Operations



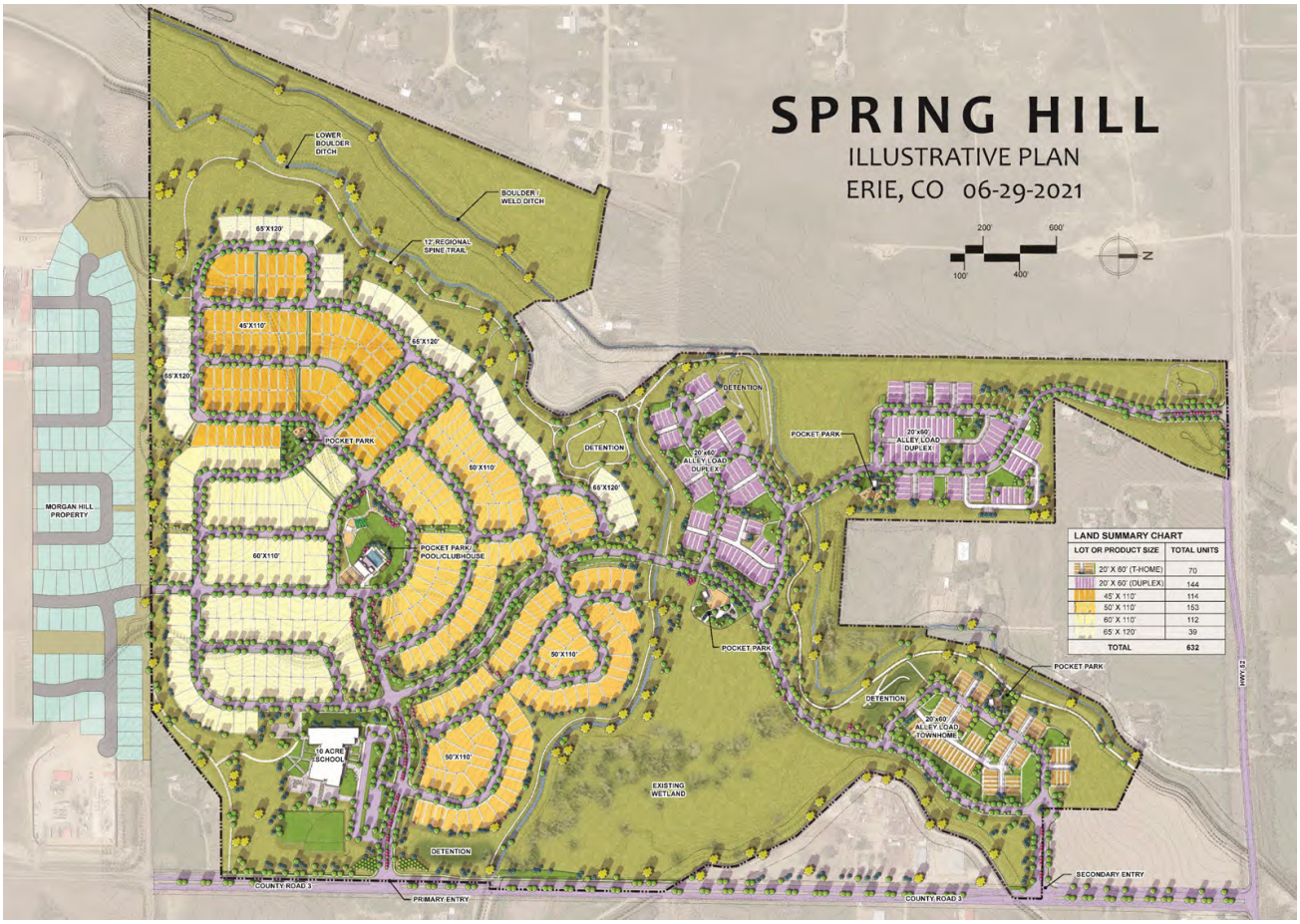
Wetland Location



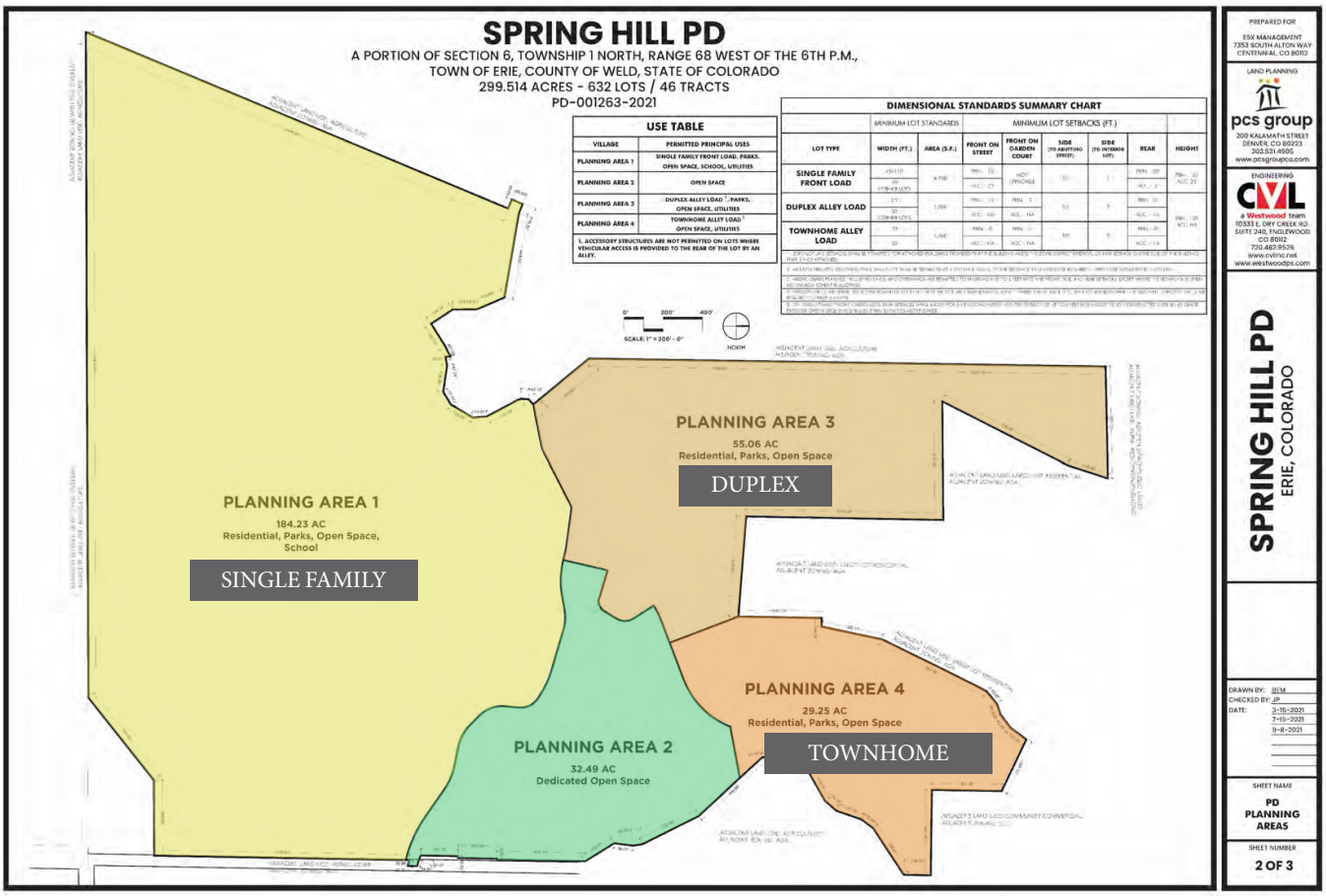
Spine Trail Opportunity



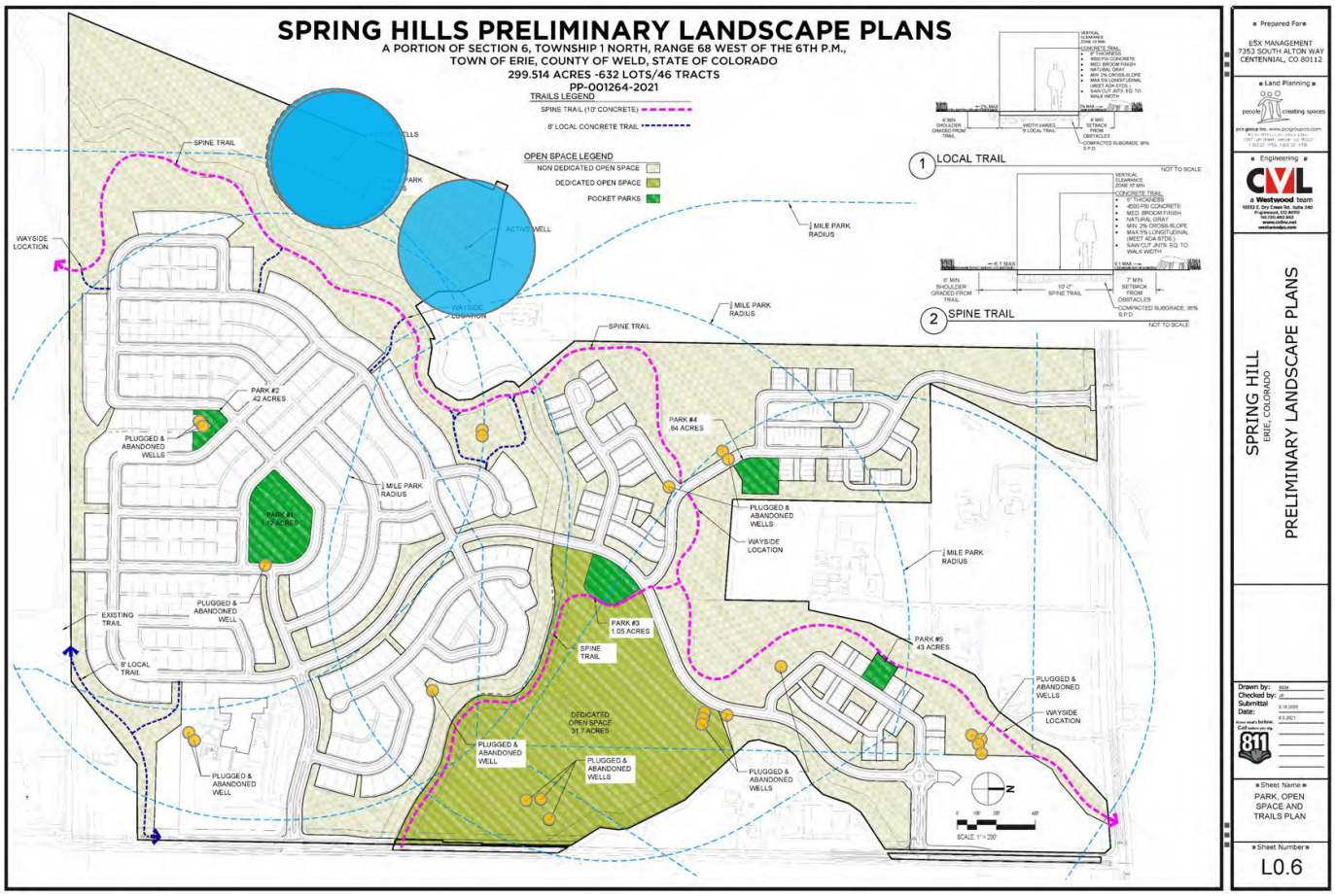
ILLUSTRATIVE MASTER PLAN



PD ZONING AREAS



OVERALL PLAN WITH PARK AREAS



PRIMARY PARK AREA WITH POOL

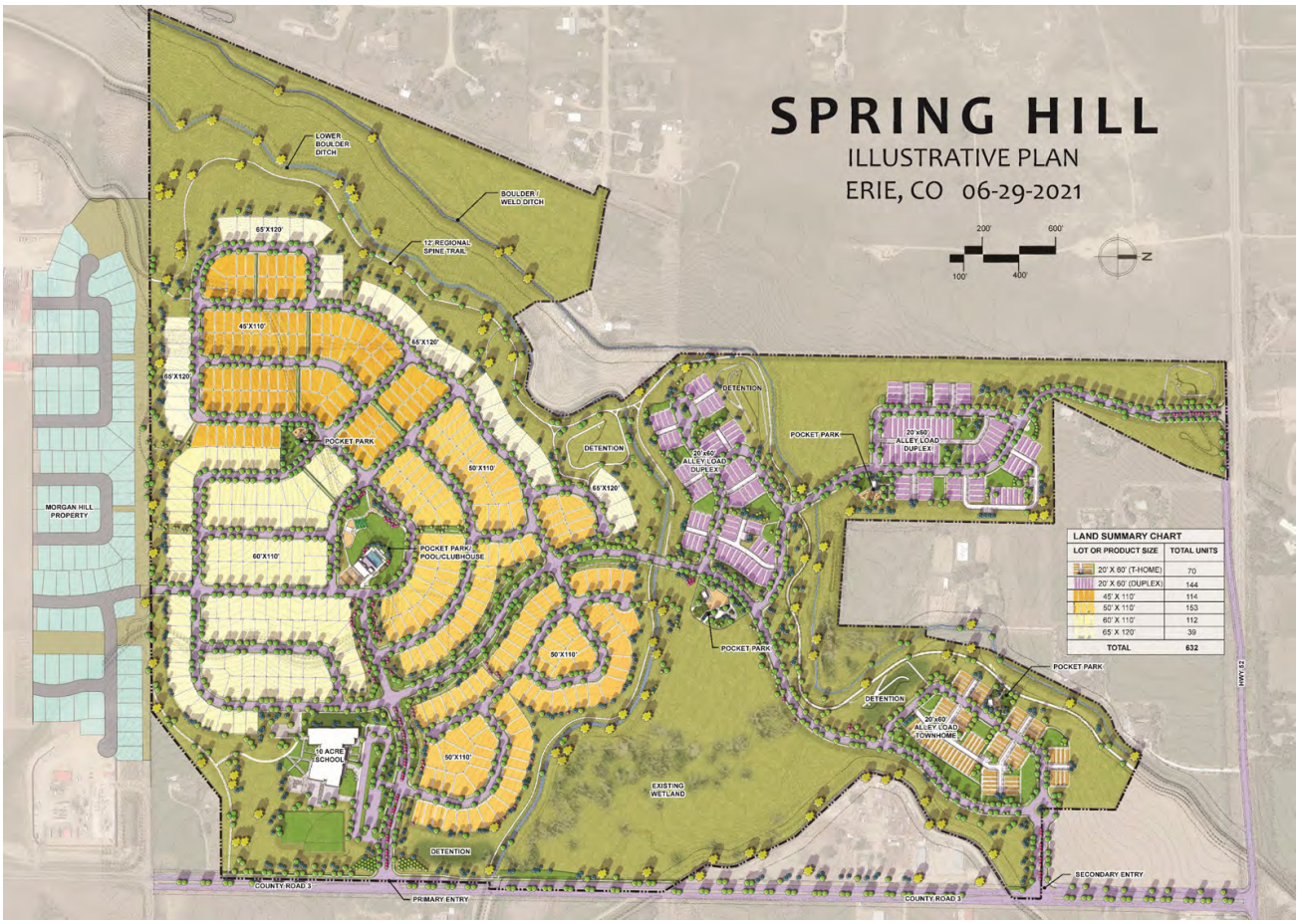


PRIMARY PARK AREA WITH POOL



PRIMARY PARK AREA WITH POOL




SPRING HILL
ILLUSTRATIVE PLAN
ERIE, CO 06-29-2021
200'
600'
100'
400'
N
LOWER BOULDER DITCH
BOULDER / WELD DITCH
12' REGIONAL SPINE TRAIL
65'X120'
45'X110'
50'X110'
60'X110'
POCKET PARK
POCKET PARK / POOL/CLUBHOUSE
MORGAN HILL PROPERTY
10 ACRE SCHOOL
DETENTION
EXISTING WETLAND
20'x60' ALLEY LOAD DUPLEX
20'x60' ALLEY LOAD TOWNHOME
COUNTY ROAD 3
PRIMARY ENTRY
SECONDARY ENTRY
HWY 52
LAND SUMMARY CHART
LOT OR PRODUCT SIZE | TOTAL UNITS
20' X 60' (T-HOME) | 70
20' X 60' (DUPLEX) | 144
45' X 110' | 114
50' X 110' | 153
60' X 110' | 112
65' X 120' | 39
TOTAL | 632

TOWN OF ERIE

AFFIDAVIT OF MAILING - PUBLIC HEARING NOTICE

I, John Prestwich, as the applicant/representative for the Spring Hill Preliminary Plat (*project name & application type*), hereby attest that on this 13th day of March, 20 26, a true and correct copy of the Town of Erie Public Hearing Notice for the public hearing with the Planning Commission (*Planning Commission or Board of Trustees*) scheduled for 4/1/2026 (*public hearing date*), marked as Exhibit "A" attached hereto and by reference incorporate herein, was mailed to those referenced in Exhibit "B" in accordance with the requirements of the Unified Development Code of the Town of Erie.

I further attest that the addresses shown in Exhibit "B" are true and correct addresses as determined from the records of the associated County Property Portal Records Search and that said Notices were placed in the United States Mail with the appropriate postage affixed thereon.

John Prestwich
Applicant/Representative's Signature

3/13/2026
Date

STATE OF COLORADO)
) ss.
COUNTY OF Denver)

ACKNOWLEDGED BEFORE ME THIS 13th DAY OF March, 2026 BY John Prestwich AS Applicant.

WITNESS MY HAND AND OFFICIAL SEAL:

Mia Bernard
NOTARY PUBLIC

MY COMMISSION EXPIRES: 7/11/2029

MIA A BERNARD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20254026312
MY COMMISSION EXPIRES JULY 11, 2029

Planning & Development Department

TOWN OF ERIE PUBLIC HEARING NOTICE

Updated

3/13/26

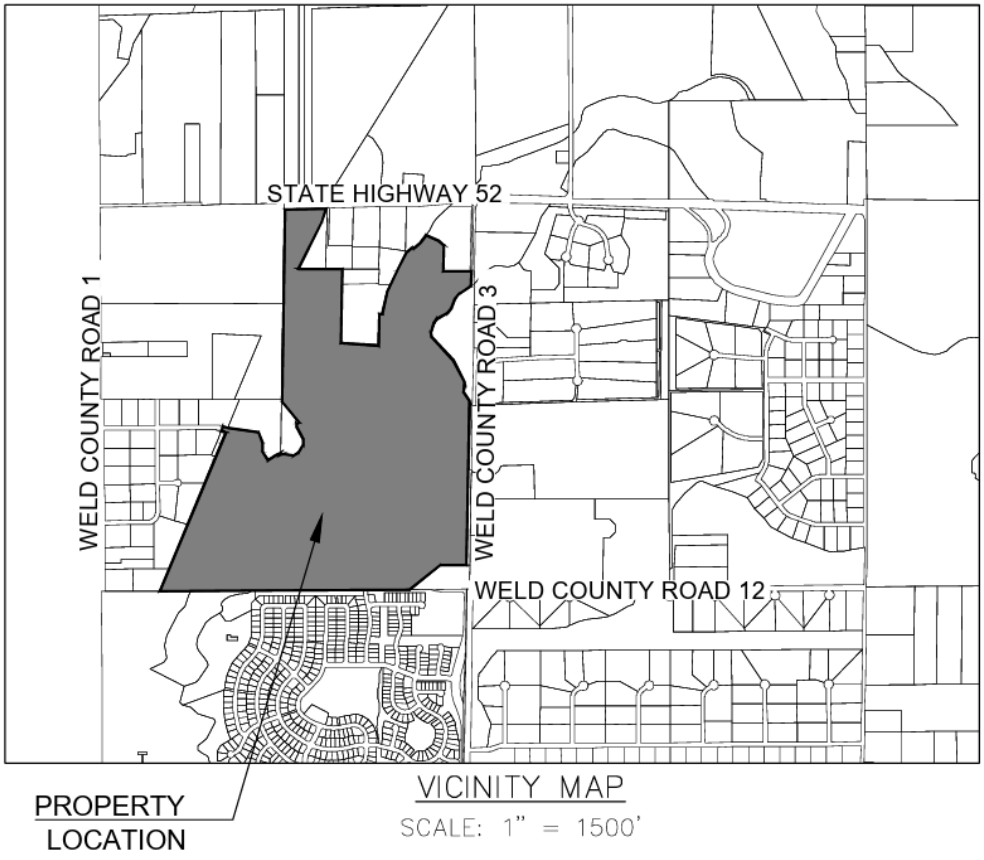
The Town of Erie Planning & Development Department has scheduled the following item for consideration:

Applicant/Developer: ME ERIE, LLC

Project Description: Spring Hill Preliminary Plat application for 632 lots and 49 tracts

Legal Description: TRACT B, SPRING HILL MINOR SUBDIVISION TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

Location: At the southwest corner of Weld County Road 3 and State Highway 52



Planning & Development Department

Planner: Harry Brennan

Board or Commission: Planning Commission

Hearing For: Spring Hill Preliminary Plat
Date of Hearing: Wednesday, April 1, 2026
Time: 6:30 PM
Place: Planning Commission meetings will be held in person in the Town Council Chambers, 645 Holbrook Street (first floor, northwest entrance) **UNLESS** otherwise noted in the **Town Calendar on the Town's website**. You can access the Town Calendar by going to the Town's website, www.erieco.gov and scrolling to the bottom of the page to "Events & Meetings". Select the "Planning Commission Meeting" in the box or click "View All" for more information, dates, and access to the meeting agenda. Please note: Public Comment can be given both in person and via Zoom (please see the Town Calendar at www.erieco.gov for Zoom information).

This letter is your notice of the above referenced hearing(s). We are sending you this notice as required by Erie Municipal Code Title X, Chapter 7.2.F.4.a. or as a referral agency of the Town. Copies of the application and support material for this project are on file and available for public inspection. Applicant materials are typically posted to the Town of Erie Agenda Center, online at https://erie.legistar.com, the Friday before the public hearing date. Public comment is welcome during public hearings; or, you may send email comments to hbrennan@erieco.gov; or, written comments to Town of Erie - Planning, P.O. Box 750, Erie, CO 80516-0750. **If you have any questions, please call Planning at 303-926-2770.**

NOTICE OF PUBLIC HEARING
PLANNING COMMISSION
TOWN OF ERIE

Notice is hereby given that on Wednesday, April 1, 2026, at 6:30 PM, or as soon as possible thereafter at the Erie Town Hall Board Room, 645 Holbrook Street, Erie, CO 80516, a PUBLIC HEARING will be held upon the application made by ME ERIE, LLC, 7353 S Alton Way Ste A100, Englewood, CO 80112 for the purpose of considering a Preliminary Plat Land Use Application pursuant to the Codes of the Town of Erie and applicable State Statutes.

The affected property is located: at the southwest corner of Weld County Road 3 and State Highway 52

The legal description of the property is: TRACT B, SPRING HILL MINOR SUBDIVISION TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

The application is on file with the Town of Erie.

Interested and affected parties are encouraged to attend. The Planning Commission will be taking comments prior to making a determination or taking any action on this matter.

Debbie Stamp
Town Clerk

FOR QUESTIONS OR COMMENTS, CONTACT
TOWN OF ERIE
PLANNING & DEVELOPMENT DEPARTMENT
P.O. BOX 750
ERIE, COLORADO 80516
PHONE: (303) 926-2770
FAX: (303) 926-2706

Please publish in the Colorado Hometown Weekly on Wednesday, March 11, 2026.
Please send the affidavit of publication and billing to:

Town Clerk
Town of Erie
PO Box 750
Erie, CO 80516

Back

Notice Publish Date:
Wednesday, March 11, 2026

Notice Content

NOTICE OF PUBLIC HEARING PLANNING COMMISSION TOWN OF ERIE Notice is hereby given that on Wednesday, April 1, 2026, at 6:30 PM, or as soon as possible thereafter at the Erie Town Hall Board Room, 645 Holbrook Street, Erie, CO 80516, a PUBLIC HEARING will be held upon the application made by ME ERIE, LLC, 7353 S Alton Way Ste A100, Englewood, CO 80112 for the purpose of considering a Preliminary Plat Land Use Application pursuant to the Codes of the Town of Erie and applicable State Statutes. The affected property is located: at the southwest corner of Weld County Road 3 and State Highway 52 The legal description of the property is: TRACT B, SPRING HILL MINOR SUBDIVISION TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO The application is on file with the Town of Erie. Interested and affected parties are encouraged to attend. The Planning Commission will be taking comments prior to making a determination or taking any action on this matter. Debbie Stamp_____ Town Clerk FOR QUESTIONS OR COMMENTS, CONTACT TOWN OF ERIE PLANNING & DEVELOPMENT DEPARTMENT P.O. BOX 750 ERIE, COLORADO 80516 PHONE: (303) 926-2770 FAX: (303) 926-2706 Published: Colorado Hometown Weekly March 11, 2026-2159364

TOWN OF ERIE
AFFIDAVIT OF NOTICE POSTING

Spring Hill Preliminary Plat Planning Commission

(*PROJECT NAME & PUBLIC HEARING TYPE – PLANNING COMMISSION, BOARD OF TRUSTEES, BOA*)





I, *HARRY BRENNAN*, ATTEST THAT NOTICE WAS POSTED IN ACCORDANCE WITH THE ERIE MUNICIPAL CODE, TITLE 10, – "UNIFIED DEVELOPMENT CODE AND DESIGN GUIDELINES," AT LEAST 15 DAYS BEFORE THE SCHEDULED HEARING TO BE HELD ON THE APRIL 1, 2026 A.D. THE PHOTOS, ABOVE, ARE TRUE AND CORRECT PHOTOS OF THE NOTICE SO POSTED.



_____

(SIGNATURE OF PERSON LISTED ABOVE)

HARRY BRENNAN
SENIOR PLANNER
TOWN OF ERIE

From: wwbell@comcast.net
Sent: Monday, March 16, 2026 3:04 PM
To: Harry Brennan
Subject: April 1st Planning Commission

Follow Up Flag: Follow up
Flag Status: Flagged

External Email: Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Harry,

This comment is in regard to the Spring Hill Preliminary Plat. As a resident of Morgan Hill, I am concerned about the construction of 632 homes at the end of our connecting Miranda Road. I am not sure if there are already protections in place but would like the Commission to address any prohibitions on construction equipment moving through Morgan Hill to gain access to Spring Hill. It appears there are at least three other access points for construction equipment without going through Morgan Hill. I might add that there are a lot of little children living on or near Miranda Rd.

Thank you for your consideration.

William Bell

TOWN OF ERIE

645 Holbrook Street
Erie, CO 80516

Planning Commission

Board Meeting Date: 4/1/2026

File #: 2026-207, **Version:** 1

SUBJECT:
A Resolution of the Planning Commission of the Town of Erie Recommending Approval to the Town Council of the Rezoning of the Sierra Vista property to Community Mixed Use (CMU) and Airport (AP)

DEPARTMENT: Planning & Development

PRESENTER(S): Christopher C. LaRue, Principal Planner

TIME ESTIMATE: 45 minutes

POLICY ISSUES:
The proposed AP and CMU zoning aligns with the Comprehensive Plan and supports compatible commercial and residential uses. The site's location along Highway 7 and near the airport makes it well suited for mixed use development. Rezoning will promote economic diversification and expanded housing opportunities within this key corridor.

STAFF RECOMMENDATION:
Staff recommend Planning Commission adopt resolution P26-06 recommending the Town Council approve the rezoning request.

SUMMARY/KEY POINTS

- The applicant is requesting to rezone from Low Density Residential (LDR) and Community Commercial (CC) to Airport (AP) and Community Mixed Use (CMU).
- The proposed AP and CMU zoning aligns with the Comprehensive Plan and supports compatible commercial and residential uses.
- The site's Highway 7 corridor location and proximity to the airport make it well suited for mixed development.
- Rezoning will promote economic diversification and broaden housing opportunities within this key growth area.

BACKGROUND OF SUBJECT MATTER:
The site is located on the northwest corner of Highway 7 and Bonanza Drive. The applicant is requesting approval to rezone 15.9 acres to Airport (AP) and 44.5 acres to Community Mixed Use

(CMU), along with a Minor Subdivision that would create three tracts: Tract A (16 acres, AP), Tract B (26 acres, CMU), and Tract C (18 acres, CMU). The subdivision is required by the UDC to ensure that new lot lines align with the proposed zoning boundaries. Under the review process, the Planning Commission provides a recommendation on the rezoning, while the Town Council is responsible for making the final decision on both the rezoning and the Minor Subdivision.

ATTACHMENT(S):

1. Resolution P26-06
2. Staff Report
3. Staff Presentation
4. CMU and AP Use Table
5. Applicant Presentation
6. Applicant Submittals:
    a. Rezoning <https://portal.laserfiche.com/Portal/Browse.aspx?id=328399&repo=r-a69d230a>
    b. Minor Subdivision <https://portal.laserfiche.com/Portal/Browse.aspx?id=304796&repo=r-a69d230a>
7. Referral Comments Combined
8. Neighborhood Meeting Information
9. Proposed Sierra Vista Zoning Map
10. Proposed Sierra Vista Minor Subdivision
11. PC Public Hearing Notices
12. Broomfield Final Comment

Town of Erie
Planning Commission
Resolution No. P26-06

A Resolution of the Planning Commission of the Town of Erie Recommending Approval of the Rezoning of the Sierra Vista Property to Community Mixed Use (CMU) and Airport (AP)

Whereas, on June 27, 2025, BC Land, LLC (the "Applicant") filed an application (the "Application") for approval of the Sierra Vista Rezoning to Community Mixed Use (CMU) and Airport (AP) (the "Rezoning"), for real property more particularly described in **Exhibit A** attached hereto; and

Whereas, on April 1, 2026, the Planning Commission held a properly-noticed public hearing on the Rezoning Application.

Now, Therefore be it resolved by the Planning Commission of the Town of Erie, Colorado, that:

Section 1. Findings. Upon consideration of the Application and supporting documentation, hearing the statements of Town staff and the public, and giving due consideration to the matter, the Planning Commission finds and determines as follows:

a. The Application meets the applicable criteria set forth in Title 10 of the Erie Municipal Code (the "UDC"); and

b. The Application is consistent with the Comprehensive Plan.

Section 2. Decision. Based on the foregoing findings, the Planning Commission hereby recommends that the Town Council approve the Rezoning.

Adopted this 1st day of April, 2026.

_____
Ben Hemphill, Chair

Attest:

_____
Doug Trettin, Secretary

Exhibit A
Legal Description

Sierra Vista Minor Subdivision Filing No. 2, Tract A, Tract B, and Tract C.

TOWN OF ERIE
PLANNING COMMISSION AGENDA ITEM
April 1, 2026

SUBJECT:	**PUBLIC HEARING:**
	Resolution No. P26-06: Rezoning of the Sierra Vista Property
	A Resolution of the Planning Commission of the Town of Erie Recommending Approval of the Rezoning of the Sierra Vista property to Community Mixed Use (CMU) and Airport (AP)
CODE REVIEW:	Erie Municipal Code, Title 10
PURPOSE:	Consideration of a rezone of the Sierra Vista Property to Community Mixed Use (CMU) and Airport (AP)
DEPARTMENT:	Planning and Development
PRESENTER:	Christopher C. LaRue, Principal Planner

STAFF RECOMMENDATION:

Staff find the Sierra Vista Rezone complies with the Rezoning Criteria and recommend the Planning Commission recommend approval of the Town Council Ordinance to rezone the Sierra Vista property to Community Mixed Use (CMU) and Airport (AP)

SUMMARY AND BACKGROUND OF SUBJECT MATTER:

Applicant: BC Land, LLC
14570 Clay Street
Broomfield, CO 80023

Existing Conditions:

Zoning:	Low Density Residential (LR)
Project Size:	60.392
Existing Use:	Undeveloped
Future Land Use:	Employment & Corridor Commercial

Location:

Below is a map that depicts the site in red and the surrounding area. The property is on the northwest corner of Highway 7 and Bonanza Drive.



Adjacent Land-Use/Zoning:

	ZONING	LAND USE
NORTH	Rural Residential (RR)	Single-Family Erie Air Park Sub
SOUTH	City of Broomfield (south of Hwy 7)	Anthem Development
EAST	Planned Development (PD) – Vista Ridge	Commercial (gas station, day care, storage)
WEST	Airport (AP)	Town owned Airport Land

Site History and Specific Development Information:

The Sierra Vista property has a history within the Town for fourteen years.

1. Annexation
    - Property was annexed in July 2012. Up to 500 units of multi-family were permitted through the annexation agreement.
2. Zoning
    - Concurrently with Annexation in July 2012, the property zoned approximately 40 acres to High-Density Residential (HR) and 20 acres to Community Commercial (CC).
    - In 2014 approximately 54 acres of site were zoned to Low Density Residential (LR) and 6 acres to Community Commercial.
3. Plat and Amendments

- In 2012 a Minor Subdivision application was reviewed to create four tracts. This application was never approved and the submittal expired due to inactivity.
- A Preliminary Plat application for 165 single-family lots and future commercial development was considered by the Town Council in 2016. The applicant withdrew the application.
- In 2018 a Minor Subdivision was approved for the site that created three future development tracts. The main purpose at that time was to separate ownership interests.

The applicant is requesting approval to rezone 15.9 acres to Airport (AP) and 44.5 acres to Community Mixed Use (CMU), along with a Minor Subdivision that would create three tracts: Tract A (15.9 acres, AP), Tract B (26.1 acres, CMU), and Tract C (18.4 acres, CMU). The subdivision is required by the UDC to ensure that new lot lines align with the proposed zoning boundaries. Planning Commission provides a recommendation on the rezoning, while the Town Council is responsible for making the final decision on both the rezoning and the Minor Subdivision.

Tract A, located on the western portion of the site, is proposed for Airport (AP) zoning and will be developed with airport-related commercial uses such as aviation-support services, restaurants, office buildings, or general retail. All land designated with Airport (AP) zoning will comply with the Town of Erie Municipal Code airport overlay district standards outlined in Section 10-2-6.

Tracts B and C are proposed Community Mixed Use (CMU). These tracts must comply with UDC requirements for mixed-use development on parcels larger than five acres. CMU parcels between 5 and 20 acres must include at least two principal uses, while parcels over 20 acres must include at least three, and in all cases at least one of the required principal uses must be residential. Qualifying principal use groups include residential, office, commercial, and public/institutional. Each required use must occupy a minimum of 25 percent of the total gross floor area within the CMU development area.

A table of the permitted uses (by-right, and special review) for the CMU and AP districts is provided as an attachment.

The applicant has outlined the following voluntary commitments to guide future development of the site.

- Limiting the maximum height of any portion of a primary structure to 40 feet when adjacent to a residential lot
- Minimum building setback of 40 feet from abutting residential
- Prohibiting any commercial use within 100 feet of abutting residential lot or neighborhood

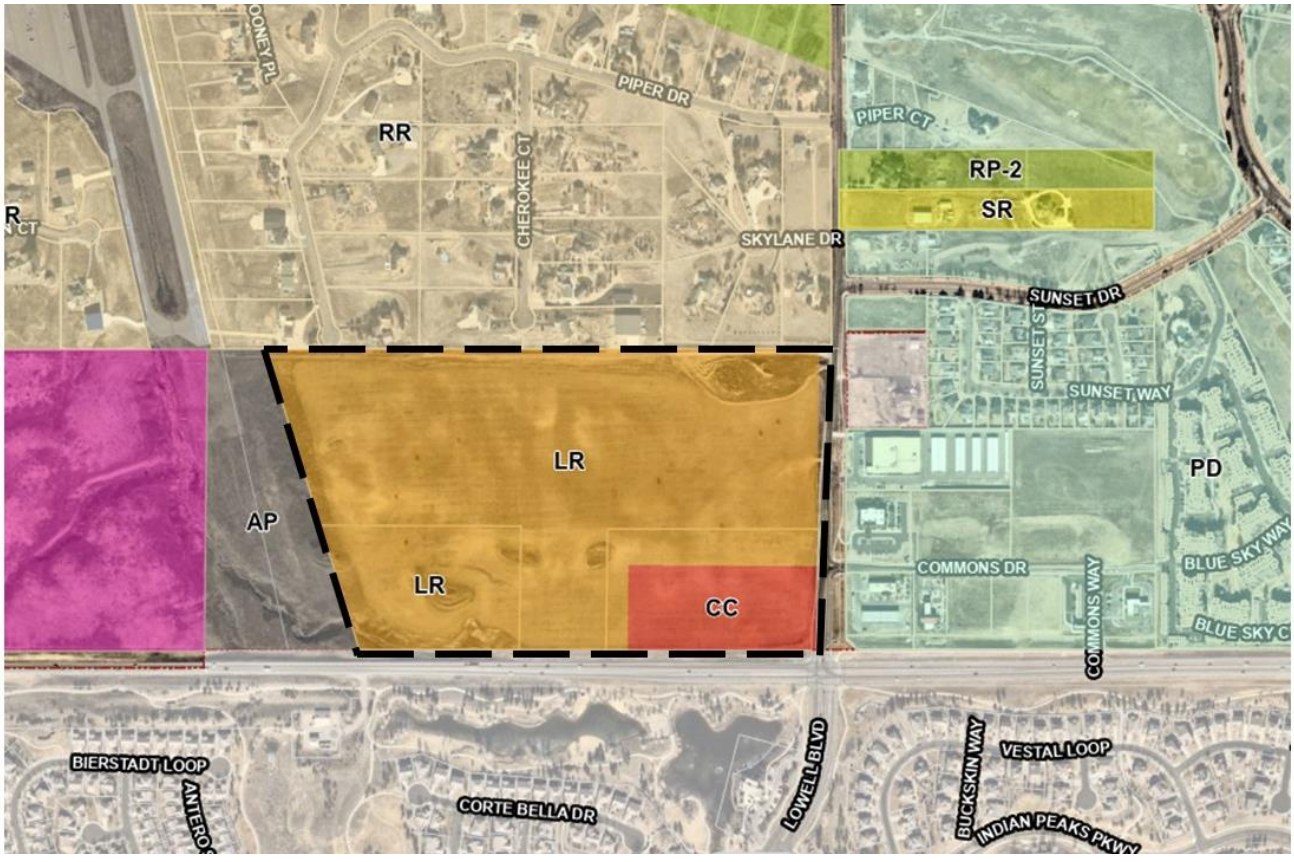
These commitments are not zoning requirements or enforceable by the Town.

Future Required Applications:

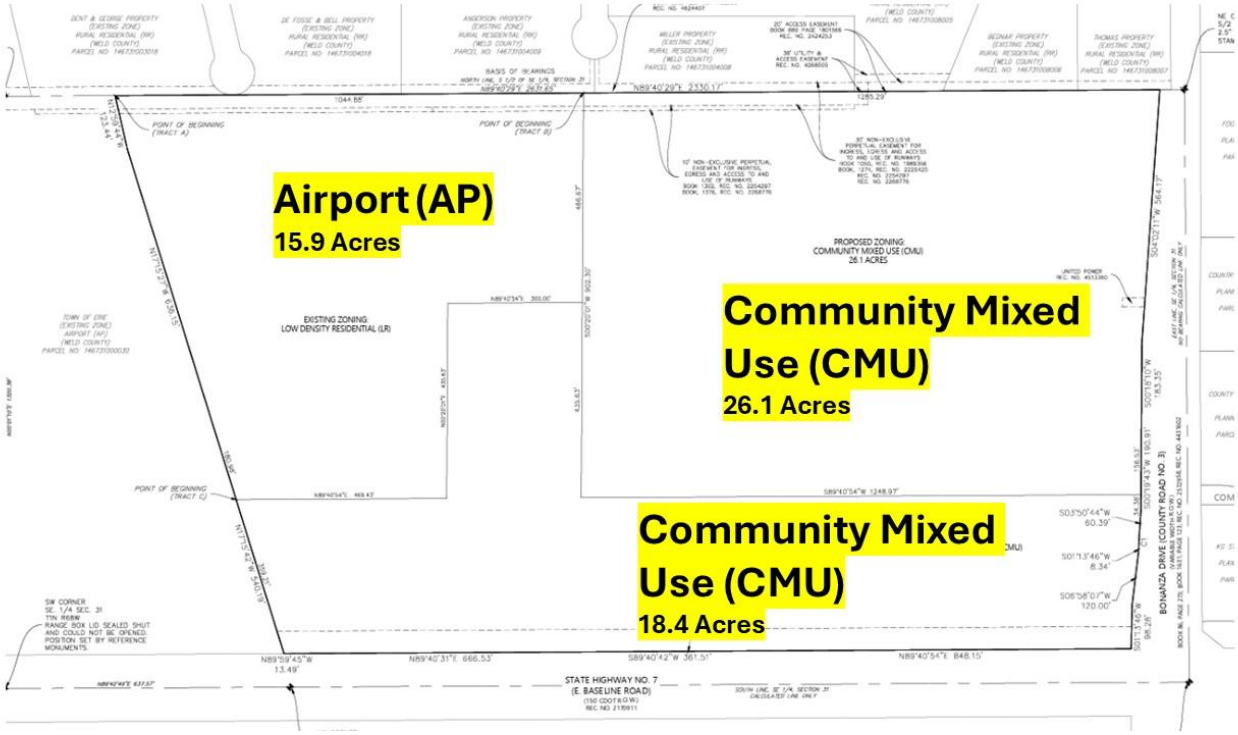
The next steps for developing the site will involve submittal of Preliminary or Final Plat and Development Agreement (DA), and Site Plan applications. Site Plans that include more than 25,000 square feet of combined building area require public hearing and approval by the Planning Commission, while smaller site plans may be reviewed administratively. Both the Planning Commission and the Town Council must review Preliminary Plats. Final Plats are placed on the Town Council consent agenda for acceptance of easements and approval of the accompanying Development Agreement.

Town of Erie Zoning Map:

Most of the subject site is zoned Low Density Residential (LR), with the southeast corner designated as Community Commercial (CC). LR allows single-family or duplex units at a density of 3 to 5 du/ac. CC allows a range of community-oriented retail and service uses. On the zoning map below, the subject property is outlined in black to define its relationship to adjacent zoning.



The applicant proposes zoning the property as depicted on the following map:



Staff find that the application is generally consistent with the scale and character of surrounding development and that the proposal supports compatibility with nearby commercial and residential uses. Developments in the proposed CMU district will have to meet the CMU design standards in the UDC 10-6-8. This includes building orientation, massing and façade standards, as well as regulations governing roofs, building materials, lot frontage, and colors. Further detailed review will occur during subsequent plat and site plan application processes.

Compliance with Town of Erie Comprehensive Plan:

The Future Land Use Map designates the site as both Employment and Corridor Commercial. The Employment category supports uses that generate jobs, including industrial and flex spaces, light manufacturing, medical or technical facilities, aeronautical uses, and incubator spaces. The Corridor Commercial designation applies to commercial uses that attract regional activity along highways and major arterials, such as big-box retail and other national or regional commercial businesses. Staff find that the rezoning request largely aligns with these designations in the 2024 Comprehensive Plan. While residential is not a primary use within Employment areas, it may be included as a secondary supporting use when it does not conflict with the primary employment-focused intent. The scale and configuration of the proposed development support the Comprehensive Plan's vision for the site, and the combination of Airport (AP) zoning and Community Mixed Use (CMU) zoning is consistent with both the Employment and Corridor Commercial land use categories.

The site is outlined on the Future Land Use Map below with a dashed black line.



Staff find that this application is also consistent with several specific policies in the Comprehensive Plan:

C.1.1 Mix of Housing Types: Encourage A Variety of Housing Types in Neighborhoods to Provide a More Diverse Selection of Lifestyles and Housing Pricing for Erie Residents.

- Staff finds that the proposed rezoning could allow for the development of apartments, which would help diversify the Town's housing options. Erie currently has a limited supply of rental apartment units, and the introduction of this housing type would provide an additional and needed option for residents seeking alternatives to single-family homes.

C.1.4 Activity Centers: Ensure Each Neighborhood Includes an Activity Center for Its Residents.

- Staff find that the proposed rezoning would introduce uses capable of creating a significant activity center for the region while also integrating housing opportunities. Future development under the requested zoning districts would help bring new commercial services, employment options, and residential choices to the surrounding area, supporting broader community needs and contributing to a more complete and connected regional destination.

C.5.1: Ensure that new development meets Comprehensive Plan vision, priorities, and resources management.

- The rezoning to CMU and AP will allow for the creation of additional employment opportunities, helping to expand and strengthen the Town's overall employment base.

E.1.2. Encourage Infill Development and Adaptive Reuse of Existing Structures and Properties.

- This site has remained undeveloped for many years, and offers the advantage of utilizing existing utilities and roadway infrastructure already in place, making future development more efficient and cost-effective.

E.2.1 Promote Mixed-Use Neighborhoods and Diverse Housing Opportunities Near Employment.

- This site would provide a mix of residential and commercial uses that would help support this goal by introducing both needed housing options and complementary commercial services within the same development area.

E.3.3 Cultivate A Mix of Local, Unique, and Creative Businesses

- The Town of Erie is home to a vibrant community of small, locally owned businesses as well as national chains, all of which depend on access to appropriately zoned properties to grow and succeed. This site presents an opportunity to expand business activity by offering new, well-located development sites that can meet the needs of both local entrepreneurs and larger commercial operators. Supporting this type of economic growth aligns with the Town's goal of fostering a resilient, community-driven local economy.

E.5.2 Expand use of the Erie Municipal Airport to be more of a community resource and amenity.

- The proposal introduces new Airport-zoned land that functions as a transition area between the Erie Municipal Airport and the residentially oriented neighborhoods to the east. This zoning can accommodate compatible commercial uses—such as restaurants, taverns, offices, retail, and open space—while supporting airport operations and helping to minimize potential impacts on nearby residential areas.

H.1.1: Locate higher density housing and mixed-use development in areas that are currently served or will be served by bus transit and neighborhood centers.

- The rezoning will encourage mixed-use development in proximity to future transit corridors as well as existing and planned employment and commercial areas, supporting a more connected land-use pattern and expanding access to jobs, services, and housing within the community.

Traffic, Utilities, and Infrastructure:

The application includes a preliminary impact assessment that evaluates traffic, public services and utilities, and infrastructure at a high level. This level of review is appropriate for a rezoning request and provides sufficient information for staff to assess the proposed zoning change. More detailed information about specific uses or businesses is not required at this stage. Future Site Plan and Plat applications will include comprehensive technical

analyses, such as a full traffic impact study, utility reports, and detailed drainage and grading plans.

Access to the site is currently planned from Bonanza Street, with no direct access from Highway 7. Any future proposal for highway access would require review and approval by both Town staff and CDOT. The existing traffic signal at Bonanza Drive and Highway 7 will serve the site, and staff will evaluate whether additional traffic improvements are necessary as future development applications are submitted.

Both water and sanitary sewer service are available in the vicinity of the site, allowing future development to connect to existing utility lines with improvements as necessary. A storm sewer main currently serves the area south of the property, and stormwater infrastructure will require review at the time of development. Staff will conduct additional analysis during future Site Plan and Plat applications to determine whether any utility upgrades or extensions are needed.

STAFF REVIEW AND ANALYSIS

Staff reviewed the Sierra Vista rezoning requests for conformance with the Municipal Code, Title 10, UDC Section 10-7-5 Approval Criteria. Staff find the Rezoning is in compliance with the Approval Criteria as listed below:

a. The rezoning will promote the public health, safety, and general welfare;

The applicant has adequately demonstrated that the subject property can support the proposed development intensity and that the anticipated development can be achieved in a way that promotes the health, safety, and general welfare of the public. Future development applications will be required to meet all applicable design standards in the UDC, ensuring that the project is adequately integrated into the surrounding neighborhood through appropriate architecture, building scale, pedestrian and sidewalk connections, landscaping, and overall site design.

b. The rezoning is generally consistent with the town's comprehensive plan and the purposes of this UDC;

The proposed zoning is generally consistent with the Town of Erie Comprehensive Plan designations of Employment and Corridor Commercial. The Airport (AP) and Community Mixed Use (CMU) zoning districts allow uses that align with the Comprehensive Plan's goals, supporting a range of employment-generating activities, encouraging infill development, and creating opportunities for housing near jobs and services. These districts also reinforce the role of the Erie Municipal Airport and provide a diverse mix of businesses, helping to advance multiple community policies related to economic vitality, land-use efficiency, and balanced growth.

c. Adequate facilities and services (including streets and transportation, water, gas, electric, police and fire protection, and sewage and waste disposal, as applicable) will be available to serve the subject property while maintaining adequate levels of service to existing development;

All the above-mentioned services are available to the subject property. Adequate public safety resources, utility infrastructure, recreation facilities, parks, open space, and

schools exist to serve future development on the site while maintaining acceptable service levels for the surrounding community. Any potential impacts on existing development—and the need to ensure that service levels remain sufficient—will be evaluated in greater detail during future Plat and Site Plan review processes, where mitigation measures can be identified and required as necessary.

d. The rezoning is not likely to result in significant adverse impacts upon the natural environment, including air, water, noise, storm water management, wildlife, and vegetation, or such impacts will be substantially mitigated;

Based on the information provided in the rezoning application, no significant adverse impacts to the referenced conditions are anticipated at this stage. The applicant will be required to submit more detailed documentation during the Plat and Site Plan approval processes to demonstrate that the proposed development will not negatively affect these conditions, or to identify and implement appropriate mitigation measures if impacts are identified.

e. The rezoning is not likely to result in significant adverse impacts upon other property in the vicinity of the subject property;

No significant adverse impacts are anticipated for properties in the vicinity of the subject site. The proposed rezoning is not expected to create detrimental effects on surrounding development. The applicant has committed to incorporating appropriate building heights and setback buffers to help ensure compatibility with nearby uses. Staff will continue to review these elements in detail during future Site Plan and Plat applications to confirm that the project maintains adequate transitions and minimizes potential impacts as development plans advance.

f. Future uses on the subject property will be compatible in scale with uses on other properties in the vicinity of the subject property; and

The Comprehensive Plan establishes preferred land uses throughout the Town’s Planning Area Boundary, with compatibility between adjacent uses serving as a key consideration in those designations. The commercial and residential uses proposed with this rezoning are consistent with the Comprehensive Plan and are compatible in scale and character with surrounding properties.

g. The rezoning is generally consistent with the town's economic development goals and objectives in bring positive growth and sustainable revenues to the town.

Rezoning the property to AP and CMU will significantly enhance its development potential by enabling a broader range of uses and creating a better path for future investment. The site’s strategic location along the Highway 7 corridor (adjacent to the airport and near existing commercial and residential areas) promotes positive growth. Development under the proposed zoning districts will advance the Town’s goals related to economic diversification and expanded housing opportunities, supporting a balanced mix of employment, services, and residential options within this key corridor.

NEIGHBORHOOD MEETING

As required by the Municipal Code, a Neighborhood Meeting was held on October 30, 2025. The required notice for the Neighborhood Meeting was provided. The summary and notice information are included.

PUBLIC NOTICE

Notice of this Public Hearing has been provided as follows:

Published in the newspaper:	3/11/26
Property Posted:	3/13/26
Letters to adjacent property owners within 500':	3/13/26

Sierra Vista Rezoning

Planning Commission

Chris LaRue, Principal Planner

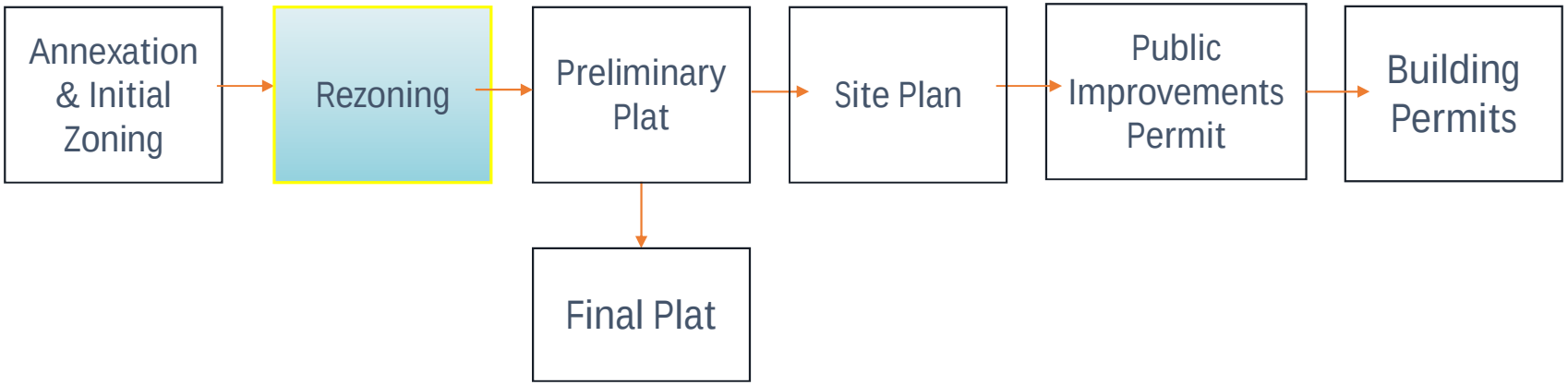
April 1, 2026

Request

Rezoning – Planning Commission Recommendation

- Project Size: Approx 60 AC (16 AC to AP; 18 AC to CMU; & 26 AC to CMU)
- Proposed Lots: 3 tracts
- Existing Zoning: LDR & CC
- Existing Use: Undeveloped

Development Review Process

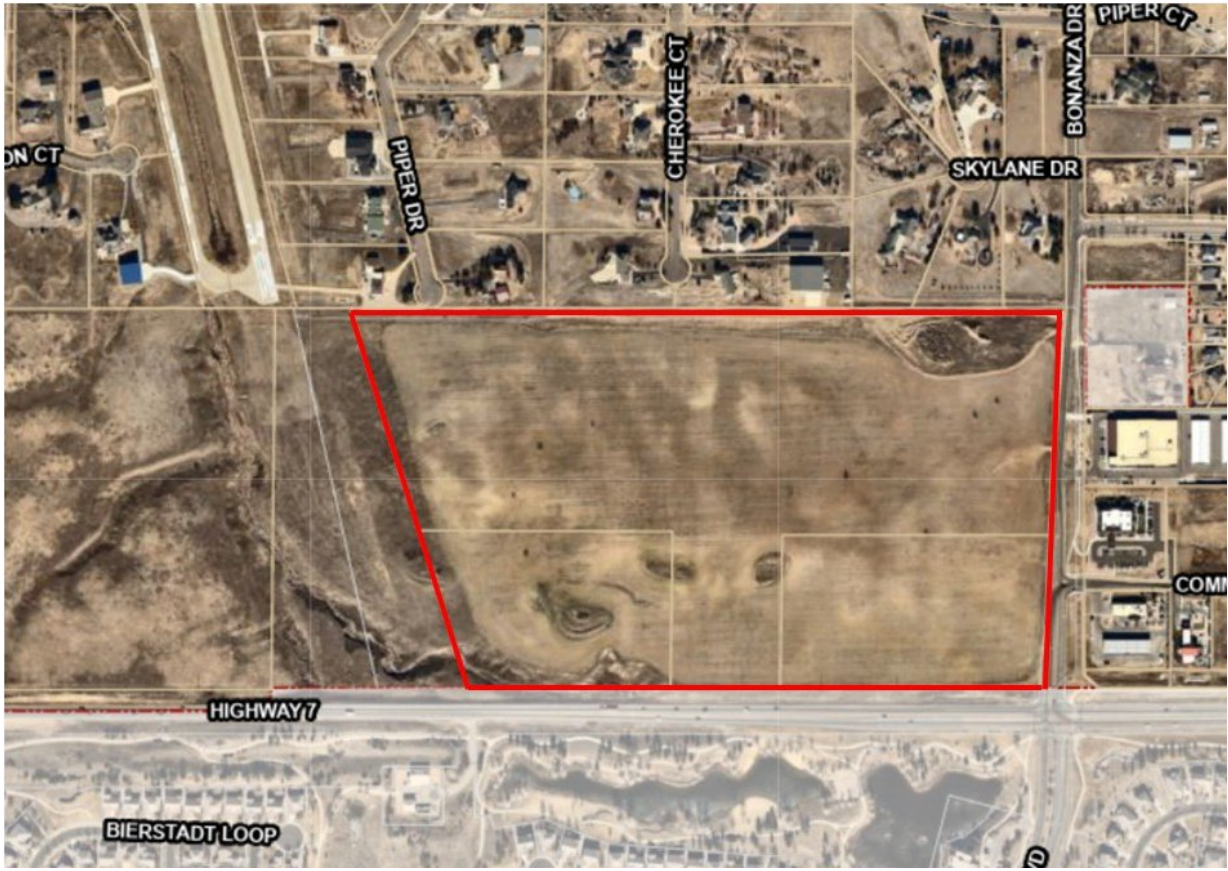


Overview

- Background
- Proposal
- Decision

Location

The subject site is northwest of Hwy 7 & Bonanza Dr



Location – North on Bonanza





Location – NW 7 & Bonanza





Location – W from Storage



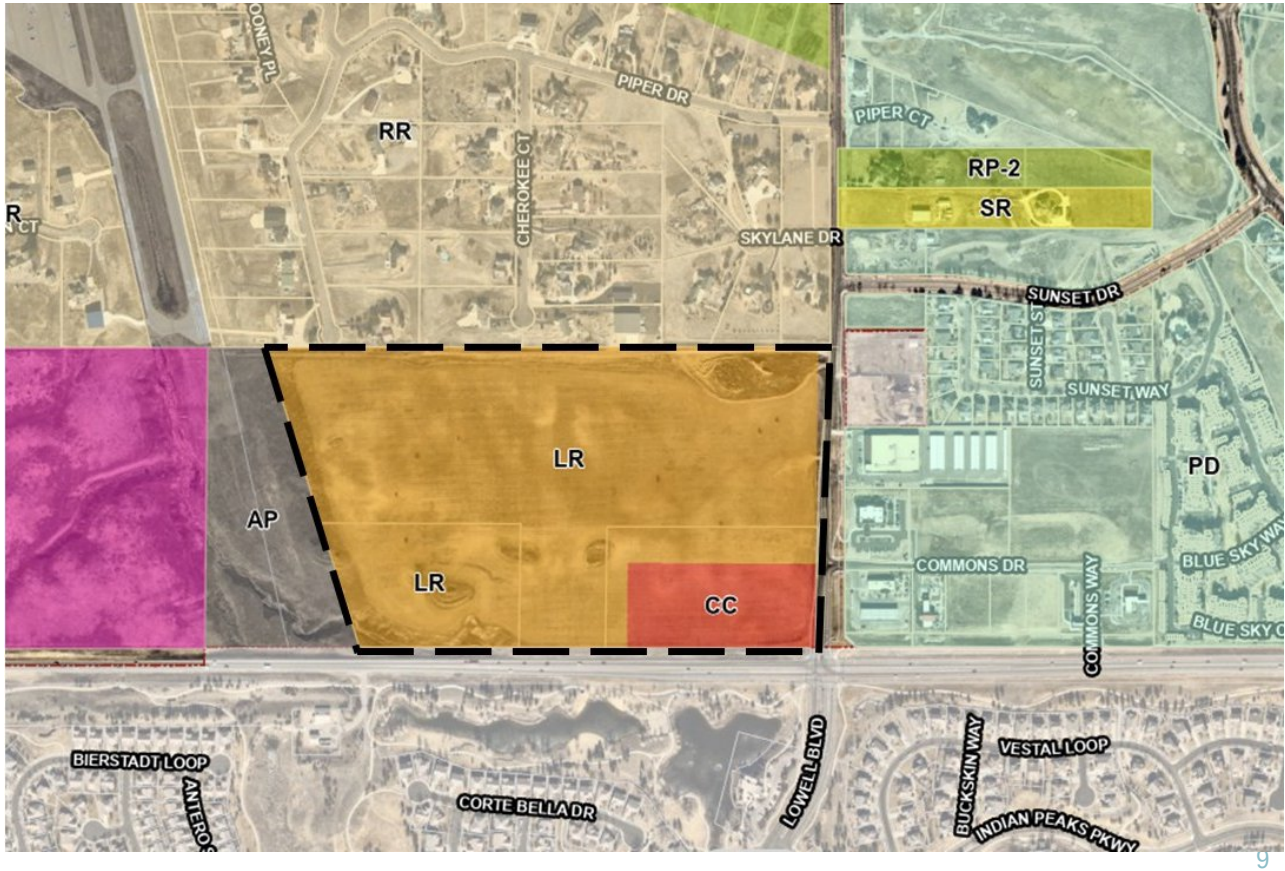


Existing Zoning

LR & CC

Allows SFD/Duplex at 3 to 5 du/ac

Full range of community-oriented retail & service



Comprehensive Plan

Employment

Uses that generate employment such as industrial/flex space, light manufacturing, medical/technical facilities, aeronautical, & incubator spaces.



Comprehensive Plan

Corridor Commercial

- Uses that generate regional activity along highways and major arterials
- Residential can be secondary



Comprehensive Plan Policies

C.1.1 Mix of housing Types to encourage a variety of housing;

C.1.4 Activity Centers for Residents;

C.5.1 Ensure new development meeting Comp Plan vision, priorities, etc;

E.1.2 Encourage Infill Development;

E.2.1 Promote Mixed-Use Neighborhoods & Diverse housing opportunities near Employment;

E.3.3 Cultivate a Mix of Local, Unique, & Creative Businesses

E.5.2 Expand use of the Airport as a community recourse

H.1.1 Locate higher density housing and mixed-use development in areas that are served or will be served by bus

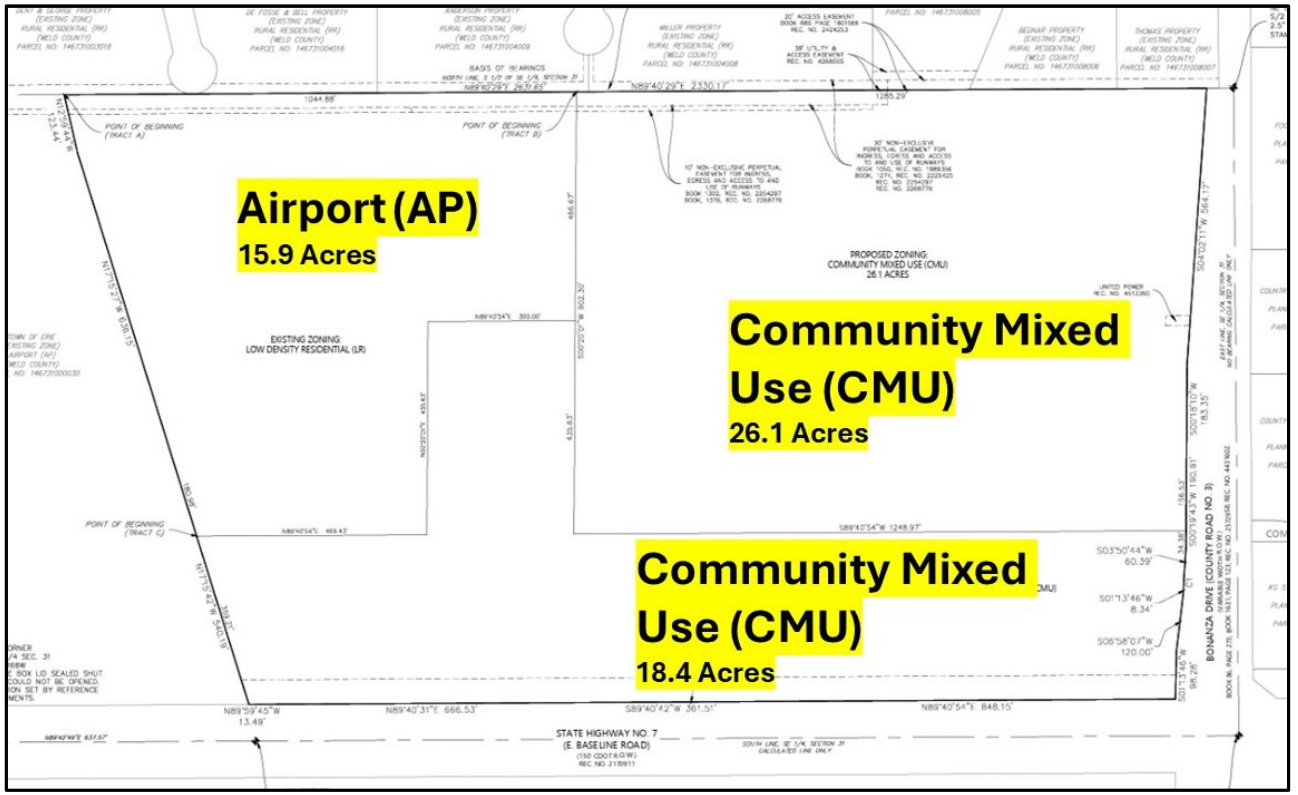
Overview

- ✓ Background
- Proposal
- Decision

Proposed Zoning

AP

Airport related uses & commercial such as restaurants, offices, or general retail



Proposed Zoning

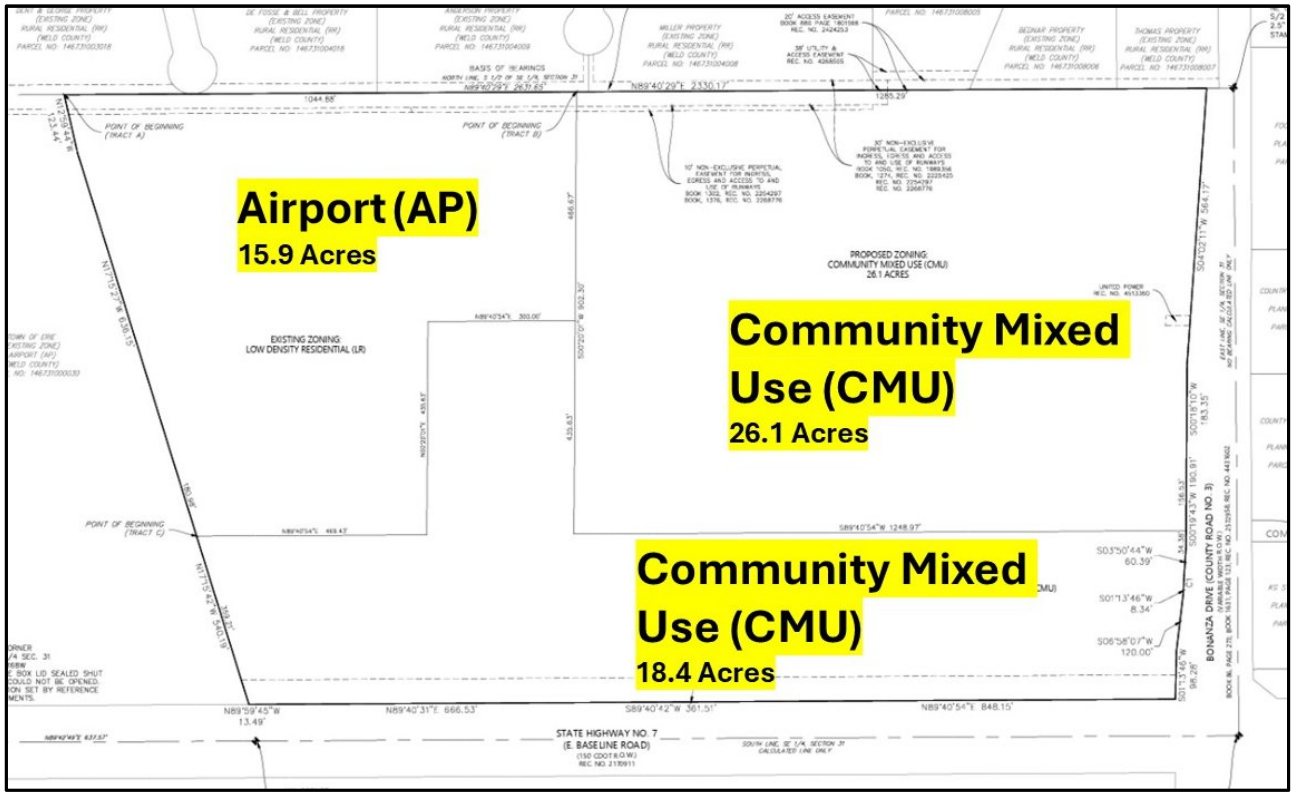
CMU

Up to 20 acres must have 2 principal uses

Over 20 acres must have 3

1 use must be residential

Use minimum of 25% of GFA



Proposed Zoning



Proposed Zoning

Developer Commitments Tract B

Limiting bld heights & creating 40’ buffers

100’ buffers for commercial



Overview

- ✓ Background
- ✓ Proposal
- Decision

Approval Criteria UDC Section 10.7.5.B.3

a. The rezoning will promote the public health, safety, and general welfare.

b. The rezoning is generally consistent with the town's comprehensive plan and the purposes of this UDC;

Staff: Staff find that the proposed Rezoning can support the proposed development intensity in a way the promotes public health, safety, and general welfare. Proposal is consistent with the Town's Comprehensive Plan by encouraging several key goals.

Approval Criteria

c. Adequate facilities and services (including streets and transportation, water, gas, electric, police and fire protection, and sewage and waste disposal, as applicable) will be available to serve the subject property while maintaining adequate levels of service to existing development;

Staff: All utilities are available to the subject site while maintaining acceptable levels of service. No specific significant adverse impacts were identified or are expected. Future developments will be evaluated on their ability to provide adequate levels of service.

Approval Criteria

d. The rezoning is not likely to result in significant adverse impacts upon the natural environment, including air, water, noise, storm water management, wildlife, and vegetation, or such impacts will be substantially mitigated;

e. The rezoning is not likely to result in significant adverse impacts upon other property in the vicinity of the subject property.

Staff: Negative impacts are not anticipated to the natural environment. Detailed studies are required with future applications. Town staff find that this development will be compatible with the character of surrounding land uses.

Approval Criteria

f. Future uses on the subject property will be compatible in scale with uses on other properties in the vicinity of the subject property;

g. The rezoning is generally consistent with the town's economic development goals and objectives in bring positive growth and sustainable revenues to the town.

Staff: Town staff find that this development will be compatible with the character of surrounding land uses. Future development plans shall provide further evidence they will fit with surrounding uses. Allowing a broader range of uses should promote development along Hwy 7 while advancing Town goals of economic diversification and housing opportunities

Staff Recommendation

Staff find the application complies with the Approval Criteria & recommends the PC Adopt Resolution P26-06 recommending the Town Council Approve the Sierra Vista Rezoning to Airport (AP) & Community Mixed Use (CMU).

Neighborhood Meeting

- October 30, 2025
- 47 Attendees
- Questions on uses, traffic, utilities

Public Notice

Public Notice of Planning Commission Hearing:

Published in the Daily Times Call:	3/11/26
Property Posted:	3/13/26
Letters to Adjacent Property Owners:	3/13/26

Sierra Vista Rezoning

Planning Commission

Chris LaRue, Principal Planner

April 1, 2026

PERMITTED USES			
P = Permitted Use by Right S = Special Review Use			
USE	**CATEGORY**	**CMU**	**AP**
RESIDENTIAL USES			
Household Living	Dwelling, Live/Work	P	S
	Dwelling, Multi- Family	P	
Group Living	Dormitory	S	S
	Group Home, Residential	P	
	Group Home, Large	S	
	Group Home, Small	S	
	Nursing Home or Assisted Living Facility	P	
PUBLIC/INSTITUTIONAL USES			
Aviation	Airport and related uses		P
	Heliport		P
	Helistop		P
Child Care	Child Care Center, Large	S	
	Child Care Center Small	P	
Community Facilities	Community Center (Public)	P	S
	Correctional Facility		
	Governmental Office	P	P
	Neighborhood Recreation Center (Indoor/Outdoor)	P	S
	Public Works Facility		S
	Public Safety Station	S	S
	Transit Center	S	S
Cultural Facilities	Botanical garden	S	S
	Library	S	S
	Museum	S	S
	Zoo		
Educational Use	College or University	P	S
	Commercial School	P	S
	School - Public	P	
	School - Private	S	
Human Health Services	Dental or Medical Office, Clinic, Lab	P	
	Laboratory	S	
	Substance Abuse Treatment Facility, Outpatient	S	
	Urgent Care Facility	P	
Park and Open Space	Athletic Fields and Courts	P	
	Open Space	P	P
	Outdoor Amphitheater, Public	S	
	Park	P	P
Place of Worship	Place of Worship	P	S
Wireless Communication Facilities	Alternative Tower Structure and Base Station	P	P
	Towers	S	S
Utility Facilities	Utility Facility, Major	S	S
	Utility Facility, Minor	P	P
	Utility, Town- Owned	P	P
COMMERCIAL USES			
Animal Sales and Care	Animal Hospital, Small Animals (indoor)	P	
	Kennel or Animal Day Care (indoor)	S	
Financial Institution	Automated teller machine (freestanding)	P	P
	Bank	P	
	Bank, with drive- through service	S	
Food and Beverage Service	Tavern	P	P
	Nightclub	P	S
	Restaurant	P	P
	Restaurant, with drive-through or drive-up service	S	
Office	Office, Business or Professional	P	P
	Recording or Broadcasting Studio	P	
Parking	Parking Lot	S	P
	Parking Structure	S	
Recreation/Entertainment, Indoor	Commercial Amusement, Indoor	P	
	Sexually- oriented business		S
Recreation/Entertainment, Outdoor	Outdoor Recreation, Commercial	S	S
	Golf Driving Range	S	
Retail Sales and Service	Funeral Parlor, Mortuary or Crematory	P	
	Gas Station	P	P
	General Retail	P	P
	Personal Service Establishment	P	
	Pharmacy	P	
	Pharmacy with drive-through service	S	
	Repair Shop, Appliances	P	
Vehicles and Equipment	Car Wash	S	
	Vehicle Service and Repair, Light	S	
Visitor Accommodation	Bed and Breakfast	S	
	Hotel or Motel	P	
MANUFACTURING AND LIGHT INDUSTRIAL USES			
Industrial Service	Building Materials and Lumber Sales	S	
	Industrial, Light		S
	Research and Development Facility		S
Manufacturing and Production	Light Manufacturing, General		S
	Mining and Mineral Extraction	S	S

SIERRA VISTA

REZONE & MINOR SUBDIVISION PLAT

TOWN OF ERIE PLANNING COMMISSION

April 1, 2026

MEET OUR TEAM

BC LAND, LLC

Applicant

NORRIS DESIGN
PEOPLE + PLACEMAKING

Entitlements

GLD
GAUGE LAND
DEVELOPMENT

Land Development Consultant

LJA

Civil Engineer



SIERRA VISTA | VICINITY MAP

3

NORTH

0' 300' 600'
SCALE

WHY WE ARE HERE

- **Rezoning:**
    - A Rezoning of the site will allow land uses and development standards that are consistent with a different zoning designation than the current designation and will bring the zoning in conformance with the Comprehensive Plan.
    - This application **DOES NOT** include a site plan or site-specific uses.
- **Minor Subdivision Plat:**
    - A Minor Subdivision land use application is required with this rezoning as no lot shall be divided by a zone district boundary line per UDC 10-5-4.D.4. The Minor Subdivision upon approval will be recorded at the time of the Zoning Map recording. The Minor Subdivision may be ready for recording prior to the zoning approval, but will not be recorded until the zoning is recorded.

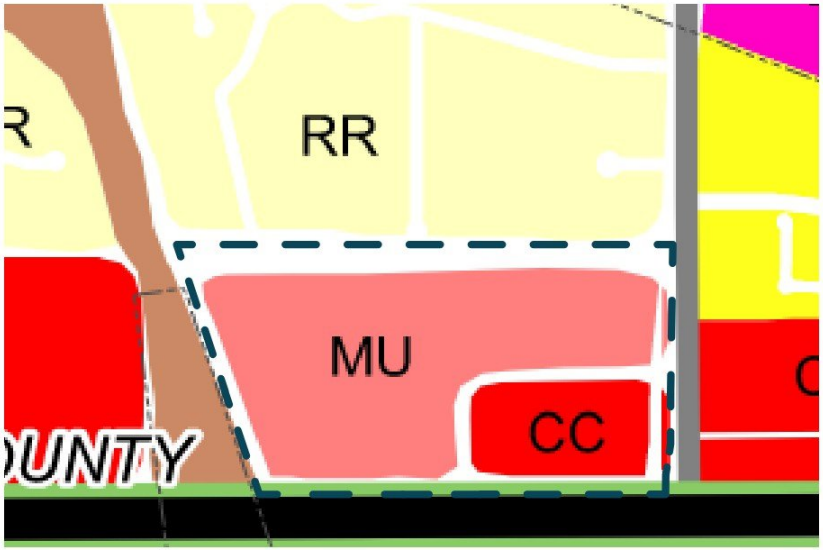
ERIE COMPREHENSIVE PLAN — FUTURE LAND USE (FLU) MAPS

2024 (CURRENT)



- **Employment**
- **Corridor Commercial**
- Residential - Rural
- Residential - Low
- Neighborhood Commercial
- Mixed Use Village
- Parks, Open Space, and Protected Lands
- Site Boundary

2015



- **MU - Mixed Use**
- **CC - Community Commercial**
- RR - Residential Rural
- LDR - Low Density Residential
- A - Airport
- B - Business
- Site Boundary

EXISTING ZONING & LOT BOUNDARIES



- **LR - Low Density Residential**
- **CC - Community Commercial**
- AP - Airport
- RR - Rural Residential
- B - Business
- PD - Planned Development
- RP-2 - Rural Preservation 2
- SR - Suburban Residential
- Existing Lot Boundary

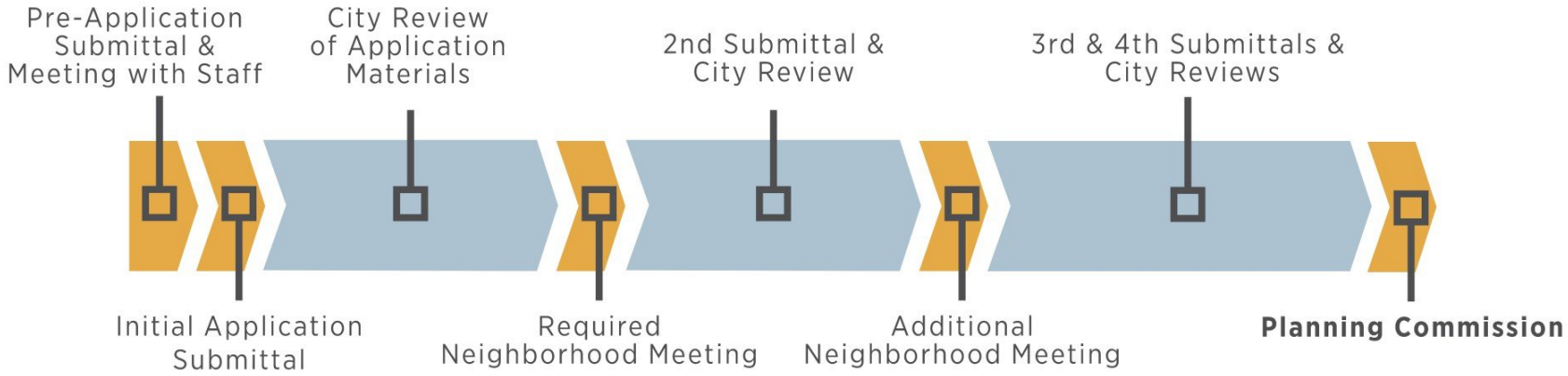
PROPOSED ZONING & LOT BOUNDARIES



- **CMU - Community Mixed-Use**
- **AP - Airport**
- RR - Rural Residential
- B - Business
- PD - Planned Development
- RP-2 - Rural Preservation 2
- SR - Suburban Residential
- Proposed Lot Boundary


ZONED
RURAL RESIDENTIAL
AIRPORT USE
(15.9 ACRES)
COMMUNITY
MIXED-USE
(44.5 ACRES)
COUNTY ROAD NO. 3
(BONANZA DR)
ZONED
AIRPORT
ZONED
PLANNED
DEVELOPMENT
STATE HIGHWAY 7
(E. 168TH AVENUE)
CITY AND COUNTY OF BROOMFIELD – SFD HOMES
AIRPORT ZONING
Permitted Uses:
• Open Space & Parks
• Restaurants & Taverns
• General Retail
• Governmental Office
• Offices
• Utility Facilities
• Gas Station
• Airport, Helipad, Helistop
COMMUNITY MIXED-USE ZONING
Permitted Uses:
• Community & Recreation Centers
• Open Space & Parks
• Schools
• Dental & Medical Offices/Clinics
• Restaurants & Taverns
• Offices
• General Retail
• Hotels & Motels
• Multi-Family Dwellings

APPLICATION PROCESS



- 4 email updates sent to residents whom provided email contact
- Separate email and phone follow-ups sent to answer residents' specific questions

COMMUNITY CONCERNS

- **Anthem Residents:** increasing air traffic
- **Air Park:** protecting current avigation easement and setback, no loud commercial uses adjacent to homes, stepping back and massing
- **City and County of Broomfield:** increasing air traffic and limiting uses permitted under AP zoning
    - *"If Tract A is rezoned from Low-Density Residential (LR) to Airport (AP), would this allow a future owner to develop aviation-related uses on the property, such as a heliport, helistop, or related airport uses like private airplane hangars?"*



Mead & Hunt

October 16, 2025

Blake Carlson
BC Land, LCC
Broomfield, CO 80023

Subject: Sierra Vista Rezoning

We are writing to provide clarification regarding the recent recommendations to protect the property within the Runway Protection Zone (RPZ) and non-precision approach surfaces associated with Erie Municipal Airport, specifically land between the south end of Runway 15-33 and State Highway 7 adjacent to your proposed development.

This recommendation is provided solely to enhance safety and ensure compliance with Federal Aviation Administration (FAA) guidelines concerning land use compatibility. The RPZ and approach surfaces are critical safety buffers designed to protect people and property on the ground in the event of an aircraft overrun or undershoot during landing or takeoff. This is best achieved through restricting development and use.

There are no expectations that increases in air traffic, or changes in the airport's operational footprint will be induced as a result of this rezoning. The portion of the property that is being proposed as Airport (AP) zoning is compatible with FAA guidelines and must be maintained in accordance with FAA standards for RPZ land use and approach protection, which prohibit structures, public gatherings, and other incompatible uses within the safety zone. We wish to emphasize that this recommendation is not in support any expansion of airport operations or activities.

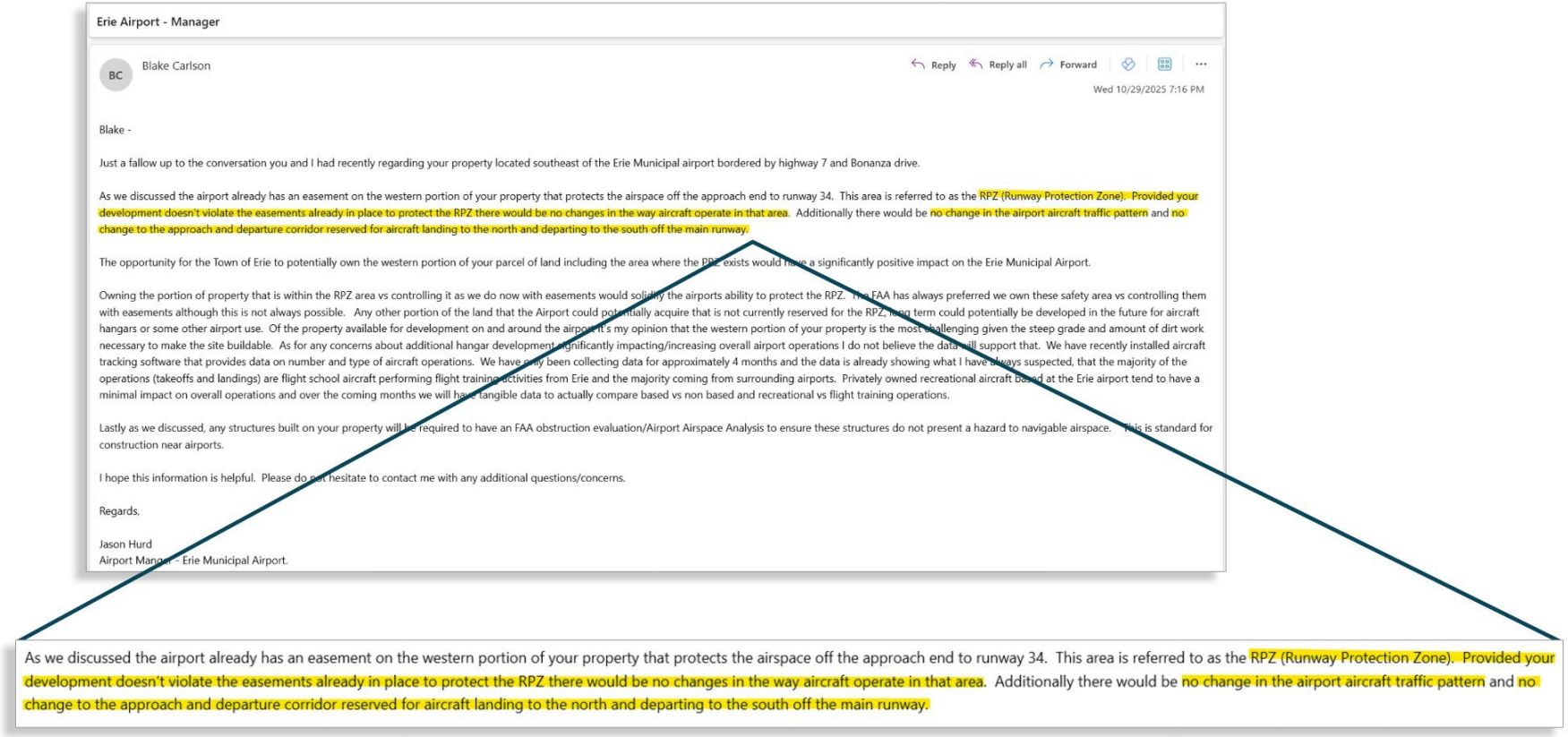
This measure is strictly precautionary and reflects efforts to protect public safety and responsible airport stewardship. Should you have any questions or require further documentation, please feel free to contact me at 303-275-8030 or Jeremy.Lee@meadhunt.com.

Sincerely,

MEAD & HUNT, Inc.

Jeremy K. Lee, PE
Project Manager

There are no expectations that increases in air traffic, or changes in the airport's operational footprint will be induced as a result of this rezoning. The portion of the property that is being proposed as Airport (AP) zoning is compatible with FAA guidelines and must be maintained in accordance with FAA standards for RPZ land use and approach protection, which prohibit structures, public gatherings, and other incompatible uses within the safety zone. We wish to emphasize that this recommendation is not in support any expansion of airport operations or activities.



Erie Airport - Manager

BC Blake Carlson

Reply Reply all Forward

Wed 10/29/2025 7:16 PM

Blake -

Just a fallow up to the conversation you and I had recently regarding your property located southeast of the Erie Municipal airport bordered by highway 7 and Bonanza drive.

As we discussed the airport already has an easement on the western portion of your property that protects the airspace off the approach end to runway 34. This area is referred to as the RPZ (Runway Protection Zone). Provided your development doesn't violate the easements already in place to protect the RPZ there would be no changes in the way aircraft operate in that area. Additionally there would be no change in the airport aircraft traffic pattern and no change to the approach and departure corridor reserved for aircraft landing to the north and departing to the south off the main runway.

The opportunity for the Town of Erie to potentially own the western portion of your parcel of land including the area where the RPZ exists would have a significantly positive impact on the Erie Municipal Airport.

Owning the portion of property that is within the RPZ area vs controlling it as we do now with easements would solidify the airports ability to protect the RPZ. The FAA has always preferred we own these safety area vs controlling them with easements although this is not always possible. Any other portion of the land that the Airport could potentially acquire that is not currently reserved for the RPZ, long term could potentially be developed in the future for aircraft hangars or some other airport use. Of the property available for development on and around the airport it's my opinion that the western portion of your property is the most challenging given the steep grade and amount of dirt work necessary to make the site buildable. As for any concerns about additional hangar development significantly impacting/increasing overall airport operations I do not believe the data will support that. We have recently installed aircraft tracking software that provides data on number and type of aircraft operations. We have only been collecting data for approximately 4 months and the data is already showing what I have always suspected, that the majority of the operations (takeoffs and landings) are flight school aircraft performing flight training activities from Erie and the majority coming from surrounding airports. Privately owned recreational aircraft based at the Erie airport tend to have a minimal impact on overall operations and over the coming months we will have tangible data to actually compare based vs non based and recreational vs flight training operations.

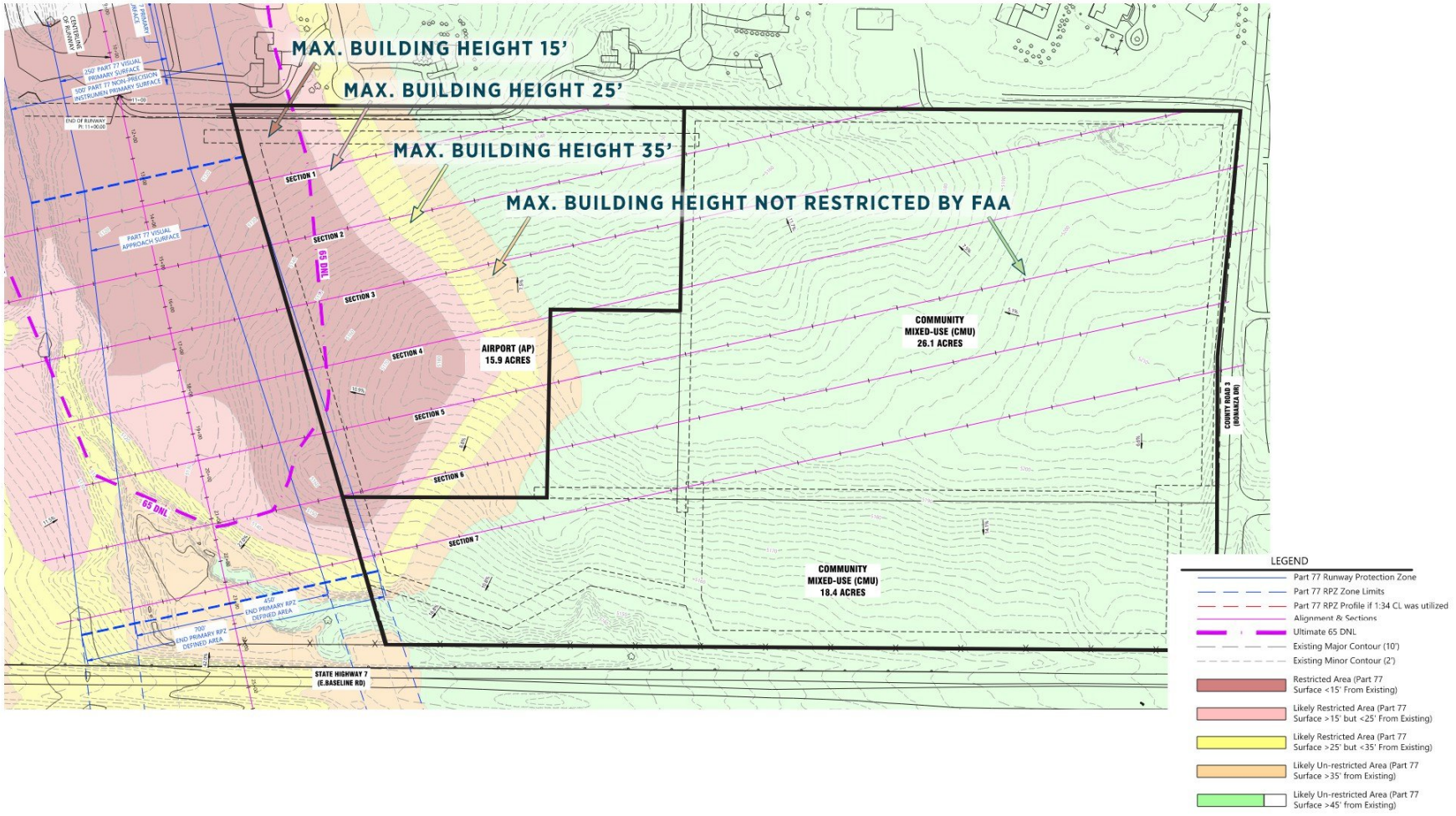
Lastly as we discussed, any structures built on your property will be required to have an FAA obstruction evaluation/Airport Airspace Analysis to ensure these structures do not present a hazard to navigable airspace. This is standard for construction near airports.

I hope this information is helpful. Please do not hesitate to contact me with any additional questions/concerns.

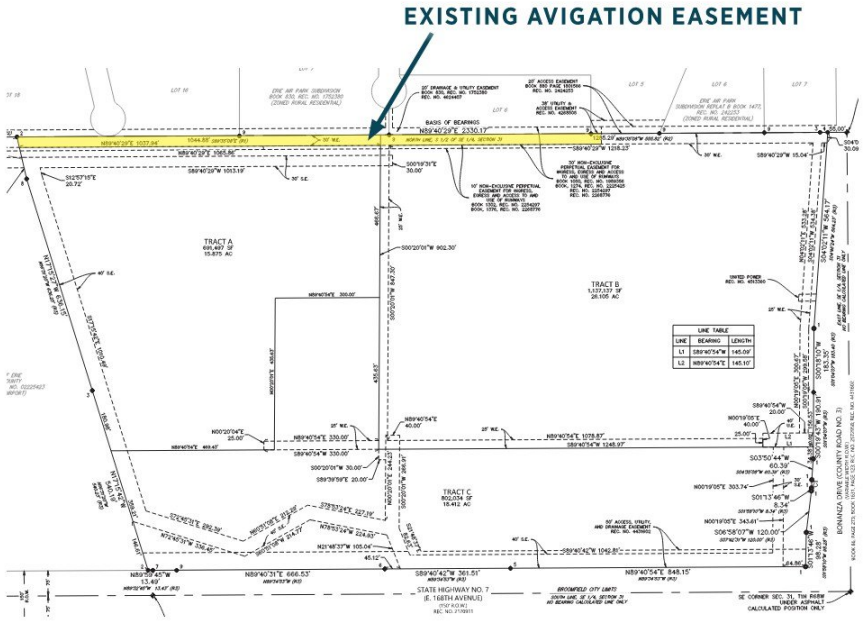
Regards,

Jason Hurd
Airport Manager - Erie Municipal Airport.

As we discussed the airport already has an easement on the western portion of your property that protects the airspace off the approach end to runway 34. This area is referred to as the RPZ (Runway Protection Zone). Provided your development doesn't violate the easements already in place to protect the RPZ there would be no changes in the way aircraft operate in that area. Additionally there would be no change in the airport aircraft traffic pattern and no change to the approach and departure corridor reserved for aircraft landing to the north and departing to the south off the main runway.


MAX. BUILDING HEIGHT 15'
MAX. BUILDING HEIGHT 25'
MAX. BUILDING HEIGHT 35'
MAX. BUILDING HEIGHT NOT RESTRICTED BY FAA
SECTION 1
SECTION 2
SECTION 3
SECTION 4
SECTION 5
SECTION 6
SECTION 7
65 DNL
AIRPORT (AP)
15.9 ACRES
COMMUNITY
MIXED-USE (CMU)
26.1 ACRES
COMMUNITY
MIXED-USE (CMU)
18.4 ACRES
COUNTY ROAD 3
(OCOTILLO DR)
STATE HIGHWAY 7
(E.BASELINE RD)
LEGEND
Part 77 Runway Protection Zone
Part 77 RPZ Zone Limits
Part 77 RPZ Profile if 1:34 CL was utilized
Alignment & Sections
Ultimate 65 DNL
Existing Major Contour (10')
Existing Minor Contour (2')
Restricted Area (Part 77 Surface <15' From Existing)
Likely Restricted Area (Part 77 Surface >15' but <25' From Existing)
Likely Restricted Area (Part 77 Surface >25' but <35' From Existing)
Likely Un-restricted Area (Part 77 Surface >35' from Existing)
Likely Un-restricted Area (Part 77 Surface >45' from Existing)

PLAT NOTES



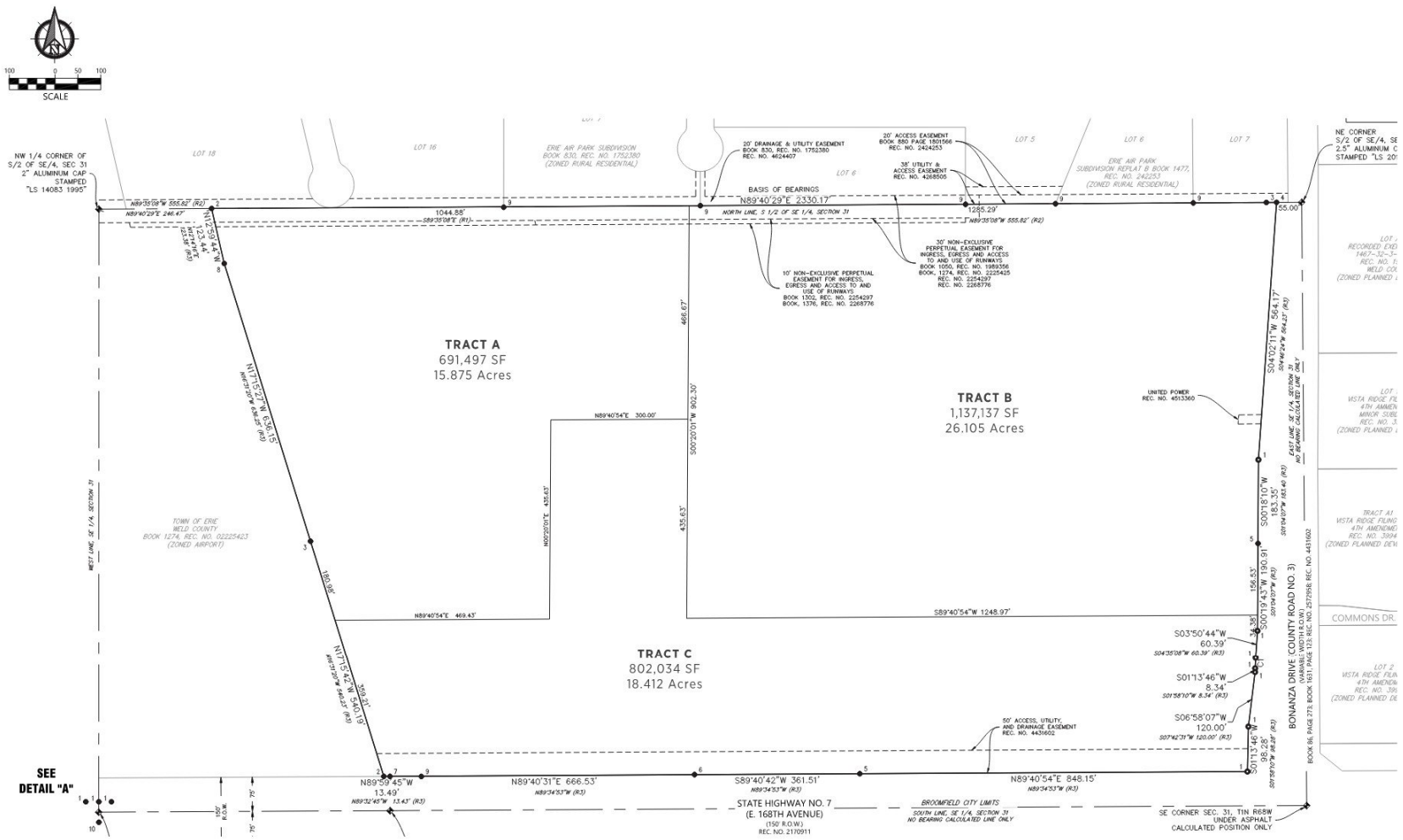
13. ALL LAND DESIGNATED AS AP ZONING SHALL CONFORM TO THE TOWN OF ERIE MUNICIPAL CODE AIRPORT OVERLAY DISTRICT GUIDELINES AS STATED IN TOWN OF ERIE MUNICIPAL CODE SECTION 10-2-6.

14. TRACT B SHALL APPLY THE FOLLOWING NEIGHBORHOOD PROTECTION PLANS TO THE NORTHERN PROPERTY LINE WHEN ADJACENT TO LOW-DENSITY RESIDENTIAL NEIGHBORHOODS:

a. THE MAXIMUM HEIGHT OF ANY PORTION OF A PRIMARY STRUCTURE SHALL NOT EXCEED 40 FEET IN HEIGHT, WHEN ABUTTING A LOW DENSITY RESIDENTIAL LOT.

b. THE MINIMUM SETBACK PERMITTED ABUTTING A LOW DENSITY RESIDENTIAL LOT IS 40 FEET.

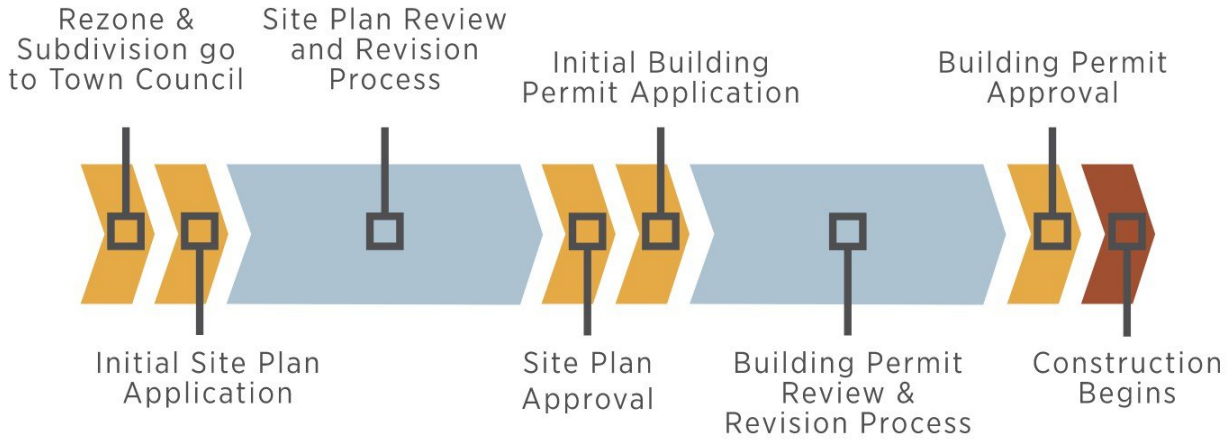
c. NO COMMERCIAL USE WILL BE PERMITTED WITHIN 100 FEET OF A LOW DENSITY RESIDENTIAL LOT OR NEIGHBORHOOD.


SCALE
100 0 50 100
NW 1/4 CORNER OF S/2 OF SE/4, SEC. 31 2" ALUMINUM CAP STAMPED "LS 14083 1995"
NE CORNER S/2 OF SE/4, SE 2.5" ALUMINUM C STAMPED "LS 20
BASIS OF BEARINGS N89°40'29"E 2330.17'
NORTH LINE, S 1/2 OF SE 1/4, SEC.TION 31
1044.88'
1285.29'
55.00
TRACT A
691,497 SF
15.875 Acres
TRACT B
1,137,137 SF
26.105 Acres
TRACT C
802,034 SF
18.412 Acres
ERIE AIR PARK SUBDIVISION BOOK 830, REC. NO. 1752380 (ZONED RURAL RESIDENTIAL)
ERIE AIR PARK SUBDIVISION REPLAT B BOOK 1477, REC. NO. 2402253 (ZONED RURAL RESIDENTIAL)
20' DRAINAGE & UTILITY EASEMENT BOOK 830, REC. NO. 1752380 REC. NO. 4624407
20' ACCESS EASEMENT BOOK 880 PAGE 1801566 REC. NO. 2424253
38' UTILITY & ACCESS EASEMENT REC. NO. 4268505
30' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS BOOK 1050, REC. NO. 1883356 BOOK, 1274, REC. NO. 2225425 REC. NO. 2254297 REC. NO. 2268776
10' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS BOOK 1302, REC. NO. 2254297 BOOK, 1376, REC. NO. 2268776
UNITED POWER REC. NO. 4513360
50' ACCESS, UTILITY, AND DRAINAGE EASEMENT REC. NO. 4431602
TOWN OF ERIE WELD COUNTY BOOK 1274, REC. NO. 02225423 (ZONED AIRPORT)
N89°40'54"E 300.00'
N89°40'54"E 469.43'
S89°40'54"W 1248.97'
S03°50'44"W 60.39'
S01°13'46"W 8.34'
S06°58'07"W 120.00'
S01°13'46"W 35.28'
SEE DETAIL "A"
N89°59'45"W 13.49'
N89°40'31"E 666.53'
S89°40'42"W 361.51'
N89°40'54"E 848.15'
STATE HIGHWAY NO. 7 (E. 168TH AVENUE) (150' R.O.W.) REC. NO. 2170911
BROOMFIELD CITY LIMITS SOUTH LINE, SE 1/4, SECTION 31 NO BEARING CALCULATED LINE ONLY
SE CORNER SEC. 31, T1N R68W UNDER ASPHALT CALCULATED POSITION ONLY
BONANZA DRIVE (COUNTY ROAD NO. 3) (VARIABLE WIDTH R.O.W.) BOOK 86, PAGE 273, BOOK 1631, PAGE 123, REC. NO. 2372958 REC. NO. 4431602
COMMONS DR.
LOT 18
LOT 16
LOT 6
LOT 5
LOT 7
WEST LINE, SE 1/4, SECTION 31
EAST LINE, SE 1/4, SECTION 31 NO BEARING CALCULATED LINE ONLY

REZONING APPROVAL CRITERIA

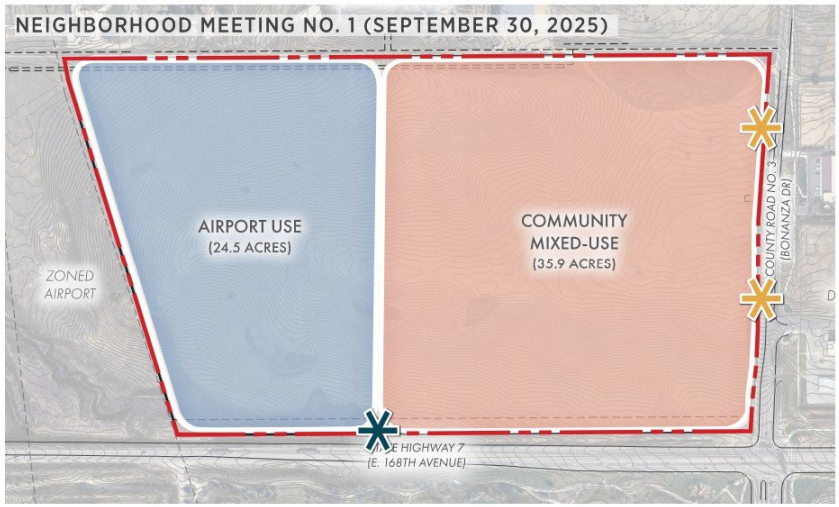
- The rezoning will promote public health, safety, and general welfare
- The rezoning is consistent with the Town's Comprehensive Plan and the purposes of the Municipal Code; Adequate facilities and services (including roads and transportation, water, gas, electric, police and fire protection, and sewage and waste disposal, as applicable) will be available to serve the subject property while maintaining adequate levels of service to existing development
- The rezoning is not likely to result in significant adverse impacts upon the natural environment, including air, water, noise, storm water management, wildlife, and vegetation, or such impacts will be substantially mitigated
- The rezoning is not likely to result in significant adverse impacts upon other property in the vicinity of the subject property
- Future uses on the subject property will be compatible in scale with uses on other properties in the vicinity of the subject property

NEXT STEPS

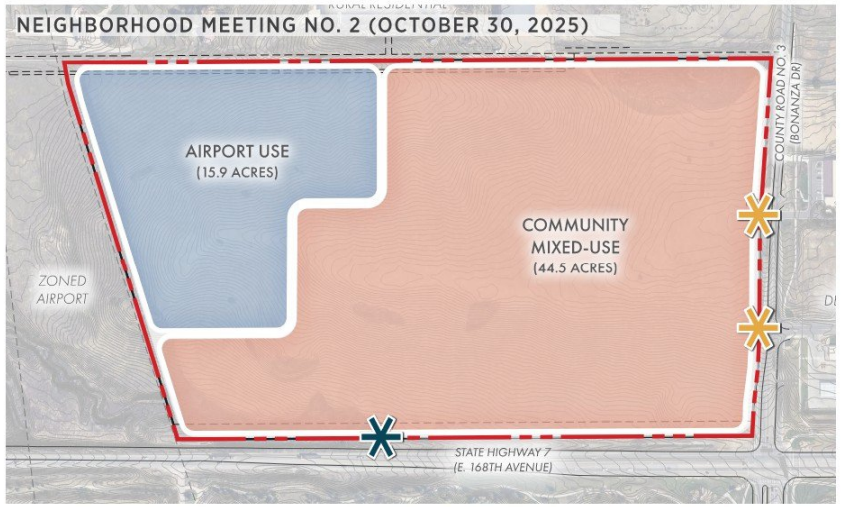

Rezone & Subdivision go to Town Council
Site Plan Review and Revision Process
Initial Building Permit Application
Building Permit Approval
Initial Site Plan Application
Site Plan Approval
Building Permit Review & Revision Process
Construction Begins

QUESTIONS?

PREVIOUS CONCEPTUAL ZONING PLAN



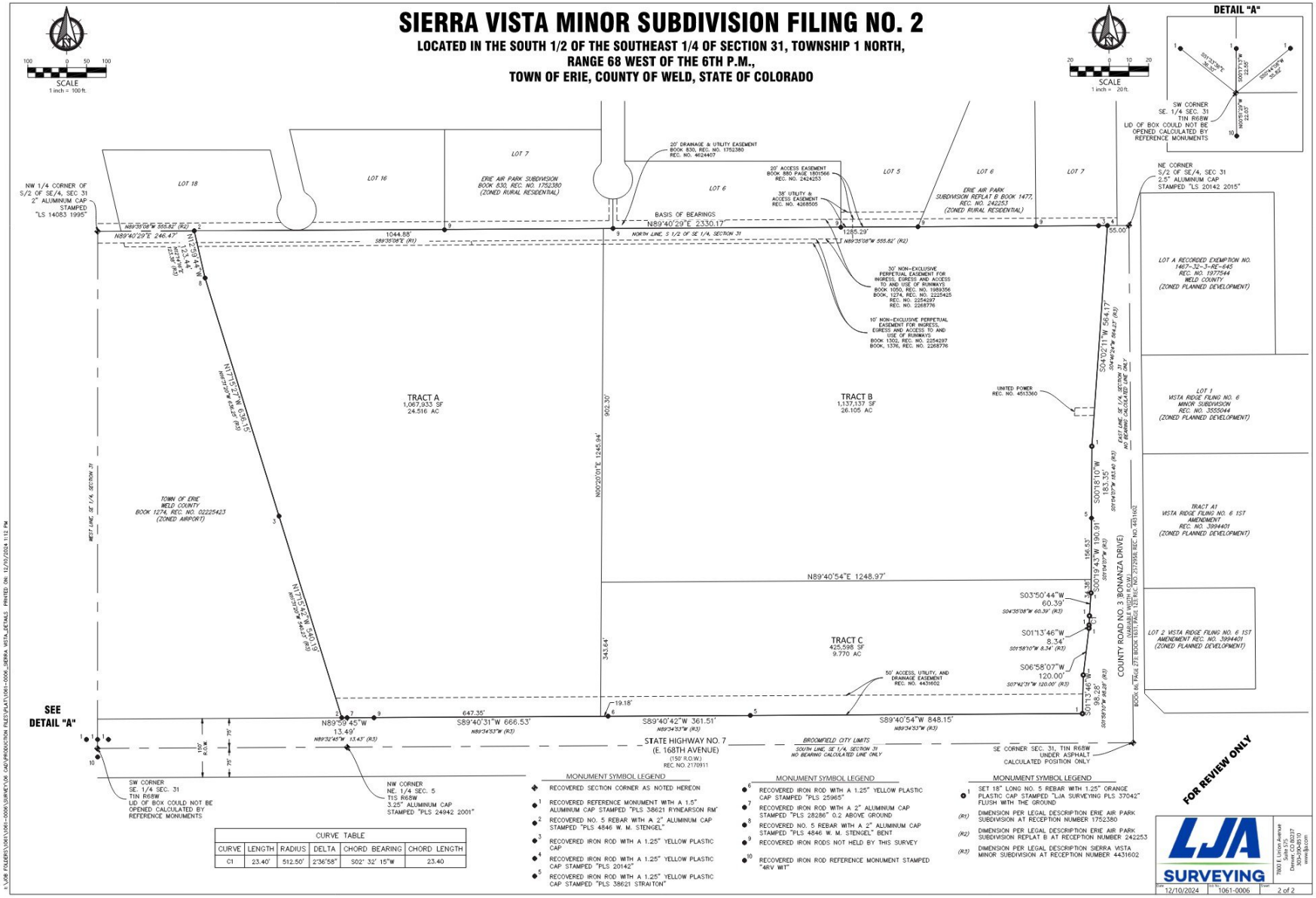
CURRENT CONCEPTUAL ZONING PLAN



***All vehicle entries are conceptual and subject to change.**

Proposed Two-way Stop

Proposed Right-in / Right-out


SIERRA VISTA MINOR SUBDIVISION FILING NO. 2
LOCATED IN THE SOUTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 31, TOWNSHIP 1 NORTH,
RANGE 68 WEST OF THE 6TH P.M.,
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO
SCALE
1 inch = 100 ft.
SCALE
1 inch = 20 ft.
DETAIL "A"
SW CORNER
SE. 1/4 SEC. 31
T1N R68W
LID OF BOX COULD NOT BE
OPENED CALCULATED BY
REFERENCE MONUMENTS
NW 1/4 CORNER OF
S/2 OF SE/4, SEC 31
2" ALUMINUM CAP
STAMPED
"LS 14083 1995"
NE CORNER
S/2 OF SE/4, SEC 31
2.5" ALUMINUM CAP
STAMPED "LS 20142 2015"
BASIS OF BEARINGS
N89°40'29"E 2330.17'
NORTH LINE, S 1/2 OF SE 1/4, SECTION 31
N89°40'29"E 246.47'
1044.88'
S89°35'08"E (R1)
1285.29'
N89°35'08"W 555.82' (R2)
55.00'
LOT 18
LOT 16
LOT 7
ERIE AIR PARK SUBDIVISION
BOOK 830, REC. NO. 1752380
(ZONED RURAL RESIDENTIAL)
LOT 6
LOT 5
LOT 6
LOT 7
ERIE AIR PARK
SUBDIVISION REPLAT B BOOK 1477,
REC. NO. 242253
(ZONED RURAL RESIDENTIAL)
20' DRAINAGE & UTILITY EASEMENT
BOOK 830, REC. NO. 1752380
REC. NO. 4624407
20' ACCESS EASEMENT
BOOK 880 PAGE 1801566
REC. NO. 2424253
35' UTILITY &
ACCESS EASEMENT
REC. NO. 4268505
30' NON-EXCLUSIVE
PERPETUAL EASEMENT FOR
INGRESS, EGRESS AND ACCESS
TO AND USE OF RUNWAYS
BOOK 1050, REC. NO. 1989356
BOOK, 1274, REC. NO. 2225425
REC. NO. 2254297
REC. NO. 2268776
10' NON-EXCLUSIVE PERPETUAL
EASEMENT FOR INGRESS,
EGRESS AND ACCESS TO AND
USE OF RUNWAYS
BOOK 1302, REC. NO. 2254297
BOOK, 1376, REC. NO. 2268776
LOT A RECORDED EXEMPTION NO.
1467-32-3-RE-645
REC. NO. 1977544
WELD COUNTY
(ZONED PLANNED DEVELOPMENT)
LOT 1
VISTA RIDGE FILING NO. 6
MINOR SUBDIVISION
REC. NO. 3555044
(ZONED PLANNED DEVELOPMENT)
TRACT A1
VISTA RIDGE FILING NO. 6 1ST
AMENDMENT
REC. NO. 3994401
(ZONED PLANNED DEVELOPMENT)
LOT 2 VISTA RIDGE FILING NO. 6 1ST
AMENDMENT REC. NO. 3994401
(ZONED PLANNED DEVELOPMENT)
TRACT A
1,067,933 SF
24.516 AC
TRACT B
1,137,137 SF
26.105 AC
TRACT C
425,598 SF
9.770 AC
UNITED POWER
REC. NO. 4513360
TOWN OF ERIE
WELD COUNTY
BOOK 1274, REC. NO. 02225423
(ZONED AIRPORT)
WEST LINE, SE 1/4, SECTION 31
EAST LINE, SE 1/4, SECTION 31
N00°20'01"E 1245.94'
902.30'
343.64'
S04°02'11"W 564.17'
S04°46'32"W 564.23' (R3)
S01°18'10"W
183.15'
S01°19'43"W 183.40' (R3)
S00°19'43"W 190.91'
S01°19'43"W (R3)
196.63'
S00°19'43"W 196.63'
S01°19'43"W (R3)
N89°40'54"E 1248.97'
S03°50'44"W
60.39'
S04°35'08"W 60.39' (R3)
S01°13'46"W
8.34'
S01°58'10"W 8.34' (R3)
S06°58'07"W
120.00'
S07°42'31"W 120.00' (R3)
S01°13'46"W
98.42'
S01°58'10"W 98.42' (R3)
COUNTY ROAD NO. 3 BONANZA DRIVE)
(PUBLIC ACCESS ESTABLISHED BY USE)
BOOK 66, TRACT 272, BOOK 1302, REC. NO. 2372956, REC. NO. 4431602
N12°59'44"W
123.44'
N12°59'44"W 123.44' (R3)
N11°15'25"W 1161.63'
N11°15'25"W 1161.63' (R3)
N11°15'25"W 540.09'
N11°15'25"W 540.09' (R3)
647.35'
S89°40'31"W 666.53'
N89°34'53"W (R3)
19.18'
S89°40'42"W 361.51'
N89°34'53"W (R3)
S89°40'54"W 848.15'
N89°34'53"W (R3)
N89°59'45"W
13.49'
N89°32'40"W 13.43' (R3)
SEE
DETAIL "A"
100'
R.O.W.
75'
75'
STATE HIGHWAY NO. 7
(E. 168TH AVENUE)
(150' R.O.W.)
REC. NO. 2170911
BROOMFIELD CITY LIMITS
SOUTH LINE, SE 1/4, SECTION 31
NO BEARING CALCULATED LINE ONLY
50' ACCESS, UTILITY, AND
DRAINAGE EASEMENT
REC. NO. 4431602
SE CORNER SEC. 31, T1N R68W
UNDER ASPHALT
CALCULATED POSITION ONLY
SW CORNER
SE. 1/4 SEC. 31
T1N R68W
LID OF BOX COULD NOT BE
OPENED CALCULATED BY
REFERENCE MONUMENTS
NW CORNER
NE. 1/4 SEC. 5
T1S R68W
3.25" ALUMINUM CAP
STAMPED "PLS 24942 2001"
CURVE TABLE
CURVE | LENGTH | RADIUS | DELTA | CHORD BEARING | CHORD LENGTH
C1 | 23.40' | 512.50' | 2°36'58" | S02° 32' 15"W | 23.40
MONUMENT SYMBOL LEGEND
RECOVERED SECTION CORNER AS NOTED HEREON
1 RECOVERED REFERENCE MONUMENT WITH A 1.5" ALUMINUM CAP STAMPED "PLS 38621 RYNEARSON RM"
2 RECOVERED NO. 5 REBAR WITH A 2" ALUMINUM CAP STAMPED "PLS 4846 W. M. STENGEL"
3 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP
4 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 20142"
5 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 38621 STRAITON"
MONUMENT SYMBOL LEGEND
6 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 25965"
7 RECOVERED IRON ROD WITH A 2" ALUMINUM CAP STAMPED "PLS 28286" 0.2 ABOVE GROUND
8 RECOVERED NO. 5 REBAR WITH A 2" ALUMINUM CAP STAMPED "PLS 4846 W. M. STENGEL" BENT
9 RECOVERED IRON RODS NOT HELD BY THIS SURVEY
10 RECOVERED IRON ROD REFERENCE MONUMENT STAMPED "4RV WIT"
MONUMENT SYMBOL LEGEND
1 SET 18" LONG NO. 5 REBAR WITH 1.25" ORANGE PLASTIC CAP STAMPED "LJA SURVEYING PLS 37042" FLUSH WITH THE GROUND
(R1) DIMENSION PER LEGAL DESCRIPTION ERIE AIR PARK SUBDIVISION AT RECEPTION NUMBER 1752380
(R2) DIMENSION PER LEGAL DESCRIPTION ERIE AIR PARK SUBDIVISION REPLAT B AT RECEPTION NUMBER 242253
(R3) DIMENSION PER LEGAL DESCRIPTION SIERRA VISTA MINOR SUBDIVISION AT RECEPTION NUMBER 4431602
FOR REVIEW ONLY
LJA SURVEYING
7800 E. Union Avenue
Suite 375
Denver, CO 80237
303-843-8510
www.ljaco.com
Date 12/10/2024
Job No. 1061-0006
Sheet 2 of 2
L:\JOB FOLDERS\1061\1061-0006\SURVEY\06 CAD\PRODUCTION FILES\PLAT\1061-0006_SIERRA VISTA_DETAILS PRINTED ON: 12/10/2024 1:12 PM

Applicant Submittals:

a. Rezoning
https://portal.laserfiche.com/Portal/Browse.aspx?id=328399&repo=r-a69d230a

b. Minor Subdivision
https://portal.laserfiche.com/Portal/Browse.aspx?id=304796&repo=r-a69d230a

From:	Chris LaRue
To:	"Ted Harberg"
Cc:	Lynn Merwin; Katie Allen; cmocrew
Subject:	RE: 3rd Referral Review - ZON2025-00005 Sierra Vista Rezoning & SUB2025-00006 Sierra Vista Minor Subdivision
Date:	Wednesday, February 25, 2026 4:53:00 PM
Attachments:	image001.png image002.png 2. Avigation Review.pdf 3. Erie Airport - Manager Correspondence.pdf

Hello Ted:

Thanks for sharing the letter from the City. The applicants wanted to make sure you received the attached two documents to see if that had any impact on Broomfield's comments.

Thank you, and we look forward to hearing from you.

Chris LaRue | Principal Planner
Planning & Development

Town of Erie
645 Holbrook Street | P.O. Box 750 | Erie, CO 80516
Phone: 720-745-1030
www.erieco.gov | Facebook | Twitter | LinkedIn

From: Ted Harberg <tharberg@broomfield.org>
Sent: Friday, January 16, 2026 2:25 PM
To: Development Referral <developmentreferral@erieco.gov>
Cc: Lynn Merwin <lmerwin@broomfield.org>; Katie Allen <kallen@broomfield.org>; cmocrew <CMOcrew@broomfield.org>
Subject: Fwd: 3rd Referral Review - ZON2025-00005 Sierra Vista Rezoning & SUB2025-00006 Sierra Vista Minor Subdivision

External Email: Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good afternoon,

Please see the attached comment letter from Broomfield regarding the 3rd Referral Review for ZON2025-00005 Sierra Vista Rezoning & SUB2025-00006 Sierra Vista Minor Subdivision.

Will you also please confirm that no public hearings have yet been scheduled for this application?

Thank you,

Ted Harberg
Senior Planner, AICP
City and County of Broomfield
Direct: 303-438-6362

Planning Division web page

Applications are now open for the City and County of Broomfield Boards and Commissions. Learn more or apply today! Applications close Jan. 30.

Please visit the Broomfield Community Development Department *web page or* *Broomfield.org/FindMyService* *to view ways to access all Broomfield City and County services.*

---------- Forwarded message ---------
From: **Melinda Helmer** <mhelmer@erieco.gov>
Date: Tue, Dec 23, 2025 at 12:52 PM
Subject: 3rd Referral Review - ZON2025-00005 Sierra Vista Rezoning & SUB2025-00006 Sierra Vista Minor Subdivision
To: john@coloradols.com <john@coloradols.com>, Timothy Bilobran - CDOT <timothy.bilobran@state.co.us>, Kloska - CDOT, Jeff <jeff.kloska@state.co.us>, Bradley Sheehan - CDOT <bradley.sheehan@state.co.us>, planningapps@broomfield.org <planningapps@broomfield.org>
Cc: Chris LaRue <clarue@erieco.gov>

Good afternoon,

Please see the link for 3rd Referral Review submittal documents on the above noted projects:

Rezoning: https://portal.laserfiche.com/Portal/Browse.aspx?id=328398&repo=r-a69d230a

Minor Subdivision: https://portal.laserfiche.com/Portal/Browse.aspx?id=304795&repo=r-a69d230a

Referral comments are due back by January 20, 2026. Staff DRT is scheduled for January 22, 2026.
Please forward referral comments to developmentreferral@erieco.gov

Please let me know if you have any questions.

Regards,

Melinda Helmer, CMC | Business Operations Coordinator
Town of Erie | Planning & Development
645 Holbrook Street | P.O. Box 750 | Erie, CO 80516
Cell: 720-745-1062
https://www.erieco.gov/108/Planning-Development| Facebook | Twitter | LinkedIn

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compassion.

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You received this message because you are subscribed to the Google Groups "Planning Applications" group.
To unsubscribe from this group and stop receiving emails from it, send an email to PlanningApps+unsubscribe@broomfield.org.
To view this discussion visit https://groups.google.com/a/broomfield.org/d/msgid/PlanningApps/SA9PR09MB601542BF64866D9B905C9633CBB5A%40SA9PR09MB6015.namprd09.prod.outlook.com.

October 16, 2025

Blake Carlson
BC Land, LCC
Broomfield, CO 80023

Subject: Sierra Vista Rezoning

We are writing to provide clarification regarding the recent recommendations to protect the property within the Runway Protection Zone (RPZ) and non-precision approach surfaces associated with Erie Municipal Airport, specifically land between the south end of Runway 15-33 and State Highway 7 adjacent to your proposed development.

This recommendation is provided solely to enhance safety and ensure compliance with Federal Aviation Administration (FAA) guidelines concerning land use compatibility. The RPZ and approach surfaces are critical safety buffers designed to protect people and property on the ground in the event of an aircraft overrun or undershoot during landing or takeoff. This is best achieved through restricting development and use.

There are no expectations that increases in air traffic, or changes in the airport's operational footprint will be induced as a result of this rezoning. The portion of the property that is being proposed as Airport (AP) zoning is compatible with FAA guidelines and must be maintained in accordance with FAA standards for RPZ land use and approach protection, which prohibit structures, public gatherings, and other incompatible uses within the safety zone. We wish to emphasize that this recommendation is not in support any expansion of airport operations or activities.

This measure is strictly precautionary and reflects efforts to protect public safety and responsible airport stewardship. Should you have any questions or require further documentation, please feel free to contact me at 303-275-8030 or Jeremy.Lee@meadhunt.com.

Sincerely,

MEAD & HUNT, Inc.

Jeremy K. Lee, PE
Project Manager

From: Blake Carlson
To: Beccah Bailey; Heidi Majerik
Subject: Erie Airport - Manager
Date: Wednesday, October 29, 2025 7:16:41 PM

Blake -

Just a fallow up to the conversation you and I had recently regarding your property located southeast of the Erie Municipal airport bordered by highway 7 and Bonanza drive.

As we discussed the airport already has an easement on the western portion of your property that protects the airspace off the approach end to runway 34. This area is referred to as the RPZ (Runway Protection Zone). Provided your development doesn't violate the easements already in place to protect the RPZ there would be no changes in the way aircraft operate in that area. Additionally there would be no change in the airport aircraft traffic pattern and no change to the approach and departure corridor reserved for aircraft landing to the north and departing to the south off the main runway.

The opportunity for the Town of Erie to potentially own the western portion of your parcel of land including the area where the PRZ exists would have a significantly positive impact on the Erie Municipal Airport.

Owning the portion of property that is within the RPZ area vs controlling it as we do now with easements would solidify the airports ability to protect the RPZ. The FAA has always preferred we own these safety area vs controlling them with easements although this is not always possible. Any other portion of the land that the Airport could potentially acquire that is not currently reserved for the RPZ, long term could potentially be developed in the future for aircraft hangars or some other airport use. Of the property available for development on and around the airport it's my opinion that the western portion of your property is the most challenging given the steep grade and amount of dirt work necessary to make the site buildable. As for any concerns about additional hangar development significantly impacting/increasing overall airport operations I do not believe the data will support that. We have recently installed aircraft tracking software that provides data on number and type of aircraft operations. We have only been collecting data for approximately 4 months and the data is already showing what I have always suspected, that the majority of the operations (takeoffs and landings) are flight school aircraft performing flight training activities from Erie and the majority coming from surrounding airports. Privately owned recreational aircraft based at the Erie airport tend to have a minimal impact on overall operations and over the coming months we will have tangible data to actually compare based vs non based and recreational vs flight training operations.

Lastly as we discussed, any structures built on your property will be required to have an FAA obstruction evaluation/Airport Airspace Analysis to ensure these structures do not present a hazard to navigable airspace. This is standard for construction near airports.

I hope this information is helpful. Please do not hesitate to contact me with any additional questions/concerns.

Regards,

Jason Hurd
Airport Manger - Erie Municipal Airport.

Sierra Vista – Rezoning with Minor Subdivision 1st Review

Planning & Development

To: Beccah Bailey, Norris Design
From: Aly Burkhalter, Senior Planner
Date: August 21, 2025
Re: ZON2025-00005 Sierra Vista Rezoning

Planning Division Comments

The Planning Division has reviewed the applications for the Sierra Vista Rezoning concurrent with Minor Subdivision for conformance with Municipal Code, Title 10. A Minor Subdivision land use application is required with this rezoning as no lot shall be divided by a zone district boundary line per UDC 10-5-4.D.4. Comments for both the rezoning and minor subdivision application are contained within this memo. Other Town staff and outside referral agency comments can be found in eTRAKiT project portal under Reviews and found in Attachments. Referral comments received by the Town after the date of this memo shall be uploaded in eTRAKit.

The next step for the application is revision and resubmittal for another referral and Development Review Team review. Please make the appropriate revisions to the application materials and provide written response to address each written comment from the Town staff and referral agencies. All resubmittals shall be submitted via eTRAKiT.

Rezoning Comments

These comments are organized by submittal requirement. All submittal requirements are listed for record keeping and may not require revision or response. Please provide written response to all comments in red.

1) **Land Use Application** – Provided.
   a) Please update Land Use Application Project Description: "and +/-5.9 ACRES FROM COMMUNITY COMMERCIAL TO COMMUNITY MIXED USE"
   b) Please update Development Review Fees to "All Other Zoning/Rezoning" as you are not requesting Planned Development (PD) zoning.
2) **Pre-Application Meeting** notes and comments. – Provided.
3) **Application fee** – Paid online
4) **Proof of ownership** – provided a Title Commitment dated 2/6/2025. Staff waived that the title was older than 30 days.
5) **Letter of authorization** - Provided
6) **Copies of any special agreements** – Applicant did not provide. Staff acquired via reception numbers provided with the Title Commitment
   a) **Annexation Agreement:** Staff reviewed the Annexation and did not find anything to impact the Rezoning application.
   b) **Avigation easement:** The avigation easement does have rights to limit structures which is not dictated within the Rezoning or dimensional standards of the proposed zone districts.
   c) Metro District: Record of Dissolution on 6/10/2019 (Reception #4496042)
7) **Written narrative**, describing the proposed development which at a minimum provides the following information:

a) General project concept and purpose of the request – provided
b) Proposed development time-line – please provide
c) How the proposal relates to the existing land-use of the subject property and the zoning and land-use of adjacent properties, including statements describing areas of compatibility and conflict and the mitigation measures utilized – Please describe areas of compatibility and conflict and the mitigation measures utilized for each of the adjacent land uses listed. Include this in an updated Written Narrativr.
   - Airport to the west
   - Rural Residential to the north
   - Planned Development to the east
   - City of Broomfield, Planned Unit Development to the south
d) How the proposal complies with the Town's Comprehensive Plan and rezoning approval criteria – provided
e) A description regarding the status of mineral rights and the substance of any existing or proposed covenants, special conditions, grants of easements, or other restrictions applying to the proposed subdivision – please provide

8) ALTA/ASCM Land Title Survey – provided

10) Zoning Map shall be prepared by or under the supervision of a registered professional land surveyor licensed with the State of Colorado for recording in the office if the County Clerk and Recorder. The zoning map shall contain the following information:
a) A title block (both sheets) shall provide:
   i) total acreage
   ii) number ZON2025-00005
b) A block in the lower right hand corner shall include:
   i) revision date chronology (both sheets)
   ii) north arrow designated as true north (sheet 2)
   iii) written and graphic scale (sheet 2)
c) For subdivided land, label all property lines with bearings, distance, curve data and lot/block numbers as shown on the final plat; → See Zone Map redlines
d) For proposals requesting multiple zone districts, label all zone district boundary lines with bearing, distance and curve data – provided
e) A scaled vicinity map that depicts the area around the proposal within a 1-mile radius – provided
f) A written legal description for subdivided property or a written metes and bounds description of the site's boundary for unsubdivided property – provided
g) A written legal description for each zone district indicated on the map – provided
h) Depict existing subdivision lot lines or metes and bounds property lines and rights-of-way within 100' of the proposal. Said information for adjacent properties shall be screened back → Please screen back adjacent property information
i) Identify the land use and zone district information of all adjacent property. When an adjacent property is not within the Town's boundary, the respective jurisdictions' land use and zone district information shall be identified – provided
j) Please update to Town Council Approval Certificate

   TOWN COUNCIL APPROVAL CERTIFICATE

   THIS ZONING MAP IS TO BE KNOWN AS THE "_____ ZONING MAP" AND IS APPROVED AND ACCEPTED BY ORDINANCE NO. _____, PASSED AND ADOPTED OF ERIE, COLORADO, HELD ON _____ _____, 20____.

   _____

MAYOR

ATTEST _____
TOWN CLERK

11) Concept Plan shall be prepared on 24" x 36" sheet size at a scale no greater than 1" = 200'. The Concept Plan shall show the general location of proposed streets, lots, tracts, parks, open space, trails, drainage facilities and existing and proposed oil/gas wells and their associated setbacks – provided
    a) Scale is greater tha 1" = 200' and staff waives that requirement at this time.
    b) Please add label or legend to indicate dashed lines are proposed streets
    c) Please provide zone district boundaries on concept plan
    d) The CMU zone district shall be subject to UDC 10-6-8.B. and Table 6.8-1, which requires a minimum 3 principal uses (residential, office, commercial and public/institutional use groups). Each required principal use shall occupy a minimum of 25 percent of the gross floor area of the entire CMU or NMU district development area. → **please indicate on the Concept Plan how you intend to meet this criteria.**
        i) Please include maximum residential density to coordinate with TIA
        ii) Please include maximum gross floor area to coordinate with TIA
12) Development Reports/Studies:
    a) An Assessment of Impact Report, detailing the impact the proposed development may have on Town, County, Special District, and utility facilities and services, including but not limited to:
        i) water and wastewater → Explanation is insufficient. Please provide more information. Incorrectly references Comp Plan designation of LDR.
        ii) open space and recreation – Applicant should acknowledge future conformance with Park and Open Space Dedication requirements per Municipal Code and Annexation Agreement as PROST did not account for parks in this area.
        iii) law enforcement – Provided
        iv) fire protection – Not provided. Mountain View did receive referral but did not comment.
        v) schools– Provided
        vi) general utilities (electric, gas, telephone) – Provided
    b) **Market Study or Economic Impact Study**– waived by Economic Development
    c) **Phase I Drainage Report**– Report provided. Plan waived by Engineering. Please see Engineering Review.
    d) **Traffic Impact Study** – provided. Please see Transportation Review.

Rezoning Approval Criteria

Below is the staff review for approval criteria for the Land Use Application type of Rezoning per UDC 10-7-5:

a. The rezoning will promote the public health, safety, and general welfare →
    i. There is low subsidence hazards per the Mine Subsidence Evaluation memo
    ii. There is no oil & gas hazards.
    iii. There is airport influence that is considered appropriate for the AP zoning and will need to be evaluated for appropriate future CMU uses.
b. The rezoning is generally consistent with the town's comprehensive plan and the purposes of this UDC;

i. Per UDC 10-2-4.D. *Community mixed-use district (CMU):* The purpose of the CMU zone district is to provide for a community-serving mixed-use development at a higher scale than is appropriate for neighborhood locations. The CMU district is intended for use along key transportation corridors and at important nodes in the town on sites of five acres or larger. The CMU district is intended to include commercial, institutional, recreational, and service facilities needed to support surrounding neighborhoods and the community at-large. Medium to higher-density housing should be incorporated within or located around the CMU zone district, and development should facilitate pedestrian connections between residential and nonresidential land uses.
    i. This project site located along a key transportation corridor
    ii. This project site is larger than 5-acres
    iii. The project is intended to include commercial (retail), public institutional (medical offices) and higher density residential uses
    iv. It has not yet been reviewed what pedestrian connection can be made.
ii. Per UDC 10-2-5.C. Airport (AP): The purpose of the AP zone district is to provide areas for the development of airport land uses. The area is also regulated by the airport overlay (APO) zone district.
    i. This is consistent with the project

c. Adequate facilities and services (including streets and transportation, water, gas, electric, police and fire protection, and sewage and waste disposal, as applicable) will be available to serve the subject property while maintaining adequate levels of service to existing development → See Impact Report comments. Please provide additional information
d. The rezoning is not likely to result in significant adverse impacts upon the natural environment, including air, water, noise, storm water management, wildlife, and vegetation, or such impacts will be substantially mitigated; → Expansion of Airport uses may have significant adverse impacts upon the natural environment. Please explain how those impacts may be impacted.
e. The rezoning is not likely to result in significant adverse impacts upon other property in the vicinity of the subject property→ Expansion of Airport uses may have significant adverse impacts upon other property in the vicinity of the subject property. Please explain how those impacts may be impacted.
f. Future uses on the subject property will be compatible in scale with uses on other properties in the vicinity of the subject property → Airport uses are consistent with adjacent airport. Commercial uses are consistent with Vista Ridge commercial. Residential uses are consistent with Erie Airpark residential uses.
g. The rezoning is generally consistent with the town's economic development goals and objectives in bring positive growth and sustainable revenues to the town. → Economic Development supports this criteria.

Minor Subdivision Comments

These comments are organized by submittal requirement for a Minor Subdivision. All submittal requirements are listed for record keeping and may not require revision or response. Please provide written response to all comments in red.

1) **Land Use Application**→ provided
2) **Pre-Application Meeting** notes and comments. → provided
3) **Application fee**→ provided

4) **Written narrative**, describing the proposed development which at a minimum provides the following information:
   a) General project concept and purpose of the request → provided
   b) The total land area to be subdivided → provided
   c) The total number of lots, and if residential the proposed density → Total lots provided. Residential density is requested to be part of the Rezoning application Concept Plan
   d) If non-residential, the total square footage of floor area proposed; → requested to be part of the Rezoning application Concept Plan
   e) The total land area to be preserved as open space → requested to be part of the Rezoning application Concept Plan
   f) A brief description regarding the phasing of the proposed subdivision → not required for a zoning replat
   g) A brief description regarding the availability and adequacy of existing infrastructure and other necessary services including schools, fire protection, water/sewer service, and utility providers → provided with Zoning Impact Report
   h) A brief description regarding the location, function and ownership/ maintenance of public and private open space, parks, trails, common areas, common buildings → not required for a zoning replat
   i) A brief description regarding the substance of any existing or proposed covenants, special conditions, grants of easements, or other restrictions applying to the proposed subdivision. →Please provide
5) **Proof of ownership** → provided
6) **Letter of authorization**→ provided to process the application, when the landowner is not the applicant.
7) **Special agreements**, oil/gas surface use agreements, conveyances, restrictions, or covenants that will govern the use and/or maintenance of the proposed development, or statement that no such agreements exist. → Applicant did not provide.
8) **ALTA/ACSM Land Title Survey** → provided
9) **Engineered cost estimates for public improvements** → not required. No public improvements as part of rezoning application and plat.
10) **Minor Subdivision Final Plat Exhibit**
   a) Please provide the total acreage, number of lots proposed, and project file number
   b) A block in the lower right hand corner shall include revision date chronology
   c) Depict existing subdivision lot lines or metes and bounds property lines and rights-of-way within 100' of the proposal. Said information for adjacent properties shall be screened back. Please update adjacent property line work for Vista Ridge Filing NO. 6, 2nd Amendment, including Commons Dr.
   d) Please remove the Board of Trustees Approval Certificate. It is not required for a Minor Subdivision that does not include dedications or easements to the Town.
11) **Phase III Drainage Report and Construction Plans** → waived to Phase 1 Drainage Report by Project Engineer.
12) **Final Erosion and Sediment Control Plans and a Stormwater Management Plan** → Waived by Project Engineer
13) **Final Area Grading Plan** → Waived by Project Engineer
14) **Final Road Construction Plans** → No roads proposed with rezoning application.
15) **Final Utility Construction plan and Utility Report** → Waived by Project Engineer
16) **Final Landscape Construction Plans** → Not required with rezoning
17) **Geological Report** → Provided. No subsidence concerns with this application. May review and provide further comment at future plat or site plan.

18) **Traffic Impact Study** → Provided. See Transportation Comments.
19) **Threatened and Endangered Species, Habitat, and Wetlands** report → not required
20) **Cultural Archaeological, and Historical Resource Report and Protection Plan.** → not required
21) **Native Tree and Vegetation Survey and Protection Plan** → not required
22) **Environmental Hazards Report** → not required
23) **Addressing Plat** → not required
24) Any additional information or referral documents as required by the Planning & Development Director, in order to thoroughly review the impacts of the proposed development. → Part 77 Maps provided for Airport Influence review

The review process is a cumulative process and dependent on various criteria. We reserve the right to provide further comment(s) and request additional information.

Process Informational Comments

No response required as these are informational comments.

Concurrent Reviews

A Minor Subdivision land use application is required with this rezoning as no lot shall be divided by a zone district boundary line per UDC 10-5-4.D.4. The Minor Subdivision upon approval will be recorded at the time of the Zoning Map recording. The Minor Subdivision may be ready for recording prior to the zoning approval, but will not be recorded until the zoning is recorded.

Neighborhood Meeting

A neighborhood meeting is required for all rezoning applications. The requirements of the neighborhood meeting can be found in Municipal Code section 10.7.2 D. **Staff would like to see the resubmittal before a neighborhood meeting takes place.**

Public Hearings

Your Rezoning application requires a public hearing & recommendation by Planning Commission and public hearing & decision by Town Council. Staff will not schedule the public hearing until there are no more significant comments and the neighborhood meeting has taken place. Staff will provide later instructions for public hearing when they deem this application ready for public hearing.

Please contact me at 303-981-5985 or aburkhalter@erieco.gov for further clarification. Staff would be happy to schedule a virtual meeting to discuss the comments and answer any questions.

Sincerely,

Aly Burkhalter | Senior Planner

Planning & Development
Pronouns: *She / Her / Hers* (What's this?)

Town of Erie
Street Address | P.O. Box 750 | Erie, CO 80516
Phone: 303-981-5985
www.erieco.gov | Facebook | Twitter | LinkedIn

Enhancing the quality of life by serving and building Erie with PRIDE.

Ehrhart Land Survey Comments in Blue with Red outline

Planning Comments in Red with no outline

SIERRA VISTA ZONING

LOCATED IN THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH,RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

LEGAL DESCRIPTION AP ZONING PARCEL

A PARCEL OF LAND BEING A PORTION ON THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING ALSO A PORTION OF TRACT A AND TRACT B OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31; THENCE NORTH 89°40'29" EAST, ON THE NORTH LINE OF SAID SOUTH HALF, A DISTANCE OF 246.47 FEET TO THE NORTHWESTERLY CORNER OF SAID TRACT B, SAID POINT BEING THE **POINT OF BEGINNING**;

THENCE CONTINUING NORTH 89°40'29" EAST, ON THE LINE COMMON TO SAID NORTH LINE OF THE SOUTH HALF AND THE NORTH LINE OF SAID TRACT B, A DISTANCE OF 1,044.88 FEET;

THENCE SOUTH 00°20'01" WEST A DISTANCE OF 1245.94 FEET TO THE SOUTH LINE OF SAID TRACT A, BEING ALSO THE NORTH RIGHT-OF-WAY LINE OF COLORADO STATE HIGHWAY NO. 7 (EAST 168TH AVENUE) AS DESCRIBED IN THAT SPECIAL WARRANTY DEED RECORDED FEBRUARY 15, 1989 IN SAID RECORDS UNDER RECEPTION NUMBER 2170911;

THENCE ON THE SOUTH LINE OF SAID TRACT A AND SAID NORTH RIGHT-OF-WAY LINE THE FOLLOWING (2) TWO COURSES:

1. SOUTH 89°40'31" WEST A DISTANCE OF 647.35 FEET,

2. NORTH 89°59'45" WEST A DISTANCE OF 13.49 FEET TO THE SOUTHWESTERLY CORNER OF SAID TRACT A;

THENCE NORTH 17°15'42" WEST, ON THE WESTERLY LINE OF SAID TRACT A, A DISTANCE OF 540.19 FEET TO A POINT ON THE WESTERLY LINE OF SAID TRACT B;

THENCE ON SAID WESTERLY LINE THE FOLLOWING (2) TWO COURSES:

1. NORTH 17°15'27" WEST, ON SAID WESTERLY LINE, A DISTANCE OF 636.15 FEET;

2. NORTH 12°59'44" WEST A DISTANCE OF 123.44 FEET TO THE **POINT OF BEGINNING.**

CONTAINING A CALCULATED AREA OF 24.5 ACRES (1,067,934 SQUARE FEET), MORE OR LESS.

LEGAL DESCRIPTION HR ZONING PARCEL

A PARCEL OF LAND BEING A PORTION ON THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING ALSO A PORTION OF TRACT A, TRACT B AND TRACT C OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31; THENCE NORTH 89°40'29" EAST, ON THE NORTH LINE OF SAID SOUTH HALF, A DISTANCE OF 246.47 FEET TO THE NORTHWESTERLY CORNER OF SAID TRACT B; THENCE CONTINUING NORTH 89°40'29" EAST, ON THE LINE COMMON TO SAID NORTH LINE OF THE SOUTH HALF AND THE NORTH LINE OF SAID TRACT B, A DISTANCE OF 1,044.88 FEET THE **POINT OF BEGINNING;**

THENCE CONTINUING NORTH 89°40'29" EAST, ON THE LINE COMMON TO SAID NORTH LINE OF THE SOUTH HALF AND THE NORTH LINE OF SAID TRACT B, A DISTANCE OF 1,285.29 FEET TO THE NORTHEASTERLY CORNER OF SAID TRACT B, BEING ALSO THE WESTERLY RIGHT-OF-WAY LINE OF BONANZA DRIVE;

THENCE ON THE LINE COMMON TO SAID TRACT B AND SAID WESTERLY RIGHT-OF-WAY LINE THE FOLLOWING (2) TWO COURSES:

1. SOUTH 04°02'11"W A DISTANCE OF 564.17 FEET;
2. SOUTH 00°18'10" WEST A DISTANCE OF 183.35 FEET TO THE SOUTHEASTERLY CORNER OF SAID TRACT B;

THENCE SOUTH 00°19'43" WEST, ON THE LINE COMMON TO THE EASTERLY LINE OF SAID TRACT C AND SAID WESTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 156.53 FEET;

THENCE SOUTH 89°40'54" WEST A DISTANCE OF 1,248.97 FEET;

THENCE NORTH 00°20'01" EAST A DISTANCE OF 902.30 FEET TO THE **POINT OF BEGINNNG.**

CONTAINING A CALCULATED AREA OF 26.1 ACRES (1,137,144 SQUARE FEET), MORE OR LESS.

GENERAL NOTES

1.BASIS OF BEARINGS: THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN IS ASSUMED TO BEAR NORTH 89°29'51" EAST BASED ON NAD83 (2011) COLORADO STATE PLANE NORTH ZONE (501) COORDINATES, BEING MONUMENTED AT THE WEST END BY A 2" ALUMINUM CAP STAMPED, "PLS 14083 1995" RECOVERED 0.2' BELOW THE SURFACE, BEING THE NORTHWEST CORNER OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1 AND ON THE EAST END BY A 2-1/2" ALUMINUM CAP STAMPED, "PLS 20142 2015" RECOVERED 0.3' BELOW THE SURFACE, BEING THE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1.

2. 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.

3. THIS MAP WAS PREPARED WITHOUT ANY BENEFIT OF A CURRENT TITLE COMMITMENT AND DOES NOT CONSTITUTE A TITLE SEARCH BY LJA SURVEYING, INC.TO DETERMINE OWNERSHIP, RIGHTS-OF-WAY, EASEMENTS OR OTHER MATTERS OF PUBLIC RECORD.

Provide total acreage





VICINITY MAP
SCALE: 1" = 1000'

LEGAL DESCRIPTION CC ZONING PARCEL

There are multiple references to the POB.

A PARCEL OF LAND BEING A PORTION ON THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING ALSO A PORTION OF TRACT A, TRACT B AND TRACT C OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31; THENCE NORTH 89°40'29" EAST, ON THE NORTH LINE OF SAID SOUTH HALF, A DISTANCE OF 246.47 FEET TO THE NORTHWESTERLY CORNER OF SAID TRACT B; THENCE CONTINUING NORTH 89°40'29" EAST, ON THE LINE COMMON TO SAID NORTH LINE OF THE SOUTH HALF AND THE NORTH LINE OF SAID TRACT B, A DISTANCE OF 1,044.88 FEET TO THE POINT OF BEGINNING; THENCE SOUTH 00°20'01" WEST A DISTANCE OF 902.30 FEET TO THE **POINT OF BEGINNING**;

THENCE NORTH 89°40'54" EAST A DISTANCE OF 486.31 FEET;

THENCE SOUTH 00°19'06" EAST A DISTANCE OF 343.59 FEET TO THE SOUTH LINE OF SAID TRACT C, BEING ALSO THE NORTH RIGHT-OF-WAY LINE OF SAID COLORADO STATE HIGHWAY NO. 7 (EAST 168TH AVENUE);

THENCE SOUTH 89°40'54" WEST, ON THE SOUTH LINE OF SAID TRACT C AND SAID NORTH RIGHT-OF-WAY LINE, A DISTANCE OF 109.53 FEET TO THE SOUTHWEST CORNER OF SAID TRACT C;

THENCE SOUTH 89°40'42" WEST, ON THE SOUTH LINE OF SAID TRACT B AND SAID NORTH RIGHT-OF-WAY LINE, A DISTANCE OF 361.51 FEET TO THE SOUTHEAST CORNER OF SAID TRACT A;

THENCE SOUTH 89°40'31" WEST, ON THE SOUTH LINE OF SAID TRACT A AND SAID NORTH RIGHT-OF-WAY LINE, A DISTANCE OF 19.18 FEET;

THENCE NORTH 00°20'01" EAST A DISTANCE OF 343.64 FEET TO THE **POINT OF BEGINNING**.

CONTAINING A CALCULATED AREA OF 3.8 ACRES (167,767 SQUARE FEET), MORE OR LESS.

PLANNING COMMISSION CERTIFICATE

THIS ZONING MAP~~, ZAXX XXX,~~ WAS VIEWED BY THE PLANNING COMMISSION ON THE

_____ DAY OF _____, 201__ A.D.

_____ 20___

CHAIR~~MAN~~ OF ERIE PLANNING COMMISSION

PERSON

Town Council

BOARD OF TRUSTEES APPROVAL CERTIFICATE

THIS ZONING MAP IS TO BE KNOWN AS THE "SIERRA VISTA ZONING MAP" AND IS APPROVED AND ACCEPTED BY ORDINANCE NO. _____, PASSED AND ADOPTED AT THE ~~REGULAR (SPECIAL) MEETING OF THE BOARD OF TRUSTEES~~ OF ERIE, COLORADO, HELD ON _____ _____, 201__

A MEETING OF THE TOWN COUNCIL

_____ 20___

MAYOR

ATTEST _____.

This certificate is superfluous. Weld county does not use it. Delete

CLERK & RECORDER CERTIFICATE

STATE OF COLORADO

COUNTY OF WELD

I HEREBY CERTIFY THAT THIS ZONING MAP WAS FILED IN MY OFFICE THIS _____ DAY OF _____, 201__ A. D. AND WAS RECORDED AT RECEPTION NUMBER

_____ 20___

_____

SIGNATURE

WELD COUNTY CLERK & RECORDER

SURVEYOR'S CERTIFICATE

I, PATRICK S. JERNIGAN, A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS ZONING MAP TRULY AND CORRECTLY REPRESENTS THE ABOVE DESCRIBED LEGAL DESCRIPTION FOR EACH ZONE DISTRICT.

I ATTEST THE ABOVE ON THIS _____ DAY OF _____ 2024.

FOR REVIEW ONLY

2025

PATRICK S. JERNIGAN
COLORADO REGISTERED PROFESSIONAL LAND SURVEYOR # 37042
FOR AND ON BEHALF OF LJA SURVEYING, INC.

A block in the lower right hand corner shall include:
i)revision date chronology

LJA SURVEYING
7800 E. Union Avenue
Suite 575
Denver, CO 80237
303-390-8510
www.lja.com

Date: 3/6/2025 | Job No.: 1061-0006 | Sheet: 1 of 2

I:\JOB FOLDERS\1061\1061-0006\SURVEY\06 CAD\PRODUCTION FILES\BOUNDARY_ZONING_EXHIBITS\1061-0006_ZONING_EXHIBIT_COVER PRINTED ON: 3/6/2025 9:19 AM

SIERRA VISTA ZONING

LOCATED IN THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH,RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

ZRXX-XXX

ZON2025-00005

Point of Commencement

NW 1/4 CORNER OF S/2 OF SE/4, SEC 31
2" ALUMINUM CAP STAMPED "LS 14083 1995"

Add all POB's and define them specifically

DENT & GEORGE PROPERTY
(EXISTING ZONE)
RURAL RESIDENTIAL (RR)
(WELD COUNTY)
PARCEL NO: 146731003018

DE FOSSE & BELL PROPERTY
(EXISTING ZONE)
RURAL RESIDENTIAL (RR)
(WELD COUNTY)
PARCEL NO: 146731004018

ANDERSON PROPERTY
(EXISTING ZONE)
RURAL RESIDENTIAL (RR)
(WELD COUNTY)
PARCEL NO: 146731004009

MILLER PROPERTY
(EXISTING ZONE)
RURAL RESIDENTIAL (RR)
(WELD COUNTY)
PARCEL NO: 146731004008

YAMAMOTO PROPERTY
(EXISTING ZONE)
RURAL RESIDENTIAL (RR)
(WELD COUNTY)
PARCEL NO: 146731008005

BEDNAR PROPERTY
(EXISTING ZONE)
RURAL RESIDENTIAL (RR)
(WELD COUNTY)
PARCEL NO: 146731008006

THOMAS PROPERTY
(EXISTING ZONE)
RURAL RESIDENTIAL (RR)
(WELD COUNTY)
PARCEL NO: 146731008007

FOOTE & KNIGHT PROPERTY
(EXISTING ZONE)
PLANNED DEVELOPMENT (PD)
(WELD COUNTY)
PARCEL NO: 146732000033

COUNTRY ROAD 3 INVESTORS LLC
(EXISTING ZONE)
PLANNED DEVELOPMENT (PD)
(WELD COUNTY)
PARCEL NO: 146732363001

COUNTY ROAD 3 INVESTORS LLC PROPERTY
(EXISTING ZONE)
PLANNED DEVELOPMENT (PD)
(WELD COUNTY)
PARCEL NO: 146732364003

KG STORE 316 LLC PROPERTY
(EXISTING ZONE)
PLANNED DEVELOPMENT (PD)
(WELD COUNTY)
PARCEL NO: 146732364002

COUNTRY ROAD 3 INVESTORS LLC PROPERTY
(EXISTING ZONE)
PLANNED DEVELOPMENT (PD)
(WELD COUNTY)
PARCEL NO: 146732364004

PULTE HOME CORPORATION PROPERTY
(EXISTING ZONE)
PLANNED UNIT DEVELOPMENT (PUD)
(BROOMFIELD COUNTY)
PARCEL NO: 157306106153

TOWN OF ERIE
(EXISTING ZONE)
AIRPORT (AP)
(WELD COUNTY)
PARCEL NO: 146731000030

NE CORNER
S/2 OF SE/4, SEC 31
2.5" ALUMINUM CAP
STAMPED "LS 20142 2015"

BASIS OF BEARINGS
NORTH LINE, S 1/2 OF SE 1/4, SECTION 31
N89°40'29"E 2631.65'

N89°40'29"E 1044.88'

N89°40'29"E 1285.29'

20' DRAINAGE & UTILITY EASEMENT
BOOK 830, REC. NO. 1752380
REC. NO. 4624407

20' ACCESS EASEMENT
BOOK 880 PAGE 1801566
REC. NO. 2424253

38' UTILITY & ACCESS EASEMENT
REC. NO. 4268505

10' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS
BOOK 1302, REC. NO. 2254297
BOOK, 1376, REC. NO. 2268776

30' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS
BOOK 1050, REC. NO. 1989356
BOOK, 1274, REC. NO. 2225425
REC. NO. 2254297
REC. NO. 2268776

add remaining dimensions

UNITED POWER
REC. NO. 4513360

EAST LINE, SE 1/4, SECTION 31
NO BEARING CALCULATED LINE ONLY

add remaining dimensions

PROPOSED ZONING:
AIRPORT (AP)
24.5 ACRES

EXISTING ZONING:
LOW DENSITY
RESIDENTIAL (LR)

PROPOSED ZONING:
COMMUNITY MIXED-USE (CMU)
26.1 ACRES

EXISTING ZONING:
LOW DENSITY RESIDENTIAL (LR)

WEST LINE, SE 1/4, SECTION 31
N00°01'10"E 1320.38'

902.30'

S00°19'43"W
156.53'

S00°19'43"W
34.38'

N89°40'54"E 1248.97'

486.31'

762.67'

PROPOSED ZONING:
COMMUNITY MIXED-USE (CMU)
3.9 ACRES

EXISTING ZONING:
LOW DENSITY RESIDENTIAL (LR)

EXISTING ZONING:
COMMUNITY MIXED-USE (CMU)
5.9 ACRES

add remaining dimensions

343.64'

N00°19'06"W 343.59'

50' ACCESS, UTILITY, AND DRAINAGE EASEMENT
REC. NO. 4431602

S89°40'31"W
19.18'

S89°40'54"W
109.53'

S89°40'31"W 647.35'

S89°40'54"W 738.62'

Make Bonanza the main street name. That's how it is signed, and previously platted

COUNTY ROAD NO. 3 (BONANZA DRIVE)
(VARIABLE WIDTH R.O.W.)
BOOK 86, PAGE 273; BOOK 1631, PAGE 123; REC. NO. 2572958, REC. NO. 4431602

N89°42'49"E 637.57'

STATE HIGHWAY NO. 7
(E. BASELINE ROAD)
(150' R.O.W.)
REC. NO. 2170911

SOUTH LINE, SE 1/4, SECTION 31
CALCULATED LINE ONLY

SW CORNER
SE. 1/4 SEC. 31
T1N R68W
RANGE BOX LID SEALED SHUT AND COULD NOT BE OPENED. POSITION SET BY REFERENCE MONUMENTS.

NW CORNER
NE. 1/4 SEC. 5
T1S R68W
3.25" ALUMINUM CAP
STAMPED "PLS 24942 2001"

SE CORNER SEC. 31
T1N R68W
RANGE BOX UNDER ASPHALT
CALCULATED POSITION ONLY

A block in the lower right hand corner shall include:
i)revision date chronology
ii)north arrow designated as true north;
iii)written and graphic scale

LJA SURVEYING
7800 E Union Avenue
Suite 575
Denver, CO 80237
303-390-8510
www.lja.com

Date:	Job No:	Sheet:
3/6/2025	1061-0006	2 of 2

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SIERRA VISTA | CONCEPTUAL SITE PLAN

06/27/2025

Add Legend

NORTH

0' 1125' 2500' 5000'

SCALE

NORRIS DESIGN
PEOPLE + PLACEMAKING

SIERRA VISTA MINOR SUBDIVISION FILING NO. 2

LOCATED IN THE SOUTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

A REPLAT OF TRACTS A, B, AND C, SIERA VISTA MINOR SUBDIVISION

60.392 Acres - 3 TRACTS
SUB2025-00006



VICINITY MAP
SCALE: 1" = 1000'

DEDICATION STATEMENT

KNOW ALL BY THESE PRESENTS THAT THE UNDERSIGNED, BEING THE OWNERS OF THE LAND DESCRIBED HEREON HAVE LAID OUT, PLATTED, AND SUBDIVIDED INTO TRACTS, AS SHOWN HEREON UNDER THE NAME AND STYLE OF SIERRA VISTA MINOR SUBDIVISION FILING NO. 2, AND DOES BY THESE PRESENTS, OF ITS OWN FREE WILL AND VOLUNTARILY, WITHOUT COERCION, THREAT, OR BUSINESS COMPULSION.

CONTAINED WITHIN THE TITLE COMMITMENT PREPARED BY LAND TITLE GUARANTEE COMPANY, ORDER NUMBER _____, WITH A COMMITMENT DATE OF _____.:

A PARCEL OF LAND SITUATED IN THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN IS ASSUMED TO BEAR NORTH 89°29'51" EAST BASED ON NAD83 (2011) COLORADO STATE PLANE NORTH ZONE (501) COORDINATES, BEING MONUMENTED AT THE WEST END BY A 2" ALUMINUM CAP STAMPED, "PLS 14083 1995" RECOVERED 0.2' BELOW THE SURFACE, BEING THE NORTHWEST CORNER OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1 AND ON THE EAST END BY A 2-1/2" ALUMINUM CAP STAMPED, "PLS 20142 2015" RECOVERED 0.3' BELOW THE SURFACE, BEING THE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1.

TRACT A, TRACT B, AND TRACT C OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602

CONTAINING A CALCULATED AREA OF 2,630,667.460 SQUARE FEET OR 60.392 ACRES, MORE OR LESS.

BC LAND, LLC, A COLORADO LIMITED LIABILITY COMPANY

OWNER: BLAKE CARLSON

BY: _____ DATE:_____
BLAKE CARLSON

TITLE: MANAGER OF BC LAND

ATTEST:
SECRETARY/TREASURER
STATE OF COLORADO)
) SS.
COUNTY OF _____)

ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____, 20____

BY: _____ AS _____

OWNER - BC LAND, LLC.
WITNESS MY HAND AND OFFICIAL SEAL

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

CLERK AND RECORDER'S CERTIFICATE

STATE OF COLORADO

COUNTY OF WELD

I HEREBY CERTIFY THAT THIS FINAL PLAT WAS FILED IN MY OFFICE ON THIS ____ DAY OF _____, A.D., AT _____ A.M./P.M. AND WAS RECORDED PER RECEPTION NUMBE _____ BOOK _____ PAGE _____.

This certificate is superfluous. Weld county does not use it. delete

_____
COUNTY CLERK AND RECORDER

LAND SUMMARY CHART

TYPE	AREA	% OF TOTAL
TRACTS A - C	60.392	100%

TRACT SUMMARY CHART

TRACT	AREA (SQ.FT.)	AREA (AC.±)	USE	OWNED / MAINTAINED
TRACT A	1,067,933	24.516	FUTURE DEVELOPMENT	BC LAND, LLC
TRACT B	1,137,137	26.105	FUTURE DEVELOPMENT	BC LAND, LLC
TRACT C	425,598	9.770	FUTURE DEVELOPMENT	BC LAND, LLC

TITLE VERIFICATION CERTIFICATE

WE, LAND TITLE GUARANTEE COMPANY, DO HEREBY CERTIFY THAT WE HAVE EXAMINED THE TITLE OF ALL LAND PLATTED HEREON AND THAT TITLE TO SUCH LAND IS IN THE DEDICATOR(S) FREE AND CLEAR OF ALL LIENS, TAXES AND ENCUMBRANCES, EXCEPT AS FOLLOWS: THOSE ITEMS AND OWNERSHIP INTERESTS SHOWN IN TITLE COMMITMENT _____, EFFECTIVE _____

LAND TITLE GUARANTEE COMPANY

BY: _____ DATE_____

NAME:_____

TITLE: _____

STATE OF COLORADO)
) SS.
COUNTY OF BOULDER)
ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____ 2_____.

BY: _____ AS_____

WITNESS MY HAND AND OFFICIAL SEAL

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

PLANNING AND DEVELOPMENT APPROVAL CERTIFICATE

THIS PLAT IS HEREBY APPROVED BY THE TOWN OF ERIE PLANNING AND DEVELOPMENT DIRECTOR ON THE ____ DAY OF _____ A.D., 20__.

_____
PLANING AND DEVELOPMENT DIRECTOR

BOARD OF TRUSTEE APPROVAL CERTIFICATE

THIS PLAT IS TO BE KNOWN AS _____ IS APPROVED AND ACCEPTED BY RESOLUTION NO. _____, PASSED AND ADOPTED AT THE REGULAR MEETING OF THE BOARD OF TRUSTEE OR ERIE, COLORADO, HELD ON THE ____ DAY OF _____ 20____.

_____
MAYOR

ATTEST _____
TOWN CLERK

Remove. Town Council approval not required for Minor Subdivisions.

PLAT NOTES

1. 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.
2. ANY PERSON WHO KNOWINGLY REMOVES, ALTERS OR DEFACES ANY PUBLIC LAND SURVEY MONUMENT OR ACCESSORY COMMITS A CLASS TWO (2) MISDEMEANOR PURSUANT TO STATE STATUTE 18-4-508, C.R.S.
3. BASIS OF BEARINGS: THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31 WAS ASSUMED TO BEAR N 89°40'29" EAST AND IS MONUMENTED AS SHOWN HEREON, WITH ALL MEASURED BEARINGS SHOWN HEREON, WITH ALL MEASURED BEARINGS SHOWN HEREON RELATIVE THERETO.
4. BASED UPON A REVIEW OF FLOOD INSURANCE RATE MAP COMMUNITY PANEL NO. 0813C0443K, MAP REVISED AUGUST 14,2019, THE SUBJECT PROPERTY IS NOT WITHIN THE 100-YEAR FLOOD PLAIN LIMITS.
5. TRACT MONUMENTATION SHALL BE IN ACCORDANCE WITH THE COLORADO REVISED STATUTES (CRS 38-51-105).
6. THE LINEAL DISTANCE UNIT USED IN THE PREPARATION OF THIS PLAT IS THE UNITED STATES SURVEY FOOT. THE UNITED STATES DEPARTMENT OF COMMERCE, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DEFINES THE UNITED STATES SURVEY FOOT AS 120/3937 METERS.
7. LAND TITLE GUARANTEE COMPANY COMMITMENT NUMBER: _____ EFFECTIVE DATE _____ WAS ENTIRELY RELIED UPON FOR RECORDED INFORMATION REGARDING RIGHTS OF WAY, EASEMENTS AND ENCUMBRANCES IN THE PREPARATION OF THIS PLAT. NO LIABILITY IS ACCEPTED BY LJA, SURVEYING, LLC. FOR THE ACCURACY OF INFORMATION CONTAINED IN SAID COMMITMENT.
8. DUE TO THE PROXIMITY OF THE PROPERTY TO THE ERIE MUNICIPAL AIRPORT , THERE WILL BE AIRCRAFT PASSING OVER THE PROPERTY, AIRCRAFT PASSING OVER THE PROPERTY. AIRCRAFT PASSAGE MAY RESULT IN NOISE AND OTHER IMPACTS ON THE PROPERTY. AIRCRAFT MAY CROSS PROPERTY AT LOW ALTITUDE HEIRS, SUCCESSORS AND ASSIGNS SPECIFICALLY ACKNOWLEDGE THE RIGHT OF PASSAGE OVER THE PROPERTY FOR AIRCRAFT AND AGREE TO HOLD HARMLESS THE TOWN OF EIRE FOR AIRCRAFT OPERATIONS.
9. THE SOLE INTENTION AND PURPOSE OF THE SIERRA VISTA MINOR SUBDIVISION IS TO CREATE TRACTS OF LAND IN ORDER TO ENABLE THE SALE OF THE INDIVIDUAL TRACTS SHOWN HEREIN. ALL TRACTS WILL NEED TO BE REPLATTED TO LOTS TO ACCOMMODATE DEVELOPMENT.
10. NO DEVELOPMENT RIGHTS ARE GRANTED BY THE SIERRA VISTA MINOR SUBDIVISION AND NO DEVELOPMENT SHALL BE ALLOWED ON ANY TRACT CREATED HEREIN UNTIL THE FOLLOWING REQUIREMENTS ARE FULLY COMPLIED WITH. NO DEVELOPMENT OR BUILDING OF IMPROVEMENTS SHALL BE ISSUED FOR ANY PURPOSE UNTIL THERE IS FULL COMPLIANCE WITH ALL TOWN OF EIRE MUNICIPAL CODE REQUIREMENTS, INCLUDING BUT NOT LIMITED TO: COMPLETION OF SUBDIVISION PROCEDURES FINAL PLAT; A DEVELOPMENT AGREEMENT (AND ANY OTHER AGREEMENTS THAT MAY BE REQUIRED BY THE TOWN OF ERIE MUNICIPAL CODE); AND IF NECESSARY COMPLETION OF THE SITE PLAN REVIEW PROCEDURE.
11. UTILITIES, VEHICULAR AND PEDESTRIAN ACCESS ROUTES, AND IMPROVEMENT GUARANTEE REQUIREMENTS WILL BE REQUIRED PER THE TOWN OF ERIE MUNICIPAL CODE, PRIOR TO THE ISSUANCE OF ANY BUILDING PERMIT.
12. THE RESTRICTIONS AND REQUIREMENTS SET FORTH BY THE SIERRA VITA MINOR SUBDIVISION SHALL RUN WITH THE LAND INCLUDED WITH THE SIERRA VISTA MINOR SUBDIVISION AND SHALL INSURE TO THE BENEFIT OF AND BE BINDING UPON THE SUCCESSORS AND ASSIGNS OF THE OWNER. ALL OBLIGATIONS AND RESPONSIBILITIES OF THE OWNERS HEREIN SHALL PASS TO EACH AND EVERY SUCCESSOR AND/OR ASSIGN. IT IS THE RESPONSIBILITY OF ANY PURCHASER OF A TRACT WITHIN THIS SIERRA VISTA MINOR SUBDIVISION TO FULLY INVESTIGATE THE REQUIREMENTS PRIOR TO SUCH PURCHASE.

SURVEYOR'S CERTIFICATE

I, PATRICK S. JERNIGAN, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS MAP WAS MADE BY ME OR UNDER MY DIRECT SUPERVISION, AND IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF, THAT AT LEAST ONE-SIXTH (1/6) OF THE PERIPHERAL BOUNDARY OF THE PARCEL SHOWN HEREON IS CONTIGUOUS WITH THE PRESENT BOUNDARY OF THE TOWN OF JOHNSTOWN, AND THAT THIS PLAT COMPLIES WITH SECTION 31-12-107(1)(d), COLORADO REVISED STATUTES, CONCERNING ANNEXATION PLATS.

FOR REVIEW ONLY

_____
PATRICK S. JERNIGAN
COLORADO PLS NO. 37042
FOR AND ON BEHALF OF LJA SURVEY, INC
7800 EAST UNION AVENUE, SUITE 575,
DENVER, COLORADO 80237

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 EVEN MAY ANY ACTION BASED UPON AND DEFECT IN THIS SURVEY BE COMMENCED MORE THEN TEN YEARS FROM THE DATE OF THE CERTIFICATE SHOWN HEREON.

LJA SURVEYING
7800 E. Union Avenue
Suite 575
Denver, CO 80237
303-390-6510
www.lja.com

Date:	Job No:	Sheet:
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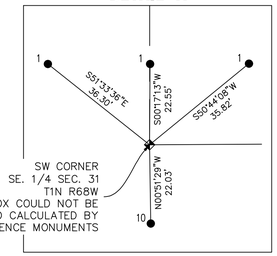
SIERRA VISTA MINOR SUBDIVISION FILING NO. 2

LOCATED IN THE SOUTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

100 0 50 100
SCALE
1 inch = 100 ft.

20 0 10 20
SCALE
1 inch = 20 ft.

DETAIL "A"



NW 1/4 CORNER OF S/2 OF SE/4, SEC 31 2" ALUMINUM CAP STAMPED "LS 14083 1995"

NE CORNER S/2 OF SE/4, SEC 31 2.5" ALUMINUM CAP STAMPED "LS 20142 2015"

LOT 18 | LOT 16 | LOT 7 | ERIE AIR PARK SUBDIVISION BOOK 830, REC. NO. 1752380 (ZONED RURAL RESIDENTIAL) | LOT 6 | LOT 5 | LOT 6 | ERIE AIR PARK SUBDIVISION REPLAT B BOOK 1477, REC. NO. 242253 (ZONED RURAL RESIDENTIAL) | LOT 7

20' DRAINAGE & UTILITY EASEMENT BOOK 830, REC. NO. 1752380 REC. NO. 4624407

20' ACCESS EASEMENT BOOK 880 PAGE 1801566 REC. NO. 2424253

38' UTILITY & ACCESS EASEMENT REC. NO. 4268505

BASIS OF BEARINGS
N89°40'29"E 2330.17'
NORTH LINE, S 1/2 OF SE 1/4, SECTION 31

N89°35'08"W 555.82' (R2)
N89°40'29"E 246.47'
1044.88'
S89°35'08"E (R1)
1285.29'
N89°35'08"W 555.82' (R2)
55.00'

30' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS BOOK 1050, REC. NO. 1989356 BOOK, 1274, REC. NO. 2225425 REC. NO. 2254297 REC. NO. 2268776

10' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS BOOK 1302, REC. NO. 2254297 BOOK, 1376, REC. NO. 2268776

LOT A RECORDED EXEMPTION NO. 1467-32-3-RE-645 REC. NO. 1977544 WELD COUNTY (ZONED PLANNED DEVELOPMENT)

LOT 1 VISTA RIDGE FILING NO. 6 MINOR SUBDIVISION REC. NO. 3555044 (ZONED PLANNED DEVELOPMENT)

Please update to VISTA RIDGE FG NO. 6 4TH AMD, including adding Commons Dr. Tract

TRACT A1 VISTA RIDGE FILING NO. 6 1ST AMENDMENT REC. NO. 3994401 (ZONED PLANNED DEVELOPMENT)

COMMONS DR

LOT 2 VISTA RIDGE FILING NO. 6 1ST AMENDMENT REC. NO. 3994401 (ZONED PLANNED DEVELOPMENT)

TRACT A
1,067,933 SF
24.516 AC

TRACT B
1,137,137 SF
26.105 AC

TRACT C
425,598 SF
9.770 AC

UNITED POWER REC. NO. 4513360

N17°15'27"W 636.15'
N16°57'20"W 636.25' (R3)

N17°15'42"W 540.19'
N16°57'20"W 540.23' (R3)

TOWN OF ERIE
WELD COUNTY
BOOK 1274, REC. NO. 02225423
(ZONED AIRPORT)

WEST LINE, SE 1/4, SECTION 31

N00°20'01"E 1245.94'
902.30'
343.64'

S04°02'11"W 564.17'
S04°46'24"W 564.23' (R3)
EAST LINE, SE 1/4, SECTION 31
NO BEARING CALCULATED LINE ONLY

S00°18'10"W 183.35'
S01°04'07"W 183.40' (R3)

S00°19'43"W 190.91'
S01°04'07"W (R3)
156.53'
34.38'

N89°40'54"E 1248.97'

S03°50'44"W 60.39'
S04°35'08"W 60.39' (R3)

Make Bonanza the main street name. That's how it is signed, and previously platted

3'46"W 8.34'
8.34' (R3)

S06°58'07"W 120.00'
S07°42'31"W 120.00' (R3)

S01°13'46"W 98.28'
S01°58'10"W 98.28' (R3)

COUNTY ROAD NO. 3 (BONANZA DRIVE)
(VARIABLE WIDTH R.O.W.)
BOOK 66, PAGE 273, BOOK 1631, PAGE 143, REC. NO. 2152995, REC. NO. 4431602

50' ACCESS, UTILITY, AND DRAINAGE EASEMENT REC. NO. 4431602

19.18'

647.35'
N89°59'45"W 13.49'
N89°32'45"W 13.43' (R3)

S89°40'31"W 666.53'
N89°34'53"W (R3)

S89°40'42"W 361.51'
N89°34'53"W (R3)

S89°40'54"W 848.15'
N89°34'53"W (R3)

STATE HIGHWAY NO. 7
(E. 168TH AVENUE)
(150' R.O.W.)
REC. NO. 2170911

BROOMFIELD CITY LIMITS
SOUTH LINE, SE 1/4, SECTION 31
NO BEARING CALCULATED LINE ONLY

SEE DETAIL "A"

150' R.O.W.
75'
75'

SW CORNER
SE. 1/4 SEC. 31
T1N R68W
LID OF BOX COULD NOT BE OPENED CALCULATED BY REFERENCE MONUMENTS

NW CORNER
NE. 1/4 SEC. 5
T1S R68W
3.25" ALUMINUM CAP
STAMPED "PLS 24942 2001"

SE CORNER SEC. 31, T1N R68W
UNDER ASPHALT
CALCULATED POSITION ONLY

CURVE TABLE					
CURVE	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C1	23.40'	512.50'	2°36'58"	S02° 32' 15"W	23.40

MONUMENT SYMBOL LEGEND

- RECOVERED SECTION CORNER AS NOTED HEREON
- 1 RECOVERED REFERENCE MONUMENT WITH A 1.5" ALUMINUM CAP STAMPED "PLS 38621 RYNEARSON RM"
- 2 RECOVERED NO. 5 REBAR WITH A 2" ALUMINUM CAP STAMPED "PLS 4846 W. M. STENGEL"
- 3 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP
- 4 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 20142"
- 5 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 38621 STRAITON"

MONUMENT SYMBOL LEGEND

- 6 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 25965"
- 7 RECOVERED IRON ROD WITH A 2" ALUMINUM CAP STAMPED "PLS 28286" 0.2 ABOVE GROUND
- 8 RECOVERED NO. 5 REBAR WITH A 2" ALUMINUM CAP STAMPED "PLS 4846 W. M. STENGEL" BENT
- 9 RECOVERED IRON RODS NOT HELD BY THIS SURVEY
- 10 RECOVERED IRON ROD REFERENCE MONUMENT STAMPED "4RV WIT"

MONUMENT SYMBOL LEGEND

- 1 SET 18" LONG NO. 5 REBAR WITH 1.25" ORANGE PLASTIC CAP STAMPED "LJA SURVEYING PLS 37042" FLUSH WITH THE GROUND
- (R1) DIMENSION PER LEGAL DESCRIPTION ERIE AIR PARK SUBDIVISION AT RECEPTION NUMBER 1752380
- (R2) DIMENSION PER LEGAL DESCRIPTION ERIE AIR PARK SUBDIVISION REPLAT B AT RECEPTION NUMBER 242253
- (R3) DIMENSION PER LEGAL DESCRIPTION SIERRA VISTA MINOR SUBDIVISION AT RECEPTION NUMBER 4431602

FOR REVIEW ONLY

LJA SURVEYING
7800 E Union Avenue
Suite 575
Denver, CO 80237
303-390-8510
www.lja.com

Date: 12/10/2024 | Job No.: 1061-0006 | Sheet: 2 of 2

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Development Application Review Comment Letter

Sierra Vista, ZON2025-00005 (rezoning) & SUB2025-00006 (minor subdivision)
PZ-25-00179
First Referral
July 31, 2025

Recipient: Doug Trettin
Jefferson County

Doug,

Thank you for submitting your application. Comments from internal City and County of Broomfield reviewers are provided below. Comments provided from outside agencies are included as an attachment to this letter.

Please resubmit once your team has received updated application documents and provided responses to the comments pertaining to any plans, documents, and reports. Included as part of your resubmittal should be a single consolidated response to the comment letter that addresses all of the comments provided in this letter. The resubmittal should be prepared according to the instructions at the end of this letter.

Comments Received By:

- Ted Harberg, Planning

City and County of Broomfield Agency Review Comments

Ted Harberg - Planning

1. The City and County of Broomfield would like to better understand the purpose of the proposed rezoning of Tract A from Low-Density Residential (LR) to Airport (AP). **Is this rezoning intended to allow an expansion of operations at the Erie airport?**
   a. An expansion of operations would mean either an expansion of the airport itself, or the addition of new private facilities such as hangars, flight training schools, or any other uses that would increase air traffic at the airport.
2. Broomfield would have concerns about the impacts that any expansion of the Erie airport has on Broomfield residents.

3. Please provide a response explaining the applicant's intention by rezoning this parcel to Airport (AP).

4. The City and County also requests that any resubmittals or future applications regarding the airport or this property be referred to Broomfield for further review.

Resubmittal Instructions

Please resubmit the items listed below as a single, complete package for follow-up review. This resubmittal should be sent directly to me tharberg@broomfield.org and the Planning Applications Email (planningapps@broomfield.org).

Project Review History

First Referral

Date Application Referred: 7/18/205
Date Comments Sent to Applicant: 7/31/2025

Sincerely,



Ted Harberg
Senior Planner
tharberg@broomfield.org
303-438-6362

Traffic & Safety
Region 1
2829 W Howard Place, 2nd Floor
Denver, Colorado 80204

COLORADO
Department of Transportation
Region 1

Project Name: CO-7 & Lowell Blvd, Erie, CO, 80516, USA

Print Date: 8/7/2025 **Highway**: 007 **Mile Marker**: 65.18

A comment response letter is REQUIRED along with the next submittal.

Review POC: Varner, Jessica

Environmental Comments:

Planning defers to the program engineer as there is a CO-7 Highway Widening project and a Multimodal Improvements project in this area.

As the two full spectrum pond designs move forward, we recommend not including any CDOT ROW in the contributing drainage basin. If stormwater runoff from CDOT ROW is routed to the ponds for treatment an IGA will be required with the Town and CDOT. This is not a smooth process so please consider schedule when deciding whether to treat CDOT ROW.

The Permittee shall complete a stormwater management plan (SWMP) which must be prepared with good engineering, hydrologic, and pollution control practices and include at a minimum the following components: qualified stormwater manager; spill prevention and response plan; materials handling; potential sources of pollution; implementation of control measures; site description; and site map.

In addition, the Permittee shall comply with all local/state/federal regulations and obtain all necessary permits. Permittee shall comply with CDOT's MS4 Permit. When working within a local MS4 jurisdictional boundary, the permittee shall obtain concurrence from the local MS4 that the local MS4 will provide construction stormwater oversight. The local MS4 concurrence documentation shall be retained with the SWMP.

For ANY ground disturbance/work within CDOT ROW---

Required:

Arch/History/Paleo:

Since this is a permit, a file search for Arch, Paleo and History is required. If the file search identifies anything, a more extensive report will be required. If nothing is identified, then the file search should be sufficient. For the file search contact:

Cultural/History File Search: https://www.historycolorado.org/file-access Email: hc_filesearch@state.co.us

Paleo File Search: Colorado University Museum of Natural History - https://www.colorado.edu/cumuseum/research-collections/paleontology/policies-procedure Email: jacob.vanveldhuizen@colorado.edu and from the Denver Museum of Nature and Science – Email: kristen.mackenzie@dmns.org https://www.dmns.org/science/locality-search-request/

Hydraulics Comments:

SBL - 8/5/2025

1) Please provide a written response to all drainage comments.

2) CDOT requires a historic basin map and a proposed basin map with CDOT right-of-way delineated, tables summarizing the 5-yr or 10-yr and 100-year flow rates, and a design point(s) where flows enter the CDOT right-of-way so that historic and proposed flow rates can be compared.

3) CDOT requires site developments maintain historic flow patterns at historic, undeveloped flow rates to CDOT right-of-way.

4) Improvements or work within CDOT right-of-way will require a separate drainage report identifying and discussing requirements from the CDOT Drainage Design Manual with supporting calculations.

Permits Comments:

Please show the current CDOT Right of Way (ROW) and label as CDOT ROW. RLW July 31 2025

8-4-2025 The proposed Right-in, Right-out access from SH 7 at Sierra Vista Drive is in compliance with the Access Control Plan. A State Highway Access Permit will be required for this access. Point of contact for that permit is Steve Loeffler, steven.loeffler@state.co.us

--Steve Loeffler, 8-4-2025

08-06-2025 For our Traffic unit to review the provided Traffic Impact Analysis it will need to be stamped by the PE. Please also do some internal QC on the Traffic Impact Analysis before resubmittal of the document.

-Jessica Varner, 08-06-2025

Residential Engineer Comments:

Mekonnen Mulugeta 8/6/2025

Please consider preserving the 170 feet of right-of-way recommended in the CO7 PEL study to accommodate future ultimate cross-sections and potential corridor widening of CO7.

Right Of Way Comments:

John Olson - Rev 1 - 7/24/2025 - I have some concerns the ALTA and Plat may not reflect the CDOT Acquisitions which were part of 25250.

James Daley Comment 7/28/25 - The deeds, plat, and 25250 ROW plans have been uploaded by John Olson. The surveyor should add the recorded 25250 parcels/easements to any documents for the development where they exist. They should also compare the existing ROW lines from our plans to make sure they are in acceptable agreement with their resolutions. I do not think any A-Lines exist along the property, but the surveyor should look on our plans for those (if any) and show/label if they do exist.

From: Laurren Kanner <laurren@gmail.com>
Sent: Tuesday, August 12, 2025 7:04 PM
To: Development Referral
Subject: Re: 1st Referral Review - Sierra Vista, ZON2025-00005 (rezoning) & SUB2025-00006 (minor subdivision)

External Email: Do not click links or open attachments unless you recognize the sender and know the content is safe.

On behalf of the Erie Airpark Homeowners Association located to the direct North of this proposed development, we wanted to make sure that the development team is aware of the existing aircraft traffic and deeded taxiway easements which are inherent to the nature of our community as an active Air Park. We can help facilitate communication with the impacted property owners to provide specific details of the easements as required.

In particular, we want to emphasize concerns around ensuring continued access for aviation usage as well as the negative impact of aircraft traffic, noise (including helicopters), and safety for the future residents and businesses in this proposed community. Additionally, most insurance companies will have increased rates for builders and occupants commensurate with the increased risk profile of being nearby aircraft traffic which we want to be certain the developers have incorporated into their plans. We're keen to understand the plans for protecting both future occupants of this development as well as limiting potential liabilities for the owners of the adjacent properties on the north side.

We are happy to provide additional comment and information which may be of use in the evaluation and planning of this development. You may reach us at board@eahoa.org. We look forward to future engagement with you.

Laurren Kanner
cell: 303-803-3260

On Fri, Jul 18, 2025 at 3:26 PM Patricia Miller <millerpatricia262@gmail.com> wrote:

> Hi, Laurren. I think you should send this out to the HOA membership. They might have comments. I'd like to know what kind of minor subdivision this will be. Ugly apartments like the ones down by the church off HW 7? Five story condos? I'd like to see more information.
>
> Pat
>
> ---------- Forwarded message ---------
> From: **Doug Trettin** <dtrettin@erieco.gov>
> Date: Fri, Jul 18, 2025 at 3:02 PM
> Subject: 1st Referral Review - Sierra Vista, ZON2025-00005 (rezoning) & SUB2025-00006

(minor subdivision)
To: Lee Mathis <lmathis@erieco.gov>, Mike Haefele <mhaefele@erieco.gov>, prevention@mvfpd.org <prevention@mvfpd.org>, dsaba@mvfpd.org <dsaba@mvfpd.org>, mkelly@mvfpd.org <mkelly@mvfpd.org>, John Ehrhart <john@coloradols.com>, Jason Hurd <jason@vectorair.net>, terrym@vectorair.net <terrym@vectorair.net>, john.sweeney@faa.gov <john.sweeney@faa.gov>, michael.b.matz@faa.gov <michael.b.matz@faa.gov>, Kloska - CDOT, Jeff <jeff.kloska@state.co.us>, kirk.allen@state.co.us <kirk.allen@state.co.us>, marilyn.cross@state.co.us <marilyn.cross@state.co.us>, referrals@weld.gov <referrals@weld.gov>, planningapps@broomfield.org <planningapps@broomfield.org>, mark@publicalliancellc.com <mark@publicalliancellc.com>, James Spehalski <jspehalski@marathonlc.com>, katina.croghan@managementtrust.com <katina.croghan@managementtrust.com>, millerpatricia262@gmail.com <millerpatricia262@gmail.com>, dj_cummings@yahoo.com <dj_cummings@yahoo.com>, rockiesland@westernmidstream.com <rockiesland@westernmidstream.com>, Bob Bresnahan <bbresnahan@civiresources.com>, Chandler Newhall <cnewhall@civiresources.com>, Sean Casper <scasper@civiresources.com>, Don_Jobe@oxy.com <don_jobe@oxy.com>, Glandon, Ashly <ashly_glandon@oxy.com>, Steve_Fisher@oxy.com <steve_fisher@oxy.com>, Reyos, Kelly <kelly.reyos@westernmidstream.com>, kwasylenky@jostenergylaw.com <kwasylenky@jostenergylaw.com>, rons@mdsslaw.com <rons@mdsslaw.com>, Michelle Creasy <mcreasy@carmelpartners.com>
Cc: Aly Burkhalter <aburkhalter@erieco.gov>, Melinda Helmer <mhelmer@erieco.gov>

Hello,

Please see the links for 1st Referral Review submittal documents on the above noted project:

https://portal.laserfiche.com/Portal/Browse.aspx?id=304796&repo=r-a69d230a (minor subdivision)

https://portal.laserfiche.com/Portal/Browse.aspx?id=304799&repo=r-a69d230a (rezoning)

Referral comments are due back by August 12, 2025. Staff DRT is scheduled for August 14, 2025.

Please forward referral comments to developmentreferral@erieco.gov

Please let me know if you have any questions. Thank you!

Doug Trettin | Planning Technician

Town of Erie | Planning & Development

645 Holbrook Street | P.O. Box 750 | Erie, CO 80516

Planning Division: 303-926-2770

Cell: 720-591-0714

www.erieco.gov/planning

Delivering exceptional public service with honesty, efficiency, and compassion

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From: Mark & Pat Kilpatrick <kilpatrick91@comcast.net>
Sent: Saturday, July 19, 2025 2:22 PM
To: Development Referral
Subject: Development on the corner of Bonanza and Baseline.

Follow Up Flag: Follow up
Flag Status: Flagged

External Email: Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Doug,

A very bad idea!

Baseline - Highway 7 - is incredibly congested throughout the day!

Numerous stoplights that are not timed for through traffic flow, sinking roads creating huge dips and bumps and more!

Find a more secluded property that the feeder roads could be widened and traffic filtered into adjacent roads!

Poor planning on the part of all concerned!

Pat Kilpatrick

303-931-9162

SIERRA VISTA MINOR SUBDIVISION FILING NO. 2

LOCATED IN THE SOUTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

A REPLAT OF TRACTS A, B, AND C, SIERA VISTA MINOR SUBDIVISION

60.392 Acres - 3 TRACTS
SUB2025-00006



VICINITY MAP
SCALE: 1" = 1000'

DEDICATION STATEMENT

KNOW ALL BY THESE PRESENTS THAT THE UNDERSIGNED, BEING THE OWNERS OF THE LAND DESCRIBED HEREON HAVE LAID OUT, PLATTED, AND SUBDIVIDED INTO TRACTS, AS SHOWN HEREON UNDER THE NAME AND STYLE OF SIERRA VISTA MINOR SUBDIVISION FILING NO. 2, AND DOES BY THESE PRESENTS, OF ITS OWN FREE WILL AND VOLUNTARILY, WITHOUT COERCION, THREAT, OR BUSINESS COMPULSION.

CONTAINED WITHIN THE TITLE COMMITMENT PREPARED BY LAND TITLE GUARANTEE COMPANY, ORDER NUMBER _____, WITH A COMMITMENT DATE OF _____:

A PARCEL OF LAND SITUATED IN THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN IS ASSUMED TO BEAR NORTH 89°29'51" EAST BASED ON NAD83 (2011) COLORADO STATE PLANE NORTH ZONE (501) COORDINATES, BEING MONUMENTED AT THE WEST END BY A 2" ALUMINUM CAP STAMPED, "PLS 14083 1995" RECOVERED 0.2' BELOW THE SURFACE, BEING THE NORTHWEST CORNER OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1 AND ON THE EAST END BY A 2-1/2" ALUMINUM CAP STAMPED, "PLS 20142 2015" RECOVERED 0.3' BELOW THE SURFACE, BEING THE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1.

TRACT A, TRACT B, AND TRACT C OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602

CONTAINING A CALCULATED AREA OF 2,630,667.460 SQUARE FEET OR 60.392 ACRES, MORE OR LESS.

BC LAND, LLC, A COLORADO LIMITED LIABILITY COMPANY

OWNER: BLAKE CARLSON

BY: _____ DATE:_____
BLAKE CARLSON

TITLE: MANAGER OF BC LAND

ATTEST:
SECRETARY/TREASURER
STATE OF COLORADO)
) SS.
COUNTY OF _____)

ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____, 20____

BY: _____ AS _____

OWNER - BC LAND, LLC.
WITNESS MY HAND AND OFFICIAL SEAL

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

CLERK AND RECORDER'S CERTIFICATE

STATE OF COLORADO

COUNTY OF WELD

I HEREBY CERTIFY THAT THIS FINAL PLAT WAS FILED IN MY OFFICE ON THIS ____ DAY OF _____, A.D., AT _____ A.M./P.M. AND WAS RECORDED PER RECEPTION NUMBE _____ BOOK _____ PAGE _____.

This certificate is superfluous. Weld county does not use it. delete

_____
COUNTY CLERK AND RECORDER

LAND SUMMARY CHART

TYPE	AREA	% OF TOTAL
TRACTS A - C	60.392	100%

TRACT SUMMARY CHART

TRACT	AREA (SQ.FT.)	AREA (AC.±)	USE	OWNED / MAINTAINED
TRACT A	1,067,933	24.516	FUTURE DEVELOPMENT	BC LAND, LLC
TRACT B	1,137,137	26.105	FUTURE DEVELOPMENT	BC LAND, LLC
TRACT C	425,598	9.770	FUTURE DEVELOPMENT	BC LAND, LLC

TITLE VERIFICATION CERTIFICATE

WE, LAND TITLE GUARANTEE COMPANY, DO HEREBY CERTIFY THAT WE HAVE EXAMINED THE TITLE OF ALL LAND PLATTED HEREON AND THAT TITLE TO SUCH LAND IS IN THE DEDICATOR(S) FREE AND CLEAR OF ALL LIENS, TAXES AND ENCUMBRANCES, EXCEPT AS FOLLOWS: THOSE ITEMS AND OWNERSHIP INTERESTS SHOWN IN TITLE COMMITMENT _____, EFFECTIVE _____

LAND TITLE GUARANTEE COMPANY

BY: _____ DATE_____

NAME:_____

TITLE: _____

STATE OF COLORADO)
) SS.
COUNTY OF BOULDER)
ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____ 2_____.

BY: _____ AS_____

WITNESS MY HAND AND OFFICIAL SEAL

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

PLANNING AND DEVELOPMENT APPROVAL CERTIFICATE

THIS PLAT IS HEREBY APPROVED BY THE TOWN OF ERIE PLANNING AND DEVELOPMENT DIRECTOR ON THE ____ DAY OF _____ A.D., 20__.

_____
PLANING AND DEVELOPMENT DIRECTOR

BOARD OF TRUSTEE APPROVAL CERTIFICATE

THIS PLAT IS TO BE KNOWN AS _____ IS APPROVED AND ACCEPTED BY RESOLUTION NO. _____, PASSED AND ADOPTED AT THE REGULAR MEETING OF THE BOARD OF TRUSTEE OR ERIE, COLORADO, HELD ON THE ____ DAY OF _____ 20____.

_____
MAYOR

ATTEST _____
TOWN CLERK

PLAT NOTES

1. 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.
2. ANY PERSON WHO KNOWINGLY REMOVES, ALTERS OR DEFACES ANY PUBLIC LAND SURVEY MONUMENT OR ACCESSORY COMMITS A CLASS TWO (2) MISDEMEANOR PURSUANT TO STATE STATUTE 18-4-508, C.R.S.
3. BASIS OF BEARINGS: THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31 WAS ASSUMED TO BEAR N 89°40'29" EAST AND IS MONUMENTED AS SHOWN HEREON, WITH ALL MEASURED BEARINGS SHOWN HEREON, WITH ALL MEASURED BEARINGS SHOWN HEREON RELATIVE THERETO.
4. BASED UPON A REVIEW OF FLOOD INSURANCE RATE MAP COMMUNITY PANEL NO. 0813C0443K, MAP REVISED AUGUST 14,2019, THE SUBJECT PROPERTY IS NOT WITHIN THE 100-YEAR FLOOD PLAIN LIMITS.
5. TRACT MONUMENTATION SHALL BE IN ACCORDANCE WITH THE COLORADO REVISED STATUTES (CRS 38-51-105).
6. THE LINEAL DISTANCE UNIT USED IN THE PREPARATION OF THIS PLAT IS THE UNITED STATES SURVEY FOOT. THE UNITED STATES DEPARTMENT OF COMMERCE, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DEFINES THE UNITED STATES SURVEY FOOT AS 120/3937 METERS.
7. LAND TITLE GUARANTEE COMPANY COMMITMENT NUMBER: _____ EFFECTIVE DATE _____ WAS ENTIRELY RELIED UPON FOR RECORDED INFORMATION REGARDING RIGHTS OF WAY, EASEMENTS AND ENCUMBRANCES IN THE PREPARATION OF THIS PLAT. NO LIABILITY IS ACCEPTED BY LJA, SURVEYING, LLC. FOR THE ACCURACY OF INFORMATION CONTAINED IN SAID COMMITMENT.
8. DUE TO THE PROXIMITY OF THE PROPERTY TO THE ERIE MUNICIPAL AIRPORT , THERE WILL BE AIRCRAFT PASSING OVER THE PROPERTY, AIRCRAFT PASSING OVER THE PROPERTY. AIRCRAFT PASSAGE MAY RESULT IN NOISE AND OTHER IMPACTS ON THE PROPERTY. AIRCRAFT MAY CROSS PROPERTY AT LOW ALTITUDE HEIRS, SUCCESSORS AND ASSIGNS SPECIFICALLY ACKNOWLEDGE THE RIGHT OF PASSAGE OVER THE PROPERTY FOR AIRCRAFT AND AGREE TO HOLD HARMLESS THE TOWN OF EIRE FOR AIRCRAFT OPERATIONS.
9. THE SOLE INTENTION AND PURPOSE OF THE SIERRA VISTA MINOR SUBDIVISION IS TO CREATE TRACTS OF LAND IN ORDER TO ENABLE THE SALE OF THE INDIVIDUAL TRACTS SHOWN HEREIN. ALL TRACTS WILL NEED TO BE REPLATTED TO LOTS TO ACCOMMODATE DEVELOPMENT.
10. NO DEVELOPMENT RIGHTS ARE GRANTED BY THE SIERRA VISTA MINOR SUBDIVISION AND NO DEVELOPMENT SHALL BE ALLOWED ON ANY TRACT CREATED HEREIN UNTIL THE FOLLOWING REQUIREMENTS ARE FULLY COMPLIED WITH. NO DEVELOPMENT OR BUILDING OF IMPROVEMENTS SHALL BE ISSUED FOR ANY PURPOSE UNTIL THERE IS FULL COMPLIANCE WITH ALL TOWN OF EIRE MUNICIPAL CODE REQUIREMENTS, INCLUDING BUT NOT LIMITED TO: COMPLETION OF SUBDIVISION PROCEDURES FINAL PLAT; A DEVELOPMENT AGREEMENT (AND ANY OTHER AGREEMENTS THAT MAY BE REQUIRED BY THE TOWN OF ERIE MUNICIPAL CODE); AND IF NECESSARY COMPLETION OF THE SITE PLAN REVIEW PROCEDURE.
11. UTILITIES, VEHICULAR AND PEDESTRIAN ACCESS ROUTES, AND IMPROVEMENT GUARANTEE REQUIREMENTS WILL BE REQUIRED PER THE TOWN OF ERIE MUNICIPAL CODE, PRIOR TO THE ISSUANCE OF ANY BUILDING PERMIT.
12. THE RESTRICTIONS AND REQUIREMENTS SET FORTH BY THE SIERRA VITA MINOR SUBDIVISION SHALL RUN WITH THE LAND INCLUDED WITH THE SIERRA VISTA MINOR SUBDIVISION AND SHALL INSURE TO THE BENEFIT OF AND BE BINDING UPON THE SUCCESSORS AND ASSIGNS OF THE OWNER. ALL OBLIGATIONS AND RESPONSIBILITIES OF THE OWNERS HEREIN SHALL PASS TO EACH AND EVERY SUCCESSOR AND/OR ASSIGN. IT IS THE RESPONSIBILITY OF ANY PURCHASER OF A TRACT WITHIN THIS SIERRA VISTA MINOR SUBDIVISION TO FULLY INVESTIGATE THE REQUIREMENTS PRIOR TO SUCH PURCHASE.

SURVEYOR'S CERTIFICATE

I, PATRICK S. JERNIGAN, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS MAP WAS MADE BY ME OR UNDER MY DIRECT SUPERVISION, AND IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF, THAT AT LEAST ONE-SIXTH (1/6) OF THE PERIPHERAL BOUNDARY OF THE PARCEL SHOWN HEREON IS CONTIGUOUS WITH THE PRESENT BOUNDARY OF THE TOWN OF JOHNSTOWN, AND THAT THIS PLAT COMPLIES WITH SECTION 31-12-107(1)(d), COLORADO REVISED STATUTES, CONCERNING ANNEXATION PLATS.

FOR REVIEW ONLY

_____
PATRICK S. JERNIGAN
COLORADO PLS NO. 37042
FOR AND ON BEHALF OF LJA SURVEY, INC
7800 EAST UNION AVENUE, SUITE 575,
DENVER, COLORADO 80237

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 EVEN MAY ANY ACTION BASED UPON AND DEFECT IN THIS SURVEY BE COMMENCED MORE THEN TEN YEARS FROM THE DATE OF THE CERTIFICATE SHOWN HEREON.

LJA SURVEYING
7800 E. Union Avenue
Suite 575
Denver, CO 80237
303-390-6510
www.lja.com

Date: 12/10/2024 | Job No.: 1061-0006 | Sheet: 1 of 2

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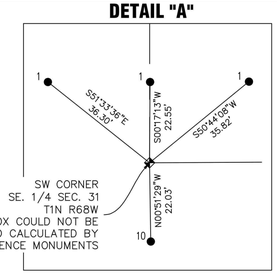
SIERRA VISTA MINOR SUBDIVISION FILING NO. 2

LOCATED IN THE SOUTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

100 0 50 100
SCALE
1 inch = 100 ft.

20 0 10 20
SCALE
1 inch = 20 ft.

DETAIL "A"



NW 1/4 CORNER OF S/2 OF SE/4, SEC 31 2" ALUMINUM CAP STAMPED "LS 14083 1995"

LOT 18 | LOT 16 | LOT 7 — ERIE AIR PARK SUBDIVISION BOOK 830, REC. NO. 1752380 (ZONED RURAL RESIDENTIAL)

LOT 6 | LOT 5 | LOT 6 | LOT 7 — ERIE AIR PARK SUBDIVISION REPLAT B BOOK 1477, REC. NO. 242253 (ZONED RURAL RESIDENTIAL)

20' DRAINAGE & UTILITY EASEMENT BOOK 830, REC. NO. 1752380 REC. NO. 4624407

20' ACCESS EASEMENT BOOK 880 PAGE 1801566 REC. NO. 2424253

38' UTILITY & ACCESS EASEMENT REC. NO. 4268505

NE CORNER S/2 OF SE/4, SEC 31 2.5" ALUMINUM CAP STAMPED "LS 20142 2015"

N89°35'08"W 555.82' (R2)

N89°40'29"E 246.47'

1044.88'
S89°35'08"E (R1)

BASIS OF BEARINGS
N89°40'29"E 2330.17'
NORTH LINE, S 1/2 OF SE 1/4, SECTION 31

1285.29'

N89°35'08"W 555.82' (R2)

55.00'

LOT A RECORDED EXEMPTION NO. 1467-32-3-RE-645 REC. NO. 1977544 WELD COUNTY (ZONED PLANNED DEVELOPMENT)

30' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS BOOK 1050, REC. NO. 1989356 BOOK, 1274, REC. NO. 2225425 REC. NO. 2254297 REC. NO. 2268776

10' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS BOOK 1302, REC. NO. 2254297 BOOK, 1376, REC. NO. 2268776

N12°59'44"W 23.44'
N14°27'16"E 123.38' (R3)

N17°15'27"W 636.15'
N16°53'20"W 656.25' (R3)

TRACT A
1,067,933 SF
24.516 AC

TRACT B
1,137,137 SF
26.105 AC

UNITED POWER REC. NO. 4513360

S04°02'11"W 564.17'
S04°46'24"W 564.23' (R3)

EAST LINE, SE 1/4, SECTION 31
NO BEARING CALCULATED LINE ONLY

LOT 1 VISTA RIDGE FILING NO. 6 MINOR SUBDIVISION REC. NO. 3555044 (ZONED PLANNED DEVELOPMENT)

TRACT A1 VISTA RIDGE FILING NO. 6 1ST AMENDMENT REC. NO. 3994401 (ZONED PLANNED DEVELOPMENT)

LOT 2 VISTA RIDGE FILING NO. 6 1ST AMENDMENT REC. NO. 3994401 (ZONED PLANNED DEVELOPMENT)

WEST LINE, SE 1/4, SECTION 31

TOWN OF ERIE
WELD COUNTY
BOOK 1274, REC. NO. 02225423
(ZONED AIRPORT)

N00°20'01"E 1245.94'

902.30'

343.64'

S00°18'10"W 183.35'
S01°04'07"W 183.40' (R3)

S00°19'43"W 190.91'
S01°04'07"W (R3)

156.53'

34.38'

N89°40'54"E 1248.97'

S03°50'44"W 60.39'
S04°35'08"W 60.39' (R3)

Make Bonanza the main street name. That's how it is signed, and previously platted

S03°46'W 8.34'
S04°35'08"W 8.34' (R3)

S06°58'07"W 120.00'
S07°42'31"W 120.00' (R3)

S01°13'46"W 98.28'
S01°58'10"W 98.28' (R3)

COUNTY ROAD NO. 3 (BONANZA DRIVE)
(VARIABLE WIDTH R.O.W.)
BOOK 86, PAGE 273; BOOK 1631, PAGE 123, REC. NO. 2572958; REC. NO. 4431602

50' ACCESS, UTILITY, AND DRAINAGE EASEMENT REC. NO. 4431602

TRACT C
425,598 SF
9.770 AC

19.18'

647.35'
N89°59'45"W 13.49'
N89°32'45"W 13.43' (R3)

S89°40'31"W 666.53'
N89°34'53"W (R3)

S89°40'42"W 361.51'
N89°34'53"W (R3)

S89°40'54"W 848.15'
N89°34'53"W (R3)

SEE DETAIL "A"

150' R.O.W.
75'
75'

STATE HIGHWAY NO. 7
(E. 168TH AVENUE)
(150' R.O.W.)
REC. NO. 2170911

BROOMFIELD CITY LIMITS
SOUTH LINE, SE 1/4, SECTION 31
NO BEARING CALCULATED LINE ONLY

SE CORNER SEC. 31, T1N R68W UNDER ASPHALT CALCULATED POSITION ONLY

SW CORNER
SE. 1/4 SEC. 31
T1N R68W
LID OF BOX COULD NOT BE OPENED CALCULATED BY REFERENCE MONUMENTS

NW CORNER
NE. 1/4 SEC. 5
T1S R68W
3.25" ALUMINUM CAP
STAMPED "PLS 24942 2001"

CURVE TABLE					
CURVE	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C1	23.40'	512.50'	2°36'58"	S02° 32' 15"W	23.40

MONUMENT SYMBOL LEGEND

- RECOVERED SECTION CORNER AS NOTED HEREON
- 1 RECOVERED REFERENCE MONUMENT WITH A 1.5" ALUMINUM CAP STAMPED "PLS 38621 RYNEARSON RM"
- 2 RECOVERED NO. 5 REBAR WITH A 2" ALUMINUM CAP STAMPED "PLS 4846 W. M. STENGEL"
- 3 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP
- 4 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 20142"
- 5 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 38621 STRAITON"

MONUMENT SYMBOL LEGEND

- 6 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 25965"
- 7 RECOVERED IRON ROD WITH A 2" ALUMINUM CAP STAMPED "PLS 28286" 0.2 ABOVE GROUND
- 8 RECOVERED NO. 5 REBAR WITH A 2" ALUMINUM CAP STAMPED "PLS 4846 W. M. STENGEL" BENT
- 9 RECOVERED IRON RODS NOT HELD BY THIS SURVEY
- 10 RECOVERED IRON ROD REFERENCE MONUMENT STAMPED "4RV WIT"

MONUMENT SYMBOL LEGEND

- 1 SET 18" LONG NO. 5 REBAR WITH 1.25" ORANGE PLASTIC CAP STAMPED "LJA SURVEYING PLS 37042" FLUSH WITH THE GROUND
- (R1) DIMENSION PER LEGAL DESCRIPTION ERIE AIR PARK SUBDIVISION AT RECEPTION NUMBER 1752380
- (R2) DIMENSION PER LEGAL DESCRIPTION ERIE AIR PARK SUBDIVISION REPLAT B AT RECEPTION NUMBER 242253
- (R3) DIMENSION PER LEGAL DESCRIPTION SIERRA VISTA MINOR SUBDIVISION AT RECEPTION NUMBER 4431602

FOR REVIEW ONLY

LJA SURVEYING
7800 E. Union Avenue
Suite 575
Denver, CO 80237
303-390-8510
www.lja.com

Date:	Job No:	Sheet:
12/10/2024	1061-0006	2 of 2

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SIERRA VISTA ZONING

LOCATED IN THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH,RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

LEGAL DESCRIPTION AP ZONING PARCEL

A PARCEL OF LAND BEING A PORTION ON THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING ALSO A PORTION OF TRACT A AND TRACT B OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31; THENCE NORTH 89°40'29" EAST, ON THE NORTH LINE OF SAID SOUTH HALF, A DISTANCE OF 246.47 FEET TO THE NORTHWESTERLY CORNER OF SAID TRACT B, SAID POINT BEING THE **POINT OF BEGINNING**;

THENCE CONTINUING NORTH 89°40'29" EAST, ON THE LINE COMMON TO SAID NORTH LINE OF THE SOUTH HALF AND THE NORTH LINE OF SAID TRACT B, A DISTANCE OF 1,044.88 FEET;

THENCE SOUTH 00°20'01" WEST A DISTANCE OF 1245.94 FEET TO THE SOUTH LINE OF SAID TRACT A, BEING ALSO THE NORTH RIGHT-OF-WAY LINE OF COLORADO STATE HIGHWAY NO. 7 (EAST 168TH AVENUE) AS DESCRIBED IN THAT SPECIAL WARRANTY DEED RECORDED FEBRUARY 15, 1989 IN SAID RECORDS UNDER RECEPTION NUMBER 2170911;

THENCE ON THE SOUTH LINE OF SAID TRACT A AND SAID NORTH RIGHT-OF-WAY LINE THE FOLLOWING (2) TWO COURSES:

1. SOUTH 89°40'31" WEST A DISTANCE OF 647.35 FEET,

2. NORTH 89°59'45" WEST A DISTANCE OF 13.49 FEET TO THE SOUTHWESTERLY CORNER OF SAID TRACT A;

THENCE NORTH 17°15'42" WEST, ON THE WESTERLY LINE OF SAID TRACT A, A DISTANCE OF 540.19 FEET TO A POINT ON THE WESTERLY LINE OF SAID TRACT B;

THENCE ON SAID WESTERLY LINE THE FOLLOWING (2) TWO COURSES:

1. NORTH 17°15'27" WEST, ON SAID WESTERLY LINE, A DISTANCE OF 636.15 FEET;

2. NORTH 12°59'44" WEST A DISTANCE OF 123.44 FEET TO THE **POINT OF BEGINNING.**

CONTAINING A CALCULATED AREA OF 24.5 ACRES (1,067,934 SQUARE FEET), MORE OR LESS.

LEGAL DESCRIPTION HR ZONING PARCEL

A PARCEL OF LAND BEING A PORTION ON THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING ALSO A PORTION OF TRACT A, TRACT B AND TRACT C OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31; THENCE NORTH 89°40'29" EAST, ON THE NORTH LINE OF SAID SOUTH HALF, A DISTANCE OF 246.47 FEET TO THE NORTHWESTERLY CORNER OF SAID TRACT B; THENCE CONTINUING NORTH 89°40'29" EAST, ON THE LINE COMMON TO SAID NORTH LINE OF THE SOUTH HALF AND THE NORTH LINE OF SAID TRACT B, A DISTANCE OF 1,044.88 FEET THE **POINT OF BEGINNING;**

THENCE CONTINUING NORTH 89°40'29" EAST, ON THE LINE COMMON TO SAID NORTH LINE OF THE SOUTH HALF AND THE NORTH LINE OF SAID TRACT B, A DISTANCE OF 1,285.29 FEET TO THE NORTHEASTERLY CORNER OF SAID TRACT B, BEING ALSO THE WESTERLY RIGHT-OF-WAY LINE OF BONANZA DRIVE;

THENCE ON THE LINE COMMON TO SAID TRACT B AND SAID WESTERLY RIGHT-OF-WAY LINE THE FOLLOWING (2) TWO COURSES:

1. SOUTH 04°02'11"W A DISTANCE OF 564.17 FEET;
2. SOUTH 00°18'10" WEST A DISTANCE OF 183.35 FEET TO THE SOUTHEASTERLY CORNER OF SAID TRACT B;

THENCE SOUTH 00°19'43" WEST, ON THE LINE COMMON TO THE EASTERLY LINE OF SAID TRACT C AND SAID WESTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 156.53 FEET;

THENCE SOUTH 89°40'54" WEST A DISTANCE OF 1,248.97 FEET;

THENCE NORTH 00°20'01" EAST A DISTANCE OF 902.30 FEET TO THE **POINT OF BEGINNNG.**

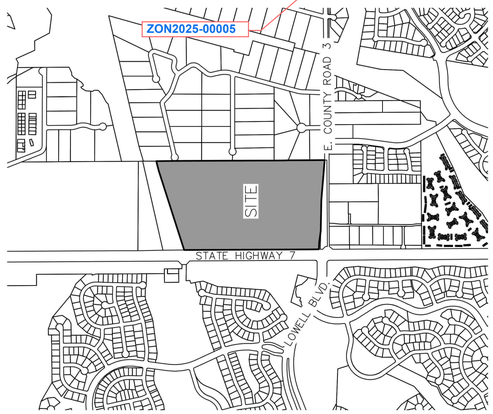
CONTAINING A CALCULATED AREA OF 26.1 ACRES (1,137,144 SQUARE FEET), MORE OR LESS.

GENERAL NOTES

1.BASIS OF BEARINGS: THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN IS ASSUMED TO BEAR NORTH 89°29'51" EAST BASED ON NAD83 (2011) COLORADO STATE PLANE NORTH ZONE (501) COORDINATES, BEING MONUMENTED AT THE WEST END BY A 2" ALUMINUM CAP STAMPED, "PLS 14083 1995" RECOVERED 0.2' BELOW THE SURFACE, BEING THE NORTHWEST CORNER OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1 AND ON THE EAST END BY A 2-1/2" ALUMINUM CAP STAMPED, "PLS 20142 2015" RECOVERED 0.3' BELOW THE SURFACE, BEING THE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1.

2. 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.

3. THIS MAP WAS PREPARED WITHOUT ANY BENEFIT OF A CURRENT TITLE COMMITMENT AND DOES NOT CONSTITUTE A TITLE SEARCH BY LJA SURVEYING, INC.TO DETERMINE OWNERSHIP, RIGHTS-OF-WAY, EASEMENTS OR OTHER MATTERS OF PUBLIC RECORD.



VICINITY MAP
SCALE: 1" = 1000'

LEGAL DESCRIPTION CC ZONING PARCEL

There are multiple references to the POB.

A PARCEL OF LAND BEING A PORTION ON THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING ALSO A PORTION OF TRACT A, TRACT B AND TRACT C OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31; THENCE NORTH 89°40'29" EAST, ON THE NORTH LINE OF SAID SOUTH HALF, A DISTANCE OF 246.47 FEET TO THE NORTHWESTERLY CORNER OF SAID TRACT B; THENCE CONTINUING NORTH 89°40'29" EAST, ON THE LINE COMMON TO SAID NORTH LINE OF THE SOUTH HALF AND THE NORTH LINE OF SAID TRACT B, A DISTANCE OF 1,044.88 FEET THE POINT OF BEGINNING; THENCE SOUTH 00°20'01" WEST A DISTANCE OF 902.30 FEET TO THE **POINT OF BEGINNING**;

THENCE NORTH 89°40'54" EAST A DISTANCE OF 486.31 FEET;

THENCE SOUTH 00°19'06" EAST A DISTANCE OF 343.59 FEET TO THE SOUTH LINE OF SAID TRACT C, BEING ALSO THE NORTH RIGHT-OF-WAY LINE OF SAID COLORADO STATE HIGHWAY NO. 7 (EAST 168TH AVENUE);

THENCE SOUTH 89°40'54" WEST, ON THE SOUTH LINE OF SAID TRACT C AND SAID NORTH RIGHT-OF-WAY LINE, A DISTANCE OF 109.53 FEET TO THE SOUTHWEST CORNER OF SAID TRACT C;

THENCE SOUTH 89°40'42" WEST, ON THE SOUTH LINE OF SAID TRACT B AND SAID NORTH RIGHT-OF-WAY LINE, A DISTANCE OF 361.51 FEET TO THE SOUTHEAST CORNER OF SAID TRACT A;

THENCE SOUTH 89°40'31" WEST, ON THE SOUTH LINE OF SAID TRACT A AND SAID NORTH RIGHT-OF-WAY LINE, A DISTANCE OF 19.18 FEET;

THENCE NORTH 00°20'01" EAST A DISTANCE OF 343.64 FEET TO THE **POINT OF BEGINNING**.

CONTAINING A CALCULATED AREA OF 3.8 ACRES (167,767 SQUARE FEET), MORE OR LESS.

PLANNING COMMISSION CERTIFICATE

THIS ZONING MAP, ZAXX-XXX, WAS VIEWED BY THE PLANNING COMMISSION ON THE

_____ DAY OF _____, 201__ A.D.

ZON2025-00005

_____ 20___

CHAIRMAN OF ERIE PLANNING COMMISSION

BOARD OF TRUSTEES APPROVAL CERTIFICATE

THIS ZONING MAP IS TO BE KNOWN AS THE "SIERRA VISTA ZONING MAP" AND IS APPROVED AND ACCEPTED BY ORDINANCE NO. _____, PASSED AND ADOPTED AT THE REGULAR (SPECIAL) MEETING OF THE BOARD OF TRUSTEES OF ERIE, COLORADO, HELD ON _____ _____, 201__.

_____ 20___

MAYOR

ATTEST _____.

CLERK & RECORDER CERTIFICATE

This certificate is superfluous. Weld county does not use it. Delete

STATE OF COLORADO

COUNTY OF WELD

I HEREBY CERTIFY THAT THIS ZONING MAP WAS FILED IN MY OFFICE THIS _____ DAY OF _____, 201__ A. D. AND WAS RECORDED AT RECEPTION NUMBER _____.

_____

SIGNATURE

WELD COUNTY CLERK & RECORDER

SURVEYOR'S CERTIFICATE

I, PATRICK S. JERNIGAN, A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS ZONING MAP TRULY AND CORRECTLY REPRESENTS THE ABOVE DESCRIBED LEGAL DESCRIPTION FOR EACH ZONE DISTRICT.

I ATTEST THE ABOVE ON THIS _____ DAY OF _____ 2024.

FOR REVIEW ONLY

2025

PATRICK S. JERNIGAN
COLORADO REGISTERED PROFESSIONAL LAND SURVEYOR # 37042
FOR AND ON BEHALF OF LJA SURVEYING, INC.

LJA SURVEYING
7800 E. Union Avenue
Suite 575
Denver, CO 80237
303-390-8510
www.lja.com

Date:	Job No.:	Sheet:
3/6/2025	1061-0006	1 of 2

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SIERRA VISTA ZONING

LOCATED IN THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH,RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

ZRXX-XXX

ZON2025-00005

Point of Commencement

NW 1/4 CORNER OF S/2 OF SE/4, SEC 31
2" ALUMINUM CAP STAMPED "LS 14083 1995"

DENT & GEORGE PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731003018

DE FOSSE & BELL PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731004018

ANDERSON PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731004009

MILLER PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731004008

YAMAMOTO PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731008005

BEDNAR PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731008006

THOMAS PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731008007

NE CORNER
S/2 OF SE/4, SEC 31
2.5" ALUMINUM CAP
STAMPED "LS 20142 2015"

20' DRAINAGE & UTILITY EASEMENT
BOOK 830, REC. NO. 1752380
REC. NO. 4624407

20' ACCESS EASEMENT
BOOK 880 PAGE 1801566
REC. NO. 2424253

38' UTILITY & ACCESS EASEMENT
REC. NO. 4268505

BASIS OF BEARINGS
NORTH LINE, S 1/2 OF SE 1/4, SECTION 31
N89°40'29"E 2631.65'

N89°40'29"E 1044.88'

N89°40'29"E 1285.29'

Add all POB's and define them specifically

10' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS
BOOK 1302, REC. NO. 2254297
BOOK, 1376, REC. NO. 2268776

30' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS
BOOK 1050, REC. NO. 1989356
BOOK, 1274, REC. NO. 2225425
REC. NO. 2254297
REC. NO. 2268776

add remaining dimensions

FOOTE & KNIGHT PROPERTY (EXISTING ZONE) PLANNED DEVELOPMENT (PD) (WELD COUNTY) PARCEL NO: 146732000033

COUNTRY ROAD 3 INVESTORS LLC (EXISTING ZONE) PLANNED DEVELOPMENT (PD) (WELD COUNTY) PARCEL NO: 146732363001

UNITED POWER
REC. NO. 4513360

EAST LINE, SE 1/4, SECTION 31, NO BEARING CALCULATED LINE ONLY

add remaining dimensions

TOWN OF ERIE (EXISTING ZONE) AIRPORT (AP) (WELD COUNTY) PARCEL NO: 146731000030

PROPOSED ZONING:
AIRPORT (AP)
24.5 ACRES

EXISTING ZONING:
LOW DENSITY
RESIDENTIAL (LR)

WEST LINE, SE 1/4, SECTION 31
N00°01'10"E 1320.38'

902.30'

PROPOSED ZONING:
COMMUNITY MIXED-USE (CMU)
26.1 ACRES

EXISTING ZONING:
LOW DENSITY RESIDENTIAL (LR)

COUNTY ROAD 3 INVESTORS LLC PROPERTY (EXISTING ZONE) PLANNED DEVELOPMENT (PD) (WELD COUNTY) PARCEL NO: 146732364003

S00°19'43"W 156.53'

S00°19'43"W 34.38'

N89°40'54"E 1248.97'

486.31'

762.67'

PROPOSED ZONING:
COMMUNITY MIXED-USE (CMU)
3.9 ACRES

EXISTING ZONING:
LOW DENSITY RESIDENTIAL (LR)

EXISTING ZONING:
COMMUNITY MIXED-USE (CMU)
5.9 ACRES

add remaining dimensions

343.64'

N00°19'06"W 343.59'

KG STORE 316 LLC PROPERTY (EXISTING ZONE) PLANNED DEVELOPMENT (PD) (WELD COUNTY) PARCEL NO: 146732364002

S89°40'31"W 19.18'

S89°40'54"W 109.53'

50' ACCESS, UTILITY, AND DRAINAGE EASEMENT
REC. NO. 4431602

Make Bonanza the main street name. That's how it is signed, and previously platted

S89°40'31"W 647.35'

S89°40'54"W 738.62'

COUNTY ROAD NO. 3 (BONANZA DRIVE)
(VARIABLE WIDTH R.O.W.)
BOOK 86, PAGE 273; BOOK 1631, PAGE 123; REC. NO. 2572958, REC. NO. 4431602

COUNTRY ROAD 3 INVESTORS LLC PROPERTY (EXISTING ZONE) PLANNED DEVELOPMENT (PD) (WELD COUNTY) PARCEL NO: 146732364004

N89°42'49"E 637.57'

STATE HIGHWAY NO. 7
(E. BASELINE ROAD)
(150' R.O.W.)
REC. NO. 2170911

SOUTH LINE, SE 1/4, SECTION 31 CALCULATED LINE ONLY

SW CORNER
SE. 1/4 SEC. 31
T1N R68W
RANGE BOX LID SEALED SHUT AND COULD NOT BE OPENED. POSITION SET BY REFERENCE MONUMENTS.

NW CORNER
NE. 1/4 SEC. 5
T1S R68W
3.25" ALUMINUM CAP
STAMPED "PLS 24942 2001"

SE CORNER SEC. 31
T1N R68W
RANGE BOX UNDER ASPHALT
CALCULATED POSITION ONLY

PULTE HOME CORPORATION PROPERTY (EXISTING ZONE) PLANNED UNIT DEVELOPMENT (PUD) (BROOMFIELD COUNTY) PARCEL NO: 157306106153

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LJA SURVEYING

7800 E Union Avenue
Suite 575
Denver, CO 80237
303-390-8510
www.lja.com

Date:	Job No:	Sheet:
3/6/2025	1061-0006	2 of 2

Sierra Vista Minor Sub & Rezoning 1st Review

Development Review

To: Aly Burkhalter, Senior Planner
From: Chad Schroeder, P.E. , Development Engineering Supervisor
Date: August 22, 2025
Re: SUB2025-00006 & ZON2025-00005 Sierra Vista Minor Sub & Rezoning

Engineering Division Comments

The development review team has reviewed the applications for the Sierra Vista Minor Sub & Rezoning for conformance with Town Standards and Specs.

The next step for the application is revision and resubmittal for another engineering review. Please make the appropriate revisions to the application materials and provide written response to address each written comment from the Town staff and referral agencies. All resubmittals shall be submitted via eTRAKiT.

1. Provide a general utility master plan and road plan for the entire Sierra Vista Development.
    a. Sanitary Sewer – show the truck lines from the connection point in at the Baron Court and Airport Drive intersection to the intersection at Bonanza Drive and Commons Drive intersection.
    b. Water – show how water will be looped through the site. Note that along the northern boundary of Sierra Vista (adjacent to the Erie Air Park Subdivision) is an existing 14-inch asbestos concrete (AC) water line which goes west through Baron Court and ends at Airport Drive. The Sierra Vista project will need to provide a replacement of this AC water line. Most likely the AC water line can be abandoned in place, to be determined in later reviews.
    c. Storm – provide a plan for the swales and culvert trunk lines to the proposed detention ponds.
2. Utility Studies need to cover the following:
    a. Sanitary Sewer
        - Does the downstream sanitary sewer system have the capacity to handle the proposed sanitary sewer flows from the proposed Sierra Vista uses? The system is constrained in segments just south of the Vista Parkway Bridge over Coal Creek. A downstream parallel line may need to be installed.
        - The lift station in Vista Ridge Filing 6 (in the southeast corner of Little Sunshine's Daycare Center) will need to be taken offline and decommissioned with the installation of the Sierra Vista sanitary sewer network.
    b. Water
        - Sierra Vista is in the Zone 3 pressure Zone. It boarders the Zone 4B to the east of Bonanza. The water looping needs to be within Zone 3. The Town highly discourages PRVs
    c. Storm / Drainage Study
        - The detention ponds need to be sized and proportionally laid out on the plans for all of the Sierra Vista proposed drainage runoff.

- The existing drainage swales at the southwest corner of the property where some of the drainage from Sierra Vista will drain to are eroded and will need to be addressed and stabilized with this development.
- There are FAA regulations pertaining to detention ponds and birds in relations to airfields. This needs to be researched for the appropriate setbacks of detention ponds to the airfield and runway approach zones.
- Drainage swale improvements along CO7 will need to be reviewed and approved by CDOT.
- Review the East Coal Creek OSP for recommended drainage improvements.

3. What is the general plan for ground vehicle and aircraft access to the airfield from the proposed western airport use areas?

The review process is a cumulative process and dependent on various criteria. We reserve the right to provide further comment(s) and request additional information.

Please contact me at 303-926-2876 or cschroeder@erieco.gov for further clarification. Staff would be happy to discuss the comments and answer any questions.

Sincerely,

Chad Schroeder, P.E. | Development Engineering Supervisor

Development Review, Public Works

Town of Erie

Street Address | P.O. Box 750 | Erie, CO 80516

Phone: 303-926-2876

www.erieco.gov | Facebook | Twitter | LinkedIn

Enhancing the quality of life by serving and building Erie with PRIDE.

Department of Parks & Recreation
Development & Neighborhood Services

Internal Memo

To: Aly Buckhalter, Senior Planner

From: Shane Greenburg, Senior Parks Planner

Subject: Sierra Vista Minor Sub with Zoning (SUB2025-00006 & ZON2025-00005) – Parks & Recreation, Development & Neighborhood Services –1st Review

8/21/25 – 1st review – Subdivision and Zoning

GENERAL COMMENTS

1) The Town needs to see a cohesive pedestrian connectivity and park / open space plan through the entire property (including commercial and residential areas) to prevent a disjointed design. As the property is more than a mile from existing Erie trails and park space, we need to see some enhanced pocket park / amenity space to reasonably meet the resident and commercial tenant park space needs. Neighborhood and Community Park requirements need to be met with fees-in-lieu. Park requirements are determined by the number of planned residential units and more details will be provided once we see more information in that regard.
   a) You can find park dedication requirements in the Town's UDC.
      i) https://library.municode.com/co/erie/codes/code_of_ordinances?nodeId=TIT10UNDECO_CH6DEDEST_10-6-3PAOPSPTR
   b) You cay find park and trail design standards in the Town's Standards and Specifications
      i) https://www.erieco.gov/DocumentCenter/View/10043/Section-1000---2024-Private-Development-Landscape-Irrigation-Parks-Open-Space--Trails?bidId=
      ii) In particular see design standards for pocket parks in Section 1080.00 POCKET PARK DESIGN STANDARDS, and trail design standards in Section 1091.00 Trails & Park Paths.
2) Please adhere to the Town's Park, Trail, and Open Space Plan found at the link below.
   a) https://erieco.gov/DocumentCenter/View/8802/PROST-Plan-Update-2016?bidId=

Memo

To: Aly Burkhalter, Senior Planner
From: Nick Wagner, Transportation Engineer
Date: August 18th , 2025
Subject: Sierra Vista Minor Sub & Rezoning - Transportation Engineering Comments
CC: John Firouzi

Transportation Concept Plan Comments – Provided by Nick Wagner:

1. Remove internal site arrows/linework. At this level we would only like to see where the site entrances are being proposed as well as their movement. Any further information should come through site plans.

2. Align North site access point with the emergency access point for the ErieStorage.com building. This would put the North drive at an equal distance from Commons Dr. to the south and Sunset Dr. to the North.

3. Continue coordination with CDOT through the development process in terms of the RI/RO along HWY 7. Due to spacing with Bonanza Dr, the RI/RO might have to serve as a acceleration lane/deceleration lane, which is similar condition to Commons Way connection.

Transportation TIA Comments – Provided by Bill Cowen of FoxTuttle:

1. In general, I will note that the TIA was completed in 2024 and the Town of Erie adopted new requirements for TIAs in 2025 so it is anticipated that some of the new requirements will not be met. I will clearly detail these new requirement needs in my comments to follow. In addition, it is important to note that Baseline Road (SH-7) is a state highway so CDOT requirements would apply. Also, the southern leg of the main SH 7 intersection (Lowell Boulevard) is in the City and County of Broomfield and coordination with that jurisdiction on the requirements for this TIA would be recommended.

2. New TIA requirements for the Town of Erie require that the applicant conduct a pre-application meeting and, through that meeting, get directions from the Town on the following topics:

    i. The Study area boundary and the intersections requiring operational analysis
    ii. The design years to be studied
    iii. The times of day (typically peak hours) to be studied
    iv. Trip generation methodology and modification of assumptions (such as pass-by, internal, etc.)
    v. The method of projecting future background traffic volumes
    vi. Data required including specific traffic count data to be used
    vii. Traffic analysis software to be used and whether progression or micro-simulation analysis is required
    viii. The type of TIA to be performed (Master Study, traffic conformance letter, transportation assessment or full TIA)

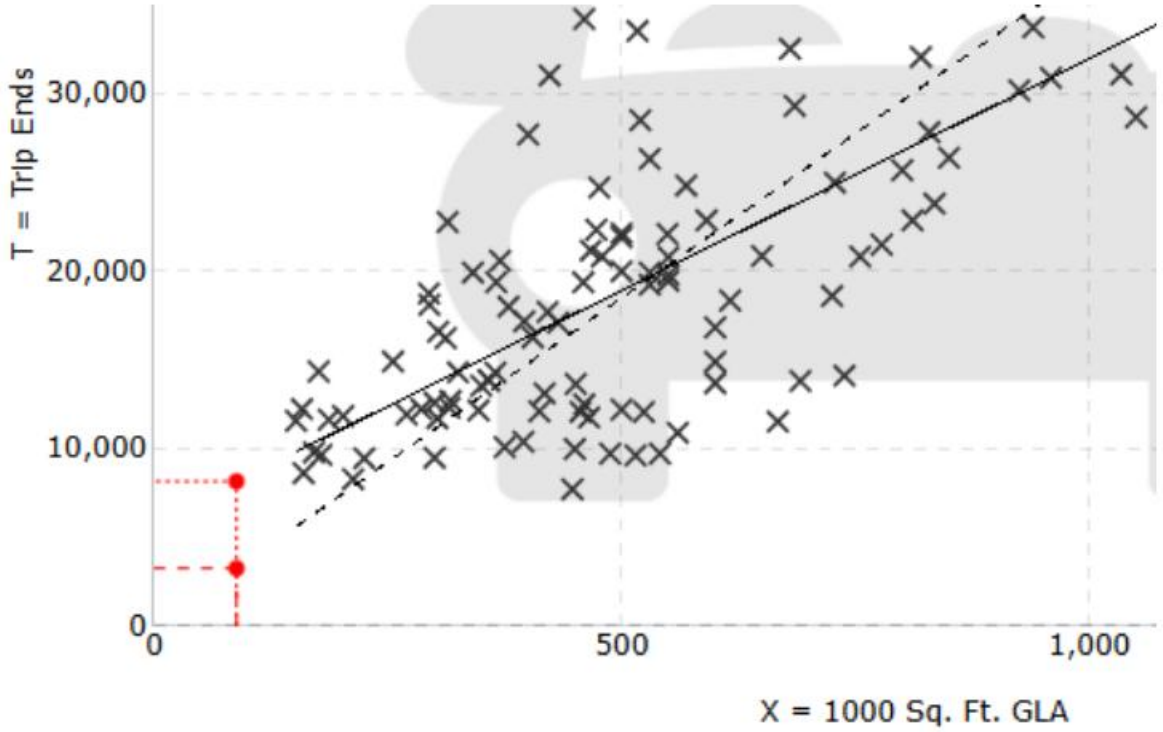
    a. Since the study was generated in 2024, this pre-application meeting likely did not occur. As such the Town may not have weighed in on these topics.

3. The TIA noted the study area including all intersections within a mile. However, it only included two existing intersections and there were more intersections within a mile distance. In addition, I question the limitation of a mile, and I would recommend that all intersections receiving a substantial amount of the project traffic be included in the TIA. At a minimum, I would recommend that the additional intersections include:

    i. Bonanza Drive and Sunset Drive
    ii. Bonanza Drive and Piper Drive
    iii. Bonanza Drive and Cessna Drive
    iv. Lowell Boulevard and Indian Peaks Parkway
    v. Lowell Boulevard and Anthem Ranch Road (northern intersection)
    vi. Lowell Boulevard and Middle Peak Drive
    vii. Lowell Boulevard and Anthem Road/Preble Creek Parkway (southern intersection)
    viii. SH 7 and Vista Parkway
    ix. SH 7 and Mountain View Boulevard
    x. SH 7 and Coal Creek Boulevard

    a. Please note I excluded recommendation of several intersections because they were anticipated to be lower volume intersections, and they were either cul-de-sacs or limited movement intersections.

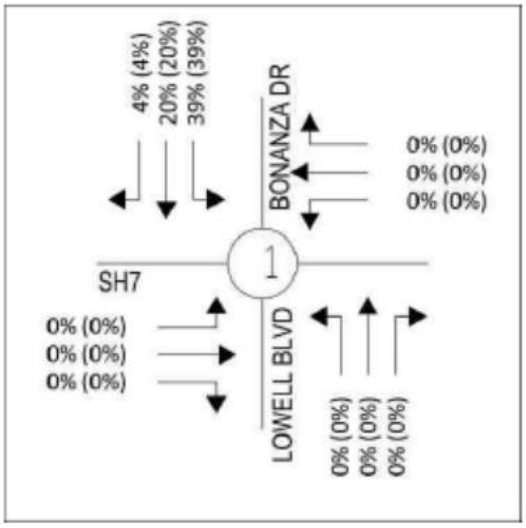
4. A trip generation estimation and summarized table was provided in the TIA. Information from the 11th Edition of the ITE Trip Generation Manual was used to provide these estimates. There was a need to estimate Gross Leasable Area for commercial and warehousing space but the applicant used a standard industry practice of 25% and it would be my recommendation that this be considered a reasonable technique for estimating GLA. My only concern with the trip generation is that the applicant used "fitted curve" equations for the residential and warehousing and used rates for the commercial development. A snapshot of the key portion of the ITE chart is shown below.



a. The bottom red dot is the daily trip estimate for the commercial land use using rates. The top red dot is the daily trip estimate for the commercial land use using a fitted curve. The difference is approximately 5,000 vehicles per day. In addition, when one looks at the data points for the studies of commercial closest to the size of this commercial land use, they are all above the rate line and massed around the fitted curve line. This would seem to suggest that using the fitted curve would be more appropriate. It would be my recommendation that the applicant be directed to either defend the decision to use the rate for this land use in light of the aforementioned information or redo the trip generation (and all associated analyses) using the fitted curve.

5. The main background growth projections needed for this study were for the SH 7 corridor and the applicant used information in CDOT's OTIS future projections for the corridor. It would be my recommendation that this be considered a reasonable approach for this determination. There were no other pertinent submitted TIAs for nearby development considered in this study. It is unclear to me whether this would be a requirement for this study. There was a recent study performed on Airport Road and there have been several in the new Parkdale subdivision.

6. Trip Distribution is an important part of any TIA. This study notes that "Generated traffic volumes were assigned to the routes that provide the shortest travel distance to their corresponding origins/destinations". This is to high level to help a reader understand the process and doesn't really speak technically to how the trip distribution was developed. One of the key determinations of potential trip distribution is how trip making is occurring today at the intersections closest to the site. This would help understand existing trends towards population and job centers in the area. When I compare the trip distribution shown in Exhibits 5 and 6 in the Appendix to the traffic counts at the SH 7 and Bonanza Drive/Lowell Boulevard intersection they do not compare equitably. As an example, the residential trip distribution shown in Exhibit 5 shows 70% of the traffic traveling to and from the east, while existing traffic counts show only 25% of the traffic doing that. Exhibit 5 also shows only 10% of the traffic coming to and from points south, while 50% of existing traffic does this. There are also errors in Exhibit 6 which make it difficult to understand the Commercial distribution. It only shows the outbound distribution (image below)



a. Just looking at the outbound distribution suggests that the percentages are quite different from what existing traffic counts would suggest. It would be our recommendation that a more robust explanation of how trip distribution was determined should be provided in the TIA and an expectation that the distribution should better align with existing traffic counts or have excellent rationale for why they do not.

7. The design year scenarios to be studied in the TIA were identified as 2027 (build out) and 2043 (Horizon). The Town's requirements are for a short-term scenario of 5 years in the future and a long-term scenario of 20 years in the future. In 2024, that would be required years 2029 and 2044 scenarios. Now that it is 2025, the study should have 2030 and 2045 scenarios.

8. Intersection Capacity Analysis was performed in the TIA for four intersections (two existing intersections and two new driveway intersections). Software using the HCM methodology was used as required. It would not be my recommendation that any additional analyses such as progression or micro-simulation be required for this study. The results are summarized in Tables 4 through 8. My only concern with these tables is that they summarize delay of service and delay by intersection approach. The Town's requires that HCM information be summarized by total intersection and by movement. I would recommend that when the tables are updated that this standard be followed. In addition, the applicant should continue to highlight any intersection or movement which operates at worse than the Table 100-1 Motor Vehicle LOS Standards.

9. A requirement of the Town for TIAs is to provide a summary table of queuing information obtained through technical analysis. The table should detail existing (or planned for new lanes) storage lengths and summation of the 95th%ile queue for each time period studied. This helps inform whether queue issues might back into through lanes and cause operational issues. It may also trigger the need for more robust technical analyses such as micro-simulation. This TIA does not speak about queuing and does not include the required table. It is our recommendation that this be required in a revised study.

10. The Town's new standards include a Safety Assessment. The requirements of this are outlined in Section 100 of the Town's Standards and Specifications and the updated TIA should provide this information. Of key consideration should be detail about each site access, whether it has acceleration and/or deceleration lanes and the potential for conflict with people walking and biking. Documentation of the addition of traffic to unprotected left turn movements would be appropriate. Also, consideration of the potential for people walking or biking from the neighborhood to the south to cross Baseline Road and travel to and from the site should be considered. In all cases, mitigation should be suggested for any potentially unsafe conditions.

11. The Town's new standards include an evaluation of Bicycle facilities for new roadways. The requirements of this are outlined in Section 100 of the Town's Standards and Specifications and the updated TIA should provide this information. Of key consideration would be the appropriate bicycle facility for Bonanza Drive adjacent to the site. CDOT will have future for a bicycle facility on SH 7.

12. The Town's new standards include an evaluation of needed pedestrian crossing treatments. The requirements of this are outlined in Section 100 of the Town's Standards and Specifications and the updated TIA should provide this information. Of key consideration would be potential crossing treatments for any transit stops on Bonanza

Drive (if such exist) or the need for a treatment connecting the development to the Kum & Go across Bonanza Drive.

13. The Town's new standards include an evaluation of Parking Management. The requirements of this are outlined in Section 100 of the Town's Standards and Specifications and the updated TIA should provide this information. The potential for any parking impacts to nearby residential land uses should be evaluated.

14. The TIA does evaluate potential motor vehicle improvements and details the evaluation and conclusions. The Town's standards require consideration of the CDOT Access Code for determining the need for right turn and left turn acceleration and deceleration lanes and it appears that the applicant has followed this practice in making improvement determinations.

    a. However, in considering operations at the signalized intersection of SH 7 and Bonanza/Lowell, the recommendation was made to increase the cycle length. Since this intersection is a state highway intersection, this would be a reasonable mitigation recommendation only if CDOT already has plans to make such a change. Otherwise, a change in the cycle length for only this intersection would likely have adverse impacts on the progression of the corridor and may require a progression analysis for the TIA. Consultation with CDOT concerning such a change is advised.

    b. Based on other changes suggested in this review (Trip Generation, Trip Distribution, Scenario Years, etc…), new analyses may yield different needs for mitigation.

Sierra Vista – Rezoning

Strategic Planning Division

To: Beccah Bailey, Norris Design
From: Josh Campbell, Senior Strategic Planner
Date: August 15, 2025
Re: ZON2025-00005 Sierra Vista – Rezoning

Strategic Planning Comments

The Strategic Planning Division, as part of the Planning & Development Department, has reviewed the application for the Sierra Vista – Rezoning for conformance with the 2024 Comprehensive Plan and the Town's commitment to increasing its livability, connectivity, and sustainability.

Land Use Conformance

Staff find that the rezoning application partially conforms with the Future Land Use Map designation in the 2024 Comprehensive Plan. The parcel(s) in question are Employment and Corridor Commercial uses. While these uses do not primarily support residential, residential is a secondary supporting use under Employment if not negatively impactful to the primary Employment use. At this time, it is not clear within the application how much residential is being considered in comparison to employment uses. For this reason, staff indicate a partial conformance with the Future Land Use Map designations in the Comprehensive Plan.

Policy Conformance

The Strategic Planning Division finds that the application conforms with multiple goals and policies within the 2024 Comprehensive Plan, especially the following policies:

1. **C.5.1:** Ensure that new development meets Comprehensive Plan vision, priorities, and resources management.
    a. The rezoning to CMU and AP will allow for the creation of more employment potential, increasing the employment base of the town.
2. **H.1.1:** Locate higher density housing and mixed use development in areas that are currently served or will be served by bus transit and neighborhood centers.
    b. The rezoning will encourage mixed use development near future transit lines and areas of employment and commercial opportunities.

Policy Recommendations

In response to the 2024 Comprehensive Plan goals, staff make the following recommendations:

1. Staff recommend the alignment with policy C.3.8 of the Comprehensive Plan as Highway 7 (Baseline) is seen as a corridor of special consideration.
2. Staff recommend thoughtful consideration of the placement of future residential uses as to not impede or negatively impact the primary use of employment as seen within the Future Land Use Map.

The review process is a cumulative process and dependent on various criteria. We reserve the right to provide further comment(s) and request additional information. Please contact me at

(720) 955-2566 or jcampbell@erieco.gov for further clarification. Staff would be happy to schedule a virtual meeting to discuss the comments and answer any questions.

Sincerely,

Josh Campbell | Senior Strategic Planner
Planning & Development

Town of Erie
645 Holbrook Street | P.O. Box 750 | Erie, CO 80516
Phone: 720-955-2566
www.erieco.gov | Facebook | Twitter | LinkedIn

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Ben Kellond

ENVIRONMENTAL REVIEW

Please provide documentation that each of the three (3) potential drill sites designated on the ALTA have been vacated. Once verified, please update the ALTA accordingly.

8/20/2025 9:45:17 AM

Ben Kellond

ENVIRONMENTAL REVIEW

Applicant did not respond to comments made during first submittal. Per the first submittal, please provide documentation that each of the three (3) potential drill sites designated on the ALTA have been vacated. Once verified, please update the ALTA accordingly.

11/13/2025 2:43:07 PM

•	**ENVIRONMENTAL REVIEW**	ReviewerBen Kellond	Sent12/22/2025	Sent By CL02
	Group3RD SUBMITTAL	RemarksDRT is on 1/22 - Planning to send comments on 1/30/26	Due1/29/2026	Received By BK01
	StatusCOMPLETE NO COMMEN...		Returned1/21/2026	

Sierra Vista – Rezoning with Minor Subdivision 2nd Review

Planning & Development

To: Beccah Bailey, Norris Design
From: Aly Burkhalter, Senior Planner
Date: November 14, 2025
Re: ZON2025-00005 Sierra Vista Rezoning

Planning Division Comments

The Planning Division has reviewed the applications for the Sierra Vista Rezoning concurrent with Minor Subdivision for conformance with Municipal Code, Title 10. A Minor Subdivision land use application is required with this rezoning as no lot shall be divided by a zone district boundary line per UDC 10-5-4.D.4. Comments for both the rezoning and minor subdivision application are contained within this memo. Other Town staff and outside referral agency comments can be found in eTRAKiT project portal under Reviews and found in Attachments. Referral comments received by the Town after the date of this memo shall be uploaded in eTRAKit.

Comment responses were not provided for DNS, Engineering, or Environmental Reviews. Please make sure to include responses to all reviews in your next submittal.

The next step for the application is revision and resubmittal for another referral and Development Review Team review. Please make the appropriate revisions to the application materials and provide written response to address each written comment from the Town staff and referral agencies. All resubmittals shall be submitted via eTRAKiT.

Rezoning Comments

These comments are organized by submittal requirement. Previous comments and comments that have been resolved are in grey and can be removed from response to comments for the 3rd submittal. Applicant 2nd submittal responses in blue if unresolved and Town 2nd review comments are in red.

1) **Land Use Application** – Provided.
   a) Please update Land Use Application Project Description: "and +/-5.9 ACRES FROM COMMUNITY COMMERCIAL TO COMMUNITY MIXED USE"
      Applicant 2nd submittal response: Revision has been made as requested.
      Town 2nd Review: Resolved
   b) Please update Development Review Fees to "All Other Zoning/Rezoning" as you are not requesting Planned Development (PD) zoning.
      Applicant 2nd submittal response: Revision has been made as requested.
      Town 2nd Review: Comment remains
2) **Pre-Application Meeting** – no comment
3) **Application fee**
   a) Town 2nd Review: Please note that 3rd party review application fees have been added
4) **Proof of ownership** – no comment
5) **Letter of authorization** - no comment
6) **Copies of any special agreements** – Applicant did not provide. Staff acquired via reception numbers provided with the Title Commitment

a) **Annexation Agreement:** Staff reviewed the Annexation and did not find anything to impact the Rezoning application.
b) **Avigation easement:** The avigation easement does have rights to limit structures which is not dictated within the Rezoning or dimensional standards of the proposed zone districts.
c) Metro District: Record of Dissolution on 6/10/2019 (Reception #4496042)

7) **Written narrative**, describing the proposed development which at a minimum provides the following information:
   a) General project concept and purpose of the request – provided
   b) Proposed development time-line – please provide
      Applicant 2nd submittal response: Proposed development timeline is uncertain as the landowner is not the long-term developer. This information has been added to the narrative
      Town 2nd Review: Applicant noted that development timeline will be established at future site plan applications.
   c) How the proposal relates to the existing land-use of the subject property and the zoning and land-use of adjacent properties, including statements describing areas of compatibility and conflict and the mitigation measures utilized – Please describe areas of compatibility and conflict and the mitigation measures utilized for each of the adjacent land uses listed. Include this in an updated Written Narrative
      - Airport to the west
      - Rural Residential to the north
      - Planned Development to the east
      - City of Broomfield, Planned Unit Development to the south
      Applicant 2nd submittal response: Additional information has been added to the Surrounding Land Use portion of the narrative, to better explain the transition of uses.
      Town 2nd Review: Resolved
   d) How the proposal complies with the Town's Comprehensive Plan and rezoning approval criteria – provided
   e) A description regarding the status of mineral rights and the substance of any existing or proposed covenants, special conditions, grants of easements, or other restrictions applying to the proposed subdivision – please provide
      Applicant 2nd submittal response: No mineral rights users exist on this site, which has been reflected on the updated narrative, included with this resubmittal application.
      Town 2nd Review: Resolved
   f) Town 2nd Review: please update the Written Narrative permitted use to comply with permitted by right uses listed in UDC TABLE 3-1: TABLE OF PERMITTED USES
8) ALTA/ASCM Land Title Survey – provided
9) Zoning Map shall be prepared by or under the supervision of a registered professional land surveyor licensed with the State of Colorado for recording in the office if the County Clerk and Recorder. The zoning map shall contain the following information:
   a) A title block (both sheets) shall provide:
      i) total acreage
      ii) number ZON2025-00005
      Applicant 2nd submittal response: Total Acreage and number have been added
      Town 2nd Review: Resolved
   b) A block in the lower right hand corner shall include:
      i) revision date chronology (both sheets)
      ii) north arrow designated as true north (sheet 2)

iii) written and graphic scale (sheet 2)
Applicant 2nd submittal response: Revision date (bottom right), True North and scale (written and graphic) added (upper left, sheet 2).
Town 2nd Review: Resolved

c) For subdivided land, label all property lines with bearings, distance, curve data and lot/block numbers as shown on the final plat; → See Zone Map redlines
Applicant 2nd submittal response: All dimensions have been added.
Town 2nd Review: Resolved

d) For proposals requesting multiple zone districts, label all zone district boundary lines with bearing, distance and curve data – provided

e) A scaled vicinity map that depicts the area around the proposal within a 1-mile radius – provided

f) A written legal description for subdivided property or a written metes and bounds description of the site's boundary for unsubdivided property – provided

g) A written legal description for each zone district indicated on the map – provided

h) Depict existing subdivision lot lines or metes and bounds property lines and rights-of-way within 100' of the proposal. Said information for adjacent properties shall be screened back → Please screen back adjacent property information
Applicant 2nd submittal response: This information is now shown on the map on sheet 2.
Town 2nd Review: Resolved

i) Identify the land use and zone district information of all adjacent property. When an adjacent property is not within the Town's boundary, the respective jurisdictions' land use and zone district information shall be identified – provided

j) Please update to Town Council Approval Certificate
Applicant 2nd submittal response: Approval certificate has been updated per the above comment.
Town 2nd Review: Not updated. Comment remains.

10) Concept Plan shall be prepared on 24" x 36" sheet size at a scale no greater than 1" = 200'. The Concept Plan shall show the general location of proposed streets, lots, tracts, parks, open space, trails, drainage facilities and existing and proposed oil/gas wells and their associated setbacks – provided

a) Scale is greater tha 1" = 200' and staff waives that requirement at this time.

b) Please add label or legend to indicate dashed lines are proposed streets
Applicant 2nd submittal response: A legend has been added per comment request.
Town 2nd Review: No legend was seen on the Concept Plan dated 10/13/2025. If street linework is removed per Transportation comments, no legend is required.

c) Please provide zone district boundaries on concept plan
Applicant 2nd submittal response: Zone district boundaries have been added to the concept plan.
Town 2nd Review: Concept plan areas match zone district boundaries. Zone district boundaries are not indicated as separate linework. Resolved

d) The CMU zone district shall be subject to UDC 10-6-8.B. and Table 6.8-1, which requires a minimum 3 principal uses (residential, office, commercial and public/institutional use groups). Each required principal use shall occupy a minimum of 25 percent of the gross floor area of the entire CMU or NMU district development area. → please indicate on the Concept Plan how you intend to meet this criteria.
i) Please include maximum residential density to coordinate with TIA
ii) Please include maximum gross floor area to coordinate with TIA
Applicant 2nd submittal response: Additional information has been added to the

narrative to include uses that could be permitted within the CMU zoning category. Permitted categories are aligned with the included TIA.
Town 2nd Review: Please continue to coordinate permitted uses in the Written Narrative and TIA.

11) Development Reports/Studies:
    a) An Assessment of Impact Report, detailing the impact the proposed development may have on Town, County, Special District, and utility facilities and services, including but not limited to:
        i) water and wastewater → Explanation is insufficient. Please provide more information. Incorrectly references Comp Plan designation of LDR.
        Applicant 2nd submittal response: The Comprehensive Plan designation of Employment has been revised on the Impact Report.
        Town 2nd Review: Explanation is insufficient as it does not address water or wastewater availability. Comment remains.
        ii) open space and recreation – Applicant should acknowledge future conformance with Park and Open Space Dedication requirements per Municipal Code and Annexation Agreement as PROST did not account for parks in this area.
        Applicant 2nd submittal response: Noted, the Impact Report has been updated to reflect any future Site Development Plans will meet the required Open Space and Recreation noted in the Town of Erie Municipal Code.
        Town 2nd Review: Resolved
        iii) law enforcement – Provided
        iv) fire protection – Not provided. Mountain View did receive referral but did not comment.
        Applicant 2nd submittal response: Comment noted, thank you.
        Town 2nd Review: Resolved
        v) schools– Provided
        vi) general utilities (electric, gas, telephone) – Provided
    b) **Market Study or Economic Impact Study**– waived by Economic Development
    c) **Phase I Drainage Report**– Report provided. Plan waived by Engineering. Please see Engineering Review.
    d) **Traffic Impact Study** – provided. Please see Transportation Review.

Rezoning Approval Criteria

Below is the staff review for approval criteria for the Land Use Application type of Rezoning per UDC 10-7-5:

a. The rezoning will promote the public health, safety, and general welfare →
    i. There is low subsidence hazards per the Mine Subsidence Evaluation memo
    ii. There is no oil & gas hazards.
    iii. There is airport influence that is considered appropriate for the AP zoning and will need to be evaluated for appropriate future CMU uses.
    Applicant 2nd submittal response: Comment noted, thank you.
    Town 2nd Review: Resolved
b. The rezoning is generally consistent with the town's comprehensive plan and the purposes of this UDC;
    i. Per UDC 10-2-4.D. *Community mixed-use district (CMU):* The purpose of the CMU zone district is to provide for a community-serving mixed-use development at a higher scale than is appropriate for neighborhood locations. The CMU district is

intended for use along key transportation corridors and at important nodes in the town on sites of five acres or larger. The CMU district is intended to include commercial, institutional, recreational, and service facilities needed to support surrounding neighborhoods and the community at-large. Medium to higher-density housing should be incorporated within or located around the CMU zone district, and development should facilitate pedestrian connections between residential and nonresidential land uses.

i. This project site located along a key transportation corridor
ii. This project site is larger than 5-acres
iii. The project is intended to include commercial (retail), public institutional (medical offices) and higher density residential uses
iv. It has not yet been reviewed what pedestrian connection can be made.

ii. Per UDC 10-2-5.C. Airport (AP): The purpose of the AP zone district is to provide areas for the development of airport land uses. The area is also regulated by the airport overlay (APO) zone district.

i. This is consistent with the project

c. Adequate facilities and services (including streets and transportation, water, gas, electric, police and fire protection, and sewage and waste disposal, as applicable) will be available to serve the subject property while maintaining adequate levels of service to existing development → See Impact Report comments. Please provide additional information
Applicant 2nd submittal response: Noted, Impact Report has been updated per received comments.
Town 2nd Review: Resolved

d. The rezoning is not likely to result in significant adverse impacts upon the natural environment, including air, water, noise, storm water management, wildlife, and vegetation, or such impacts will be substantially mitigated; → Expansion of Airport uses may have significant adverse impacts upon the natural environment. Please explain how those impacts may be impacted.
Applicant 2nd submittal response: At this time, it is not confirmed what uses will be proposed on this site. At time of Site Development Plan, specific uses will be proposed and future applications will provide any necessary impact reports, as required by Town staff.
Town 2nd Review: Resolved

e. The rezoning is not likely to result in significant adverse impacts upon other property in the vicinity of the subject property→ Expansion of Airport uses may have significant adverse impacts upon other property in the vicinity of the subject property. Please explain how those impacts may be impacted.
Applicant 2nd submittal response: t this time, it is not confirmed what uses will be proposed on this site. At time of Site Development Plan, specific uses will be proposed and future applications will provide any necessary impact reports, as required by Town staff.
Town 2nd Review: Resolved

f. Future uses on the subject property will be compatible in scale with uses on other properties in the vicinity of the subject property → Airport uses are consistent with adjacent airport. Commercial uses are consistent with Vista Ridge commercial. Residential uses are consistent with Erie Airpark residential uses.

g. The rezoning is generally consistent with the town's economic development goals and objectives in bring positive growth and sustainable revenues to the town. → Economic Development supports this criteria.

Minor Subdivision Comments

No further comments on the Minor Subdivision. The Minor Subdivision is ready for recording prior to the zoning, and will not be recorded until the zoning is recorded.

1) **Land Use Application**→ provided
2) **Pre-Application Meeting** notes and comments. → provided
3) **Application fee**→ provided
4) **Written narrative**, describing the proposed development which at a minimum provides the following information:
   a) General project concept and purpose of the request → provided
   b) The total land area to be subdivided → provided
   c) The total number of lots, and if residential the proposed density → Total lots provided. Residential density is requested to be part of the Rezoning application Concept Plan
      Applicant 2nd submittal response: This rezone submittal application is specific to the zoning designation. The applicant cannot provide number of lots or density, as it is not known at this time. Specific information will be provided at time of Site Plan application.
      Town 2nd Review: Resolved
   d) If non-residential, the total square footage of floor area proposed; → requested to be part of the Rezoning application Concept Plan
      Applicant 2nd submittal response: This rezone submittal application is specific to the zoning designation. The applicant cannot provide square footage, as it is not known at this time. Specific information will be provided at time of Site Plan application.
      Town 2nd Review: Resolved
   e) The total land area to be preserved as open space → requested to be part of the Rezoning application Concept Plan
      Applicant 2nd submittal response: This rezone submittal application is specific to the zoning designation. The applicant cannot provide the specifics on future open space provided, as it is not known at this time. Specific information will be provided at time of Site Plan application.
      Town 2nd Review: Resolved
   f) A brief description regarding the phasing of the proposed subdivision → not required for a zoning replat
   g) A brief description regarding the availability and adequacy of existing infrastructure and other necessary services including schools, fire protection, water/sewer service, and utility providers → provided with Zoning Impact Report
   h) A brief description regarding the location, function and ownership/ maintenance of public and private open space, parks, trails, common areas, common buildings → not required for a zoning replat
   i) A brief description regarding the substance of any existing or proposed covenants, special conditions, grants of easements, or other restrictions applying to the proposed subdivision. →Please provide
      Applicant 2nd submittal response: There are no known existing or proposed covenants, special conditions, grants of easements, or other restriction for this project site.
      Town 2nd Review: Resolved
5) **Proof of ownership** → provided
6) **Letter of authorization**→ provided to process the application, when the landowner is not the applicant.

7) **Special agreements**, oil/gas surface use agreements, conveyances, restrictions, or covenants that will govern the use and/or maintenance of the proposed development, or statement that no such agreements exist. → Applicant did not provide.
8) **ALTA/ACSM Land Title Survey** → provided
9) **Engineered cost estimates for public improvements** → not required. No public improvements as part of rezoning application and plat.
10) **Minor Subdivision Final Plat Exhibit**
    a) Please provide the total acreage, number of lots proposed, and project file number
    Applicant 2nd submittal response: Total Acreage, number of Tracts (no lots) and File Number have been added.
    Town 2nd Review: Resolved
    b) A block in the lower right hand corner shall include revision date chronology
    Applicant 2nd submittal response: Revision dates have been added.
    Town 2nd Review: Resolved
    c) Depict existing subdivision lot lines or metes and bounds property lines and rights-of-way within 100' of the proposal. Said information for adjacent properties shall be screened back. Please update adjacent property line work for Vista Ridge Filing NO. 6, 2nd Amendment, including Commons Dr.
    Applicant 2nd submittal response: Adjacent information was already included but has been adjusted to appear "screened". Vista Ridge 6 information has been added.
    Town 2nd Review: Resolved
    d) Please remove the Board of Trustees Approval Certificate. It is not required for a Minor Subdivision that does not include dedications or easements to the Town.
    Applicant 2nd submittal response: This has been removed.
    Town 2nd Review: Resolved
11) **Phase III Drainage Report and Construction Plans** → waived to Phase 1 Drainage Report by Project Engineer.
12) **Final Erosion and Sediment Control Plans and a Stormwater Management Plan** → Waived by Project Engineer
13) **Final Area Grading Plan** → Waived by Project Engineer
14) **Final Road Construction Plans** → No roads proposed with rezoning application.
15) **Final Utility Construction plan and Utility Report** → Waived by Project Engineer
16) **Final Landscape Construction Plans** → Not required with rezoning
17) **Geological Report** → Provided. No subsidence concerns with this application. May review and provide further comment at future plat or site plan.
18) **Traffic Impact Study** → Provided. See Transportation Comments.
19) **Threatened and Endangered Species, Habitat, and Wetlands** report → not required
20) **Cultural Archaeological, and Historical Resource Report and Protection Plan.** → not required
21) **Native Tree and Vegetation Survey and Protection Plan** → not required
22) **Environmental Hazards Report** → not required
23) **Addressing Plat** → not required
24) Any additional information or referral documents as required by the Planning & Development Director, in order to thoroughly review the impacts of the proposed development. → Part 77 Maps provided for Airport Influence review

The review process is a cumulative process and dependent on various criteria. We reserve the right to provide further comment(s) and request additional information.

Process Informational Comments

No response required as these are informational comments.

Concurrent Reviews

A Minor Subdivision land use application is required with this rezoning as no lot shall be divided by a zone district boundary line per UDC 10-5-4.D.4. The Minor Subdivision upon approval will be recorded at the time of the Zoning Map recording. The Minor Subdivision may be ready for recording prior to the zoning approval, but will not be recorded until the zoning is recorded.

Neighborhood Meeting

A Neighborhood Meetings was held on September 30, 2025 without posted notice. A second Neighborhood meeting with proper notice was held on October 30,2025. **Please provide neighborhood meeting summary and affidavits of notice via eTRAKiT**. The neighborhood meeting shall take place within six months of the first required hearing date, and if more than six months elapse, an additional neighborhood meeting shall be held which meets this requirement.

Public Hearings

Your Rezoning application requires a public hearing & recommendation by Planning Commission and public hearing & decision by Town Council. Staff will not schedule the public hearing until there are no more significant comments. Staff will provide later instructions for public hearing when they deem this application ready for public hearing. Tentative dates are provided below with posting deadlines:

- 2/4/2026 Planning Commission
  - Applicant Materials Due: 1/5/2026
  - Notice to Paper - Hometown: 1/8/2026
  - Publication in Paper: 1/14/2026
  - Letters Sent Out: 1/16/2026
  - Property/TH Posted: 1/16/2026
- 2/24/2026 Town Council
  - Applicant Materials Due – General Business: 1/26/2026
  - Notice to Paper - Hometown: 1/29/2026
  - Publication in Paper: 2/4/2026
  - Letters Sent Out: 2/6/2026
  - Property/TH Posted: 2/6/2026

I will no longer be with the Town after November 19, 2025. Please direct all future communication to Chris LaRue at clarue@erieco.gov.

Sincerely,

Aly Burkhalter | Senior Planner

Planning & Development
Pronouns: *She / Her / Hers* (What's this?)

Town of Erie
Street Address | P.O. Box 750 | Erie, CO 80516
Phone: 303-981-5985
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Referral Response Letter

Sierra Vista, ZON2025-00005 (rezoning) & SUB2025-00006 (minor subdivision)
Second Referral
November 4, 2025

Recipient: Melinda Helmer
Town of Erie

Dear Melinda,

Thank you for providing the above-referenced referral from the Town of Erie. Review comments from the City and County of Broomfield are provided below.

Comments Received By:

- Ted Harberg, Planning

City and County of Broomfield Agency Review Comments

1. Thank you for your response to our previous comments. In this response, the applicant wrote that "*the applicant does not have any rights to expand the Erie Municipal Airport.*" Although partially an answer to our questions, we do not believe our questions were fully addressed and would like to rephrase our most important question below.

   If Tract A is rezoned from Low-Density Residential (LR) to Airport (AP), would this allow a future owner to develop aviation-related uses on the property, such as a heliport, helistop, or related airport uses like private airplane hangars?

   As part of your response, please also provide a complete list of permitted uses, conditional uses, and similar uses that could be permitted in the Airport (AP) zone district.

2. Please continue to refer this application to The City and County of Broomfield for any resubmittals or future applications regarding the airport or this application.

3. Please inform Broomfield in advance when a Public Hearing for this application is scheduled.

Sincerely,

Ted Harberg
Senior Planner
tharberg@broomfield.org
303-438-6362

Referral Review History

First Referral
Date Application Referred: 7/18/205
Date Comments Sent to Applicant: 7/31/2025

Second Referral
Date Application Referred: 10/27/205
Date Comments Sent to Applicant: 11/4/2025

From: John Ehrhart <john@coloradols.com>
Sent: Thursday, November 6, 2025 11:27 AM
To: Development Referral
Cc: Aly Burkhalter; Melinda Helmer
Subject: Re: 2nd Referral Review - ZON2025-00005 Sierra Vista Rezoning & SUB2025-000006 Sierra Vista Minor Subdivision

External Email: Do not click links or open attachments unless you recognize the sender and know the content is safe.

No further comments on this one.

Thank you,
John

John P. Ehrhart, PLS
Ehrhart Land Surveying, LLC
Mapping the Future Together
303-828-3340

On Wed, Oct 22, 2025 at 10:28 AM Melinda Helmer <mhelmer@erieco.gov> wrote:

> Good morning,
>
> Please see the link for 2nd Referral Review submittal documents on the above noted project:
>
> Rezoning: https://portal.laserfiche.com/Portal/Browse.aspx?id=328398&repo=r-a69d230a
>
> Minor Subdivision: https://portal.laserfiche.com/Portal/Browse.aspx?id=304795&repo=r-a69d230a
>
> Referral comments are due back by November 11, 2025. Staff DRT is scheduled for November 13, 2025.
>
> Please forward referral comments to developmentreferral@erieco.gov

Please let me know if you have any questions.

Regards,

Melinda Helmer, CMC | Business Operations Coordinator
Town of Erie | Planning & Development
645 Holbrook Street | P.O. Box 750 | Erie, CO 80516
Cell: 720-745-1062

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Memo

To: Chris LaRue, Principal Planner
From: Nick Wagner, Transportation Engineer
Date: November 17th , 2025
Subject: Sierra Vista Rezoning & Minor-Sub - Transportation Engineering Comments
CC: John Firouzi

General Transportation Comments Provided by Nick Wagner with Town of Erie:

1. Update the TIA based on the findings/conclusion that the Sierra Vista team discussed on the 11/14 teams call regarding ITE land use code "Warehouse" as being applicable for the AP land use Code.

2. The town of Erie has a roundabout 1st policy for all intersections. Because the intersection of Commons Dr. and Bonanza is being improved, a roundabout needs to be investigated for this intersection. This is per TOE standards and specifications section 521.

3. Update concept plan to remove dashed lines as they could be interpreted as proposed access roads, which is not the case. Update the scale on the concept plan to be accurate to the site plan.

4. Show continued coordination with CDOT and City/County of Broomfield as they are the issuing authority on STH 7 as well as any proposed improvements south of STH 7 that are identified in the TIA

Transportation Impact Analysis Comments Provided by Bill Cowen with FoxTuttle:

1. It is important to note that Baseline Road (SH-7) is a state highway so CDOT requirements would apply. Also, the southern leg of the main SH 7 intersection (Lowell Boulevard) is in the City and County of Broomfield and coordination with that jurisdiction on the requirements for this TIA would be recommended.

2. On Page 4, the TIA discusses Trip Generation for the site and summarizes these numbers in Table 2 which I've copied below.

Table 2 - Vehicle Trip Generation Totals for Proposed Development

Land Use (ITE Code)	Units & /1000 sqft	AM Peak Trips (vph)			PM Peak Trips (vph)			Weekday 24-hour Trips
		In	Out	Total	In	Out	Total	
Single-Family (210)	500	79	175	254	169	127	296	3,760
Warehousing (150)	115.1	29	9	38	11	29	40	220
Commercial/Retail (820)	88.3	46	28	74	144	156	300	3,269
	Total	**154**	**212**	**366**	**324**	**312**	**636**	**7,249**

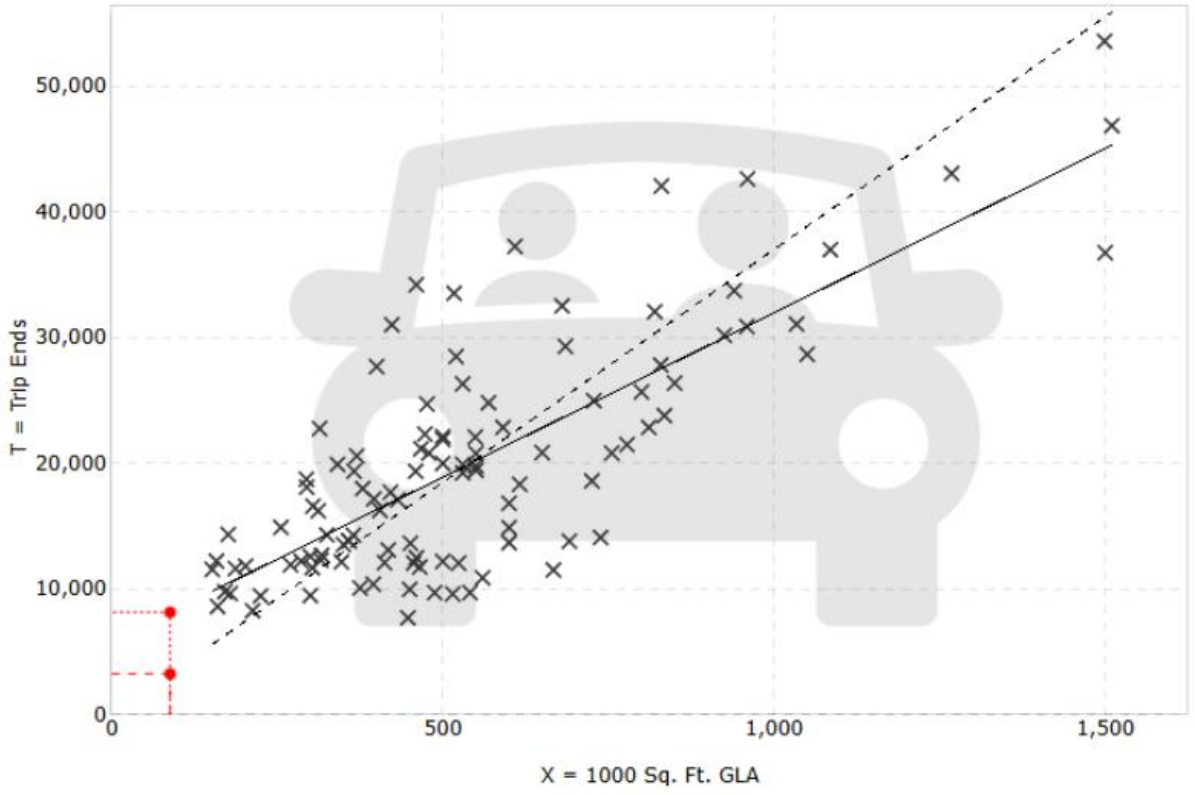
The TIA states that they have used the 11th edition of the Trip Generation Manual and that trips

were generated using “fitted equations” from the manual. Therefore, I used the fitted equations of each of the three land uses to check the trip generation values. The following concerns were identified.

a. For the Single-Family Housing land use (ITE 210), the numbers shown in Table 2 do not align with either the fitted curve or the Average Rate. As an example, the “Weekday” trip generation is listed as 3,769 vpd total in Table 2 and that value should be 4,436 vpd. The PM peak trips are listed as 296 vph total and that value should be 451 vph.
b. The Commercial/Retail land use (ITE 820) appears to have been calculated using the Average Rate instead of the Fitted Curve. I noted in previous comments that the fitted curve seems to be the most appropriate to use given the relatively low square footage of commercial/retail here. I’ll reiterate those comments below. The difference in trip generation calculated using the average rate and the fitted equations is almost 5,000 vpd, which represents a more than doubling of the trips generated by this land use.

c. Trip generation for the Warehousing land use (ITE 150) appears to have been calculated and summarized correctly.

A snapshot of the ITE Trip Generation chart for Commercial/Retail (ITE 820) is shown below.



The bottom red dot is the daily trip estimate for the commercial/retail land use using rates. The top red dot is the daily trip estimate for the same land use using a fitted curve. The difference is approximately 5,000 vehicles per day. In addition, when one looks at the data points for the studies of commercial/retail land uses closest to the size of this

commercial land use, they are all above the rate line and massed around the fitted curve line. This would seem to suggest that using the fitted curve would be more representative of commercial development of this size. Therefore, it would be my recommendation that the applicant be directed to either defend the decision to use the Average Rate for this land use in light of the aforementioned information or redo the trip generation (and all associated analyses) using the fitted curve. Again, the TIA currently states that trip generation has been accomplished using the fitted curve and that is what I am recommending.

3. On Page 7, the TIA provides the first of several tables which summarize the level of service and delay for the study area intersections. This one is Table 4 (Existing Conditions) and is shown below.

Table 4 – LOS Summary – Existing Conditions

Study Intersection	Control Type	Movement	AM Peak		PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Bonanza Dr/Lowell Blvd at SH 7	Signal	All	24.9	C	42.2	D
		EB	21.2	C	53.7	D
		WB	28.1	C	27.8	C
		NB	22.1	C	33.4	C
		SB	29.6	C	42.3	D
Bonanza Dr at Commons Dr	TWSC	All	3.2	A	3.0	A
		WB	11.2	B	12.8	B
Bonanza Dr at Sunset Dr	TWSC	All	5.7	A	3.8	A
		WB	10.3	B	9.8	A
Airport Dr at SH 7	TWSC	All	0.7	A	1.2	A
		SB	35.8	E	52.7	F
Lowell Parkway at Indian Peaks Pkwy	TWSC	All	3.8	A	2.2	A
		EB	18.5	C	11.6	B
		WB	14.9	B	16.4	C
Vista Pkwy and SH 7	Signal	All	39.5	D	21.4	C
		EB	11.5	B	14.8	B
		WB	65.8	E	31.3	C
		SB	9.3	A	9.3	A

As can be seen, this table and all subsequent tables in the TIA provide summation of only the total approach and total intersection LOS and delay. They do not provide the movement LOS and delay as required by Section 100 (TIA Standards) of the Town's Standards and Specifications.

Consequently, all conclusions which follow from these summations are of limited value as they do not address specific movements that may be experiencing changes in LOS or poor LOS results.

A comparison of LOS and delay between Background and Background plus Project trips in Tables 5 through 8 showed that there were situations where project traffic was added to a scenario, but the amount of approach delay decreased for the intersection or specific movements. These evaluations should be a comparison where all things remain equal except for the addition of project trips. This suggests that the same traffic signal timing

may not have been used in the evaluations used for these comparisons. I would recommend that the applicant be reminded to make sure they are using exactly the same traffic signal timing and phasing to compare conditions with and without project traffic and to clearly document any changes in traffic signal timing or phasing as potential mitigation in the appropriate section.

Sections of Tables 5 and 6 (intersection of Bonanza/Lowell and SH 7) are shown below to illustrate this issue

Table 5 – LOS Summary – Year 2030 (Build out) Background Only

Study Intersection	Control Type	Movement	AM Peak		PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Bonanza Dr/Lowell Blvd at SH 7	Signal	All	31.4	C	68.7	E
		EB	21.3	C	107.2	F
		WB	35.6	D	30.8	C
		NB	32.0	C	37.8	D
		SB	39.3	D	44.4	D

Table 6 – LOS Summary – Year 2030 (Build out) Background plus Development

Study Intersection	Control Type	Movement	AM Peak		PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Bonanza Dr/Lowell Blvd at SH 7	Signal	All	34.1	C	66.8	E
		EB	21.3	C	104.5	F
		WB	35.8	D	28.3	C
		NB	41.3	D	46.3	D
		SB	40.6	D	51.7	D

Note that the overall PM peak hour delay at the intersection “improves” in Table 6 when project traffic is added. This is also true for the PM peak hour delay for the EB and WB approaches.

4. On Page 11, the TIA begins a discussion of “Right and Left Turn Lane Analyses”. It notes that these evaluations were performed in accordance with CDOT guidelines. This would certainly be true for the new driveway on SH 7 however the Town of Erie now has town specific guidance in the Standards and Specifications – City Street Construction – Section 500. Specifically, Section 521.03.09 discusses “Auxiliary Lanes” and provides different standards than the CDOT Access Code. I believe that the outcomes (what facilities are needed) remain the same, and thus the only change to the TIA would be to note that both the CDOT Access Code and the Town’s Standards and Specifications were both used in these determinations. The primary purpose for raising this comment here is so that the Town’s standards can be used in the design of storage and taper.

5. The Town’s TIA requirements detailed in the Standards and Specifications – Section 100, require that a Safety Assessment be performed. This includes an evaluation of the most recent 5 years of crash data, the identification of all serious injury and fatal crashes as well as any crash trends. It also requires the identification of any locations where site traffic is

adding to potential for conflict with people using any mode of transportation. Finally, it requires identification of potential mitigation for any existing or potential safety issue present. It does not appear that this Safety Assessment occurred in this TIA, and it is my recommendation that this be required in the subsequent DRAFT of this TIA.

6. On Page 12, the TIA provides information about the percentage of project traffic being contributed to each intersection in the study area. It notes that this is "requested" for such submittals however I could find no reference to this in Section 100. I did a quick assessment of the percentages provided in this section and I noted that the percentage of traffic proportioned to the three accesses to this site summed to only 83.7%. It seems probable that 100% of the site generated traffic would be present at the sum of these three intersections. I would recommend that in the next DRAFT of this TIA the applicant check the traffic volume distribution to assure that all project traffic is accounted for.

7. On Page 14, there is a discussion of "Bicycle Facilities". The TIA notes that "There are no existing bicycle facilities on the adjacent roadways". This is not accurate, as there are bicycle lanes on Bonanza, north of SH 7 and on Lowell, south of SH 7. It also notes that the Town Code requires that bicycle facilities should be considered on new roadways. This is also not accurate. Section 100 notes the following pertaining to bicycle facilities:

Bicycle facilities for new roadways

1. An assessment of the appropriate bicycle facility should be performed, using information in the FHWA Bicycle Selection Guide for any roadway with a traffic volume of 2,000 vpd or greater OR a speed limit of 30 mph or greater OR a roadway that falls on a designated bikeway in the Transportation Mobility Plan. The Town may choose to require the addition of these bicycle facilities into the street cross-section as needed, depending upon this assessment.

Since the speed limit on Bonanza is 35 mph, this section north of SH 7 would qualify for evaluation. It is likely that this evaluation would suggest "separated bicycle facilities" for a roadway with this speed limit and volume. The section of Lowell south of SH 7 has a speed limit of 45 mph but this roadway is in the City and County of Broomfield so it is unclear what Broomfield's TIA requirements would say about evaluating bicycle facilities. SH 7 is a state highway and CDOT's requirements would pertain to that corridor. There has been an extensive study of SH 7 which speaks to future bicycle facilities on this corridor and it would be my recommendation that the TIA address the future bicycle facilities planned for SH 7 in this section. CDOT may have requirements pertaining to these facilities regarding the project site's frontage with SH 7. It is noted that in Section 521.04 of the Town's Standards and Specifications, it states that the appropriate bicycle facilities for a major collector or for a minor collector with bicycle facilities are "Buffered Bike Lanes". Bonanza Drive would fall into one of these two categories and currently has only standard bike lanes. There should be discussion of this in the TIA.

8. Also on Page 14, the TIA discusses "Pedestrian Facilities". It notes that there are no existing pedestrian facilities adjacent to the proposed development. It suggests that any sidewalks that are constructed as part of the development should connect to the existing network. It also suggests that no new pedestrian crossing treatment should be placed across Bonanza at Drive A but that one should be put at Drive B if it is converted to a four-way stop-controlled intersection.

Section 521.05 of the Standards and Specifications notes that pedestrian facilities are included on both sides of all streets within Erie. It goes on to provide a table with facility type, sidewalk/path width and tree lawn width. I would recommend that this information be included in the subsequent DRAFT of the TIA.

9. Section 100 requires that a TIA identify destinations likely to generate pedestrian trips (such as the convenience store across Bonanza from the project site) but the TIA does not do so. Section 100 also asks the TIA to identify pedestrian crossing treatments for places where pedestrians are crossing collector or arterial streets. The TIA suggests one across Bonanza at Drive B but only if it's a four-way stop-controlled intersection. The TIA does not provide any technical analyses to justify this change in traffic control (i.e. multi-way stop control warrants in the MUTCD). A pedestrian crossing treatment across Bonanza Drive at Drive B may be needed regardless of whether the traffic control at this location is changed to four-way stop control. It is my recommendation that the applicant address this further in the subsequent DRAFT TIA.

10. In Section 521.06, the Standards and Specifications note that "All new developments shall include traffic calming measures in their site design". The TIA should have a section which addresses this statement. In addition to consideration of traffic calming within the site itself, consideration should also be given to whether there is a need for traffic calming on Bonanza Drive, especially in the vicinity of Drive B since there may need to be a pedestrian crossing treatment at this location connecting the site to the convenience store on the other side of the roadway.

11. Section 100 (subsection I.) of the Standards and Specifications requires that a TIA "Analyze impact to on-street parking utilization and emergency vehicle access" using the current version of the ITE Parking Generation Handbook to estimate parking demand. It does not appear that parking has been addressed in this version of the TIA, and I recommend it be addressed in a subsequent DRAFT TIA.

12. On Page 15, the TIA discusses potential mitigation measures. There were several concerns with the mitigation being suggested.

    It was suggested in the TIA that the Signal Cycle Length be changed during the AM and PM peak hours for the Bonanza/Lowell and SH 7 intersection. Consistent cycle length in a corridor (like SH 7) is critical to progression and therefore, unless CDOT concurs that a change in cycle length will work at this one intersection or is planning to change the cycle length to this value at all signals in the corridor then this would not be a feasible mitigation. Consultation with CDOT is recommended.

    It was suggested that the intersection of Bonanza and Commons/Drive B change the traffic control to an all-way stop. It appears that this is in response to a poor LOS (F) in the WB approach. Also, potentially to address a pedestrian crossing issue at this location as previously discussed. This may be a reasonable recommendation. However, it is typical that recommending such a change would be accompanied by an evaluation of MUTCD warrants for selecting multi-way stop control. It did not appear that such an evaluation was performed and documented in the TIA. It would be important to know whether the applicant is suggesting a warranted or "unwarranted" change to four-way stop control at this location. In addition, this intersection is approximately 500 feet from the intersection of Bonanza/Lowell and SH 7 to the south. It would be critical that queues from NB traffic at Commons not back up and impede operations at the SH 7 intersection. In a review of Table 10 on P. 13, it does not appear that the TIA evaluated the queue impacts of this mitigation.

As previously noted, there were some questions about how delay might improve at an intersection in a comparison between conditions with and without project traffic. This would seem to suggest that changes in signal timing were made for different scenarios. Any recommended changes in signal timing should be identified in mitigation.

Sierra Vista Minor Sub & Rezoning 1st Review

Development Review

To: Chris LaRue, Principal Planner
From: Chad Schroeder, P.E. , Development Engineering Supervisor
Date: November 21, 2025
Re: SUB2025-00006 & ZON2025-00005 Sierra Vista Minor Sub & Rezoning

Engineering Division Comments

The development review team has reviewed the applications for the Sierra Vista Minor Sub & Rezoning for conformance with Town Standards and Specs.

The next step for the application is revision and resubmittal for another engineering review. Please make the appropriate revisions to the application materials and provide written response to address each written comment from the Town staff and referral agencies. All resubmittals shall be submitted via eTRAKiT.

These comments are organized by submittal requirement. Previous comments and comments that have been resolved are in grey and can be removed from response to comments for the 3rd submittal. Applicant 2nd submittal responses in blue if unresolved and Town 2nd review comments are in red.

1. Provide a general utility master plan and road plan for the entire Sierra Vista Development.
    a. Sanitary Sewer – show the truck lines from the connection point in at the Baron Court and Airport Drive intersection to the intersection at Bonanza Drive and Commons Drive intersection.
    Note, sanitary sewer line stub in Baron Court was upsized to 12-inches per the request of the Sierra Vista development team.
    b. Water – show how water will be looped through the site. Note that along the northern boundary of Sierra Vista (adjacent to the Erie Air Park Subdivision) is an existing 14-inch asbestos concrete (AC) water line which goes west through Baron Court and ends at Airport Drive. The Sierra Vista project will need to provide a replacement of this AC water line. Most likely the AC water line can be abandoned in place, to be determined in later reviews.
    c. Storm – provide a plan for the swales and culvert trunk lines to the proposed detention ponds.
    Delivery lines were not provided, but pond locations and general drainage layout are acceptable at this time. Next applications for the tracts will need to provide drainage layouts.
2. Utility Studies need to cover the following:
    a. Sanitary Sewer
        - Does the downstream sanitary sewer system have the capacity to handle the proposed sanitary sewer flows from the proposed Sierra Vista uses? The system is constrained in segments just south of the Vista Parkway Bridge over Coal Creek. A downstream parallel line may need to be installed.

There are two current segments of the South Coal Creek sanitary sewer interceptor that have capacity issues. One in the area of the Vista Parkway Bridge over Coal Creek and the other just north of the Erie Parkway Bridge over Coal Creek. Town staff is looking into both of these sanitary sewer capacity issues. We don't know exactly what if any requirements would be made of the Sierra Vista developments to upgrade these sanitary sewer lines. These sanitary sewer issues do not need to be addressed with the Sierra Vista Minor Subdivision application. But we want to let you know about these issues for the future applications.

- The lift station in Vista Ridge Filing 6 (in the southeast corner of Little Sunshine's Daycare Center) will need to be taken offline and decommissioned with the installation of the Sierra Vista sanitary sewer network.

  This will be addressed in future applications, but we want to note that the lift station needing to be removed and decommissioned is a part of the Sierra Vista development.

b. Water
   - Sierra Vista is in the Zone 3 pressure Zone. It boarders the Zone 4B to the east of Bonanza. The water looping needs to be within Zone 3. The Town highly discourages PRVs

c. Storm / Drainage Study
   - The detention ponds need to be sized and proportionally laid out on the plans for all of the Sierra Vista proposed drainage runoff.
   - The existing drainage swales at the southwest corner of the property where some of the drainage from Sierra Vista will drain to are eroded and will need to be addressed and stabilized with this development.
   - There are FAA regulations pertaining to detention ponds and birds in relations to airfields. This needs to be researched for the appropriate setbacks of detention ponds to the airfield and runway approach zones.
   - Drainage swale improvements along CO7 will need to be reviewed and approved by CDOT.
   - Review the East Coal Creek OSP for recommended drainage improvements.

     The Town may still make requirements of offsite drainage improvements to the Coal Creek tributary in which the Sierra Vista detention ponds will outlet into.

3. What is the general plan for ground vehicle and aircraft access to the airfield from the proposed western airport use areas?

   To be addressed in future applications.

New Comments

Utility easements need to be provided for the general utility layout provided for water, sanitary sewer, and storm structures in the attached master utility plan from 21 November 2025. Easements need to be at least 25 feet in width for one utility line. Wider easements are required for deeper utilities (a 1-1 slope of excavation is required for deeper utilities, i.e. a 15-foot sanitary line will require a 30-foot-wide easement). Two utilities need at least a 30-foot-wide easement (minimum 10-foot spacing between utility lines and/or the edge of the easement).

The easements are needed now to ensure that the utilities for all three tracts can be installed regardless of ownership or which tract develops first.

The review process is a cumulative process and dependent on various criteria. We reserve the right to provide further comment(s) and request additional information.

Please contact me at 303-926-2876 or cschroeder@erieco.gov for further clarification. Staff would be happy to discuss the comments and answer any questions.

Sincerely,

Chad Schroeder, P.E. | Development Engineering Supervisor

Development Review, Public Works

Town of Erie

Street Address | P.O. Box 750 | Erie, CO 80516

Phone: 303-926-2876

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Summary Runoff Table

Design Point	Tributary Basins	Tributary Area	Composite Imperv. %	Runoff (CFS) 5-Year	Runoff (CFS) 100-Year
HA	HA-1	35.01	2%	2.86	66.22
HB	HB-1	25.47	2%	2.04	47.36
HO1	HOS-1	2.00	20%	0.22	5.11

LEGEND

- Property Line
- Tract Line
- Sanitary Sewer Line
- Water Line
- Storm line
- Ex. Water Line
- Ex. Sanitary Sewer Line
- Sanitary Sewer Manhole
- Ex. Sanitary Sewer Manhole
- Existing Major Contour
- Existing Minor Contour
- Overflow Direction Arrow
- Drainage Flow Direction
- Major Basin Boundary
- Drainage Design Point
- Drainage Basin ID (Name: Area AC. | C5 | C100)

NOTES:

1. ALIGNMENT AND SIZING OF CONCEPTUAL UTILITIES INCLUDED IN THIS PLAN ARE FOR REFERENCE ONLY. FURTHER STUDIES AND SITE PLAN LAYOUT ARE REQUIRED TO DETERMINE ULTIMATE DESIGN LOCATIONS AND SIZES.
2. IT IS INTENDED THAT UTILITY CONNECTIVITY BE PROVIDED TO ALL UPSTREAM USERS FROM DOWNSTREAM PROPERTIES.
3. ALL TRACTS ARE REQUIRED TO CONVEY HISTORIC RUNOFF FROM UPSTREAM PROPERTIES/PARCELS. SHOULD DEVELOPED RUNOFF BE DESIRED TO BE RELEASED AND CONSOLIDATED INTO A SHARED DOWNSTREAM POND, UPSIZING OF DOWNSTREAM CONVEYANCES SHALL BE BY THE UPSTREAM PROPERTY/PARCEL.
4. DETENTION PONDS PROPOSED SHALL COMPLY WITH FAA ADVISORY CIRCULAR FOR SURFACE DRAINAGE SECTION 11.4, WHICH MANDATES A MAXIMUM DRAIN TIME OF 48 HOURS FOR THE POND AND 40 HOURS FOR THE WQCV WITH MICRO POOLS FULLY CONTAINED WITHIN A STRUCTURE..

NOTE:

1. SEWER DEPTH IS BASED ON PROVIDING SERVICE AT THE LOWEST POINTS ALONG THE FRONTAGE OF TRACT C. DEVELOPMENT APPLICAITONS WILL LIKELY IDENTIFY THIS IS NOT REQUIRED, AND THAT THE SEWER CAN BE RUN MUCH HIGHER THAN SHOWN. WE ANTICIAPTE THIS COULD RESULT IN SEWER DEPTHS CLOSER TO 25' MAX ALONG A MUCH SHORTER RUN OF PIPE.

   CONSTRUCTION OF SEWER ON AIRPORT PROPERTY COULD ALSO BE A POTENTIAL SOLUTION, BUT WOULD INVOLVE SOME CONSTRUCTION RESTRICTIONS THAT MIGHT RATHER BE AVOIDED AT THIS TIME.

FRASER BRYAN KEITH
3025 PIPER DR S
RN 5830086

SS-1
4' DIA MH
RIM = 5120.99
INV IN (8") = 5106.00
INV IN (8") = 5106.00
INV OUT (8") = 5105.80

BELL BURKE A
3030 PIPER DR S
RN 5831886

PROPOSED DETENTION POND

ERIE AIRPARK SUBDIVISION

ANDERSON BRADLEY JAY
3025 CHEROKEE CT
RN 5830986

DRNEC TIMOTHY LOUIS 3040
CHEROKEE CT
RN 5830886

YAMAMOTO HIDEAKI
270 SKYLANE DR
RN 8948034

BEDNAR BYRON J
280 SKYLANE DR
RN1084396

THOMAS JOHN K
109 N PUBLIC RD
RN 1084496

FOOTE JOEL S
250 COUNTY ROAD 3
RN 0224688

SC-1
4' DIA MH
N: 1790815.66
E: 3127372.84
RIM = 5122.15
INV IN (8") = 5101.76
INV OUT (10") = 5101.56

HO1
HOS1 | 2.00 AC. | 0.05 | 0.49

HA

10" PVC

8" PVC

SEWER STUB TO TRACT B

SS-8
4' DIA MH
RIM = 5153.92
INV OUT (8") = 5141.90

EXISTING 14" ACP WATERLINE TO BE REPLACED ALONG PROJECT LIMITS TO TIE-IN WITHIN BONANZA.

EXISTING 12" PVC WATERLINE

UPSIZED FROM 8" IN APPROVED PLANS PER CONVERSATIONS WITH TOWN STAFF

TRACT A
691,497 SF
15.875 AC
(ZONE AP)

HA1
35.01 AC. | 0.05 | 0.49

TRACT B
1,137,137 SF
26.105 AC
(ZONE CMU)

SIERRA VISTA PROJECT SITE

719' OF 20'+ PIPE RUN
(37' MAX.)

TOWN OF ERIE
PO BOX 9
R0145591

TRI-COUNTY AIRPORT DRAINAGE DITCH

HB1
25.47 AC. | 0.05 | 0.49

EXISTING HIGHPOINT TO BE CUT DOWN TO MINIMIZE SEWER DEPTH.

5164.00* EX

SS-4
4' DIA MH
RIM = 5155.12
INV IN (8") = 5135.10
INV OUT (8") = 5134.90

SS-9
4' DIA MH
RIM = 5184.88
INV OUT (8") = 5172.90

SS-2
4' DIA MH
RIM = 5140.87
INV IN (8") = 5132.60
INV OUT (8") = 5132.40

SS-5
4' DIA MH
RIM = 5156.14
INV IN (8") = 5136.30
INV IN (8") = 5136.30
INV OUT (8") = 5136.10

PROPOSED DETENTION POND

HB

AUXILLARY LANE IMPROVMENTS FOR RIGHT-IN/RIGHT-OUT PER APPROVED TRAFFIC STUDY TO BE BUILT WITH ACCESS WHEN ACCESS IS NEEDED.

TRACT C
802,034 SF
18.412 AC
(ZONE CMU)

CONNECT TO EX. SEWER STUB

SS-11
4' DIA MH
RIM = 5197.25
INV IN (8") = 5183.80
INV OUT (8") = 5183.60

BONANZA DRIVE (COUNTY ROAD 3)

ERIE STORAGE LLC
PO BOX 247
RN 5300708

LSP ERIE DEVELOPMENT, LLC
2144 E REPUBLIC RD STE B201
RN 8968660

(TO BE ABANDONED WITH CONNECTION TO THE WEST)

TEMP LIFT STATION
4' DIA MH

EX. 8" WATER STUB

SMH-K2A
4' DIA MH

SMH-K1
4' DIA MH
N: 1789979.87
E: 3129698.69
RIM = 5189.58
INV IN (8") = 5176.33
INV OUT (8") = 5176.03

SMH-K2
4' DIA MH

TBN INVESTMENTS CO, LLC
4506 21ST STREET DRIVE
RN 6785657

E. BASELINE RD (HIGHWAY 7)

SS-3
4' DIA MH
RIM = 5141.16
INV IN (8") = 5134.10
INV OUT (8") = 5133.90

SS-6
4' DIA MH
RIM = 5151.00
INV IN (8") = 5138.70
INV OUT (8") = 5138.50

SS-7
4' DIA MH
RIM = 5170.86
INV IN (8") = 5164.70
INV OUT (8") = 5164.50

CITY & COUNTY OF BROOMFIELD
ONE DESCOMBES DRIVE
R8865117

ANTHEM FILING NO. 7

SCALE
1 inch = 100 ft.
100 0 50 100

LJA
1765 W. 121st Avenue
Suite 300
Westminster, CO 80234
303-421-4224 • www.lja.com

No.	Rev. Date:	Revision Type:
1		
2		
3		
4		
5		
6		

Designed: SAS
Prepared: SAS
Approved: KRL

Job No.: 1061-0006
Scale Horiz: 1" = 100'
Scale Vert: n/a

Sheet: 1 of 1
Date: November 21, 2025

Proj. Name: Sierra Vista
Location: Town of Erie, Colorado
Plan Set: Minor Subdivision Exhibit
Sheet Name: Master Facilities Plan

Know what's below.
Call before you dig.

No. 1

I:\JOB FOLDERS\1061\1061-0006\CIVIL\EXHIBITS\MASTER FACILITIES MAP\MFM - SIERRA VISTA - 2025-11-19 PRINTED ON: 11/21/2025 1:21 PM

Department of Parks & Recreation
Development & Neighborhood Services

Internal Memo

To: Chris LaRue, Principal Planner

From: Shane Greenburg, Senior Parks Planner

Subject: Sierra Vista Minor Sub with Zoning (SUB2025-00006 & ZON2025-00005) – Parks & Recreation, Development & Neighborhood Services –2nd Review

8/21/25 – 1st review – Subdivision and Zoning
11/22/25 – 2nd review – Subdivision and Zoning - New comments in red

Please see comments from the 1st review and additional comments from the 2nd review.

GENERAL COMMENTS

1) The Town needs to see a cohesive pedestrian connectivity and park / open space plan through the entire property (including commercial and residential areas) to prevent a disjointed design. As the property is more than a mile from existing Erie trails and park space, we need to see some enhanced pocket park / amenity space to reasonably meet the resident and commercial tenant park space needs. Neighborhood and Community Park requirements need to be met with fees-in-lieu. Park requirements are determined by the number of planned residential units and more details will be provided once we see more information in that regard.
   a) You can find park dedication requirements in the Town's UDC.
      i) https://library.municode.com/co/erie/codes/code_of_ordinances?nodeId=TIT10UNDECO_CH6DEDEST_10-6-3PAOPSPTR
   b) You cay find park and trail design standards in the Town's Standards and Specifications
      i) https://www.erieco.gov/DocumentCenter/View/10043/Section-1000---2024-Private-Development-Landscape-Irrigation-Parks-Open-Space--Trails?bidId=
      ii) In particular see design standards for pocket parks in Section 1080.00 POCKET PARK DESIGN STANDARDS, and trail design standards in Section 1091.00 Trails & Park Paths.

   This has not been addressed. As part of the subdivision and zoning map, we want to get a better understanding of where park and pedestrian needs will be addressed in the subdivision. A conceptional display showing intended park and open space would be helpful.
2) Please adhere to the Town's Park, Trail, and Open Space Plan found at the link below.
   a) https://erieco.gov/DocumentCenter/View/8802/PROST-Plan-Update-2016?bidId=
3) As the requested zoning is mixed use, please adhere to additional design standards found within the Mixed-Use Vision Guide.
   a) https://www.erieco.gov/DocumentCenter/View/20240/Mixed-Use-Development-Vision-Guide-2024---Accessible?bidId=

Chris LaRue

PLANNING
REVIEW

Plat:
1. A Town Council signature block shall be added to the plat since easement dedications are being made. The Plat will need to be approved prior to zoning approval, but we can discuss internally how that should happen.
2. See comments from Broomfield and provide a response. We'd be happy to have a discussion with your team if necessary.
3. Please review comments from engineering. Easements adjustments are necessary.
4. We should hold a quick meeting together to make sure engineering comments are addressed. Another full-round review is not necessary as the requested adjustments can be made and reviewed quickly.
5. I'll provide a full timeline for the public hearings with action items once the plat is updated, executed by your team, and submitted to the Town.
Zoning:
1. Provide the executed zoning map to the Town.

1/30/2026 5:56:17 PM

Date: 1/16/2026

To: Melinda Helmer, Business Operations Coordinator
Town of Erie

From: Lynn Merwin, Planning Director and Deputy Director of Community Development
City and County of Broomfield

Subject: ZON2025-00005 Sierra Vista Rezoning & SUB2025-00006 Sierra Vista Minor Subdivision

Thank you for the third referral regarding Sierra Vista, ZON2025-00005 (rezoning) & SUB2025-00006 (minor subdivision) dated 12/23/2025. On behalf of the City and County of Broomfield, I am writing to provide comments on the subject application.

The application includes a proposed rezoning of approximately 60 acres at the southeast edge of the existing airport, north of CO 7, and the City and County of Broomfield. The rezoning map depicts three tracts with existing zoning identified as "Low Density Residential" (LR). The two eastern tracts comprising 44.5 acres are proposed to be rezoned as "Community Mixed Use" (CMU). Broomfield staff understands that the Erie Comprehensive Plan Future Land Use Map designates this 60-acre property as "Employment." Based on the property's proximity to CO 7, Broomfield does not have a concern at this time with the proposal to rezone Tract B and Tract C to CMU (Community Mixed Use).

Broomfield does have a concern with the proposal to rezone the northwest parcel comprising 15.9 acres from LR to Airport "AP". As part of the third referral, we received the applicant's Response to Comment letter in which Beccah Bailey confirmed that, if Tract A is rezoned to Airport (AP), then heliport, helistop, or related airport uses would be permitted, along with other permitted Airport Zoning Uses.

While there are no site-specific development details presented at this time, Broomfield expects that the proposed rezoning of Tract A to "Airport" has the potential to increase air traffic activity and its associated impacts on surrounding communities. These impacts may include more frequent aircraft overflights, increased noise exposure, and heightened safety considerations for residents located beneath or proximate to existing or anticipated flight paths. Such effects could be particularly impactful to nearby residential areas, schools, and other sensitive land uses within Broomfield and Erie.

Broomfield values our collaborative relationship with the Town of Erie, and continued intergovernmental coordination will help ensure that development decisions are made with a full understanding of their regional implications. Broomfield requests that operational constraints be incorporated into the land use plans to minimize increased flight activity over Broomfield and particularly our established nearby neighborhoods, such as Anthem Ranch and Anthem Highlands.

Please continue to refer this application and any future applications related to airport activities, to Broomfield for our review. We also request to be notified in advance when a Public Hearing for this application is scheduled.

Thank you for your consideration of our comments. Please let me know if you have any questions.

Sincerely,

Lynn Merwin

Lynn Merwin
Planning Director and Deputy Director of Community Development

Referral Review History

First Referral
Date Comments Sent to Erie: 7/31/2025

Second Referral
Date Comments Sent to Erie: 11/4/2025

Third Referral
Date Comments Sent to Erie: 1/16/2026

From: John Ehrhart
To: Development Referral
Cc: Chris LaRue; Melinda Helmer
Subject: Re: 3rd Referral Review - ZON2025-00005 Sierra Vista Rezoning & SUB2025-00006 Sierra Vista Minor Subdivision
Date: Wednesday, December 31, 2025 11:53:38 AM
Attachments: image001.png

External Email: Do not click links or open attachments unless you recognize the sender and know the content is safe.

No further comments on this one.

Thank you,
John

John P. Ehrhart, PLS
Ehrhart Land Surveying, LLC
Mapping the Future Together
303-828-3340

On Tue, Dec 23, 2025 at 12:52 PM Melinda Helmer <mhelmer@erieco.gov> wrote:

> Good afternoon,
>
> Please see the link for 3rd Referral Review submittal documents on the above noted projects:
>
> Rezoning: https://portal.laserfiche.com/Portal/Browse.aspx?id=328398&repo=r-a69d230a
>
> Minor Subdivision: https://portal.laserfiche.com/Portal/Browse.aspx?id=304795&repo=r-a69d230a
>
> Referral comments are due back by January 20, 2026. Staff DRT is scheduled for January 22, 2026.
>
> Please forward referral comments to developmentreferral@erieco.gov
>
> Please let me know if you have any questions.

Regards,

Melinda Helmer, CMC | Business Operations Coordinator
Town of Erie | Planning & Development
645 Holbrook Street | P.O. Box 750 | Erie, CO 80516
Cell: 720-745-1062

https://www.erieco.gov/108/Planning-Development| Facebook | Twitter | LinkedIn

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Sierra Vista Minor Sub & Rezoning 1st Review

Development Review

To: Chris LaRue, Principal Planner
From: Chad Schroeder, P.E. , Development Engineering Supervisor
Date: January 29, 2026
Re: SUB2025-00006 & ZON2025-00005 Sierra Vista Minor Sub & Rezoning

Engineering Division Comments

The development review team has reviewed the applications for the Sierra Vista Minor Sub & Rezoning for conformance with Town Standards and Specs.

The next step for the application is revision and resubmittal for another engineering review. Please make the appropriate revisions to the application materials and provide written response to address each written comment from the Town staff and referral agencies. All resubmittals shall be submitted via eTRAKiT.

These comments are organized by submittal requirement. Previous comments and comments that have been resolved are in grey and can be removed from response to comments for the 4th submittal. Applicant 3rd submittal responses in blue if unresolved and Town 3nd review comments are in green.

1. Provide a general utility master plan and road plan for the entire Sierra Vista Development.
    a. Sanitary Sewer – show the truck lines from the connection point in at the Baron Court and Airport Drive intersection to the intersection at Bonanza Drive and Commons Drive intersection.
    Note, sanitary sewer line stub in Baron Court was upsized to 12-inches per the request of the Sierra Vista development team.
    b. Water – show how water will be looped through the site. Note that along the northern boundary of Sierra Vista (adjacent to the Erie Air Park Subdivision) is an existing 14-inch asbestos concrete (AC) water line which goes west through Baron Court and ends at Airport Drive. The Sierra Vista project will need to provide a replacement of this AC water line. Most likely the AC water line can be abandoned in place, to be determined in later reviews.
    c. Storm – provide a plan for the swales and culvert trunk lines to the proposed detention ponds.
    Delivery lines were not provided, but pond locations and general drainage layout are acceptable at this time. Next applications for the tracts will need to provide drainage layouts.
    The northwest detention pond outlet extends offsite onto Town property. When the pond is constructed, the development will need to obtain an easement from the Town for drainage improvements required. If an easement cannot be obtained, the drainage improvements will need to be moved onto the property and ensure the drainage does not adversely affect downstream property. The southwest detention pond outlet drainage release will also need to ensure offsite drainage does not adversely affect downstream property, or

offsite easements will need to be obtained as well to construct offsite drainage improvements.

2. Utility Studies need to cover the following:
    a. Sanitary Sewer
        - Does the downstream sanitary sewer system have the capacity to handle the proposed sanitary sewer flows from the proposed Sierra Vista uses? The system is constrained in segments just south of the Vista Parkway Bridge over Coal Creek. A downstream parallel line may need to be installed.

          There are two current segments of the South Coal Creek sanitary sewer interceptor that have capacity issues. One in the area of the Vista Parkway Bridge over Coal Creek and the other just north of the Erie Parkway Bridge over Coal Creek. Town staff is looking into both of these sanitary sewer capacity issues. We don't know exactly what if any requirements would be made of the Sierra Vista developments to upgrade these sanitary sewer lines. These sanitary sewer issues do not need to be addressed with the Sierra Vista Minor Subdivision application. But we want to let you know about these issues for the future applications.

          Future Sierra Vista applications most likely will need to contribute to the downstream sanitary sewer improvements. The amount of the contribution will be determined by the scope of the proposed Sierra Vista development and what (if any) improvements would be necessitated by the Sierra Vista development.
        - The lift station in Vista Ridge Filing 6 (in the southeast corner of Little Sunshine's Daycare Center) will need to be taken offline and decommissioned with the installation of the Sierra Vista sanitary sewer network.

          This will be addressed in future applications, but we want to note that the lift station needing to be removed and decommissioned is a part of the Sierra Vista development.
    b. Water
        - Sierra Vista is in the Zone 3 pressure Zone. It boarders the Zone 4B to the east of Bonanza. The water looping needs to be within Zone 3. The Town highly discourages PRVs
    c. Storm / Drainage Study
        - The detention ponds need to be sized and proportionally laid out on the plans for all of the Sierra Vista proposed drainage runoff.
        - The existing drainage swales at the southwest corner of the property where some of the drainage from Sierra Vista will drain to are eroded and will need to be addressed and stabilized with this development.
        - There are FAA regulations pertaining to detention ponds and birds in relations to airfields. This needs to be researched for the appropriate setbacks of detention ponds to the airfield and runway approach zones.
        - Drainage swale improvements along CO7 will need to be reviewed and approved by CDOT.
        - Review the East Coal Creek OSP for recommended drainage improvements.

The Town may still make requirements of offsite drainage improvements to the Coal Creek tributary in which the Sierra Vista detention ponds will outlet into.
Requirements for offsite drainage improvements will be made during future development submittals. See green comments above about the northwest and southwest detention pond outlets.

3. What is the general plan for ground vehicle and aircraft access to the airfield from the proposed western airport use areas?
   To be addressed in future applications.

New Comments

Utility easements need to be provided for the general utility layout provided for water, sanitary sewer, and storm structures in the attached master utility plan from 21 November 2025. Easements need to be at least 25 feet in width for one utility line. Wider easements are required for deeper utilities (a 1-1 slope of excavation is required for deeper utilities, i.e. a 15-foot sanitary line will require a 30-foot-wide easement). Two utilities need at least a 30-foot-wide easement (minimum 10-foot spacing between utility lines and/or the edge of the easement).

The easements are needed now to ensure that the utilities for all three tracts can be installed regardless of ownership or which tract develops first.

1. Upsize the single utility 20-foot easements to be at least 25-feet. Sanitary sewer easements may need to be wider, see red comments above.

The review process is a cumulative process and dependent on various criteria. We reserve the right to provide further comment(s) and request additional information.

Please contact me at 303-926-2876 or cschroeder@erieco.gov for further clarification. Staff would be happy to discuss the comments and answer any questions.

Sincerely,

Chad Schroeder, P.E. | Development Engineering Supervisor

Development Review, Public Works

Town of Erie

Street Address | P.O. Box 750 | Erie, CO 80516

Phone: 303-926-2876

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TOWN OF ERIE 1874

Memo

To: Chris LaRue, Principal Planner
From: Nick Wagner, Transportation Engineer
Date: January 22nd , 2025
Subject: Sierra Vista Rezoning & Minor-Sub – 3rd Submittal - Transportation Engineering Comments
CC: John Firouzi

Note: Provided comments are advisory comments for future application submittals. Currently there are no comments that require immediate response. With the next application submittal for the Sierra Vista project, these comments are expected to be addressed in the final TIA.

Transportation Impact Analysis Comments Provided by Bill Cowen with FoxTuttle:

1. On Page 5, the TIA discusses Trip Generation for the site and summarizes these numbers in Table 2 which I've copied below.

Table 2 - Vehicle Trip Generation Totals for Proposed Development

Land Use (ITE Code)	Units & /1000 sqft	AM Peak Trips (vph)			PM Peak Trips (vph)			Weekday 24-hour Trips
		In	Out	Total	In	Out	Total	
Residential (220)	500	49	156	205	161	99	260	3,105
Storage/Office (150)[1]	115.1	48	30	78	141	147	288	3,213
Commercial/Retail (820)	88.3	12	4	16	6	3	19	208
	Total	**109**	**190**	**299**	**308**	**249**	**567**	**6,526**

It appears that the applicant has mistakenly placed the trip generation numbers for the Storage/Office land use in the Commercial/Retail land use row and vice versa. The total trip generation calculations remain the same, but they are in the wrong row.

In addition, the TIA states that they have used the 12th edition of the Trip Generation Manual and that trips were generated using rates from the manual. As I noted in my comments on the previous version of the TIA, the numbers generated from the Fitted Curve equations appear to better align with the data used to generate trips for the Commercial/Retail land use and would represent a more conservative approach to estimating potential trip generation for the site. A comparison of the two (provided on the next page) shows that there would be a significant change in trip generation between these two approaches. It is understood that the 12th Edition of the ITE Trip Generation Manual does not provide a fitted curve for daily trip generation and thus daily trips would need to be calculated using the rates provided. I would propose that being "consistent" using all rates or all formulas is less important than providing the most accurate assessment of trip generation potential for the site.

Here is information for trip gen land use 820

By Rate
Daily: 3,213 trips
AM Peak Hour: 78 trips (62% in, 38% exit)
PM Peak Hour: 288 trips (49% in, 51% exit)

Fitted Curve
AM Peak Hour: 187 trips (62% in, 38% exit)
PM Peak Hour: 487 trips (49% in, 51% exit)

Therefore, it would be my recommendation that in future TIAs for this project, that the fitted curve equations be used for the Commercial/Retail land use whenever a fitted curve equation is available.

2. On Page 5, there is additional detail about trip generation, and it is noted that it would be reasonable to assume internal trip capture and pass-by trip reduction for this development. I concur, however, the TIA goes on to state that they have not assumed either to be a part of this study. I noted previously that not including either of these considerations in the trip generation may overestimate the trip generation for the site. I would recommend that any future TIA for this project estimate the internal and pass-by trip capture for the site.

3. The Town's TIA requirements detailed in the Standards and Specifications – Section 100, require a number of additional evaluations to occur which have not been done in this TIA. These include a Safety Assessment, review of appropriate bicycle facilities, evaluation of pedestrian crossing treatments, the potential need for traffic calming and detailed parking management. Each of these requirements in the Standards and Specifications should be carefully reviewed and included in any future TIA developed for the project.

4. On Page 15, the TIA discusses potential mitigation measures. One of the purposes of a TIA is to determine if future conditions require change and if so what "reasonable" change might be planned for to offset these future impacts. There were two concerns with the mitigation being suggested.

    a. It was suggested in the TIA that the Signal Cycle Length be changed during the AM and PM peak hours for both the Bonanza/Lowell and SH 7 intersection and the Vista Parkway and SH 7 intersection. Consistent cycle length in a corridor (like SH 7) is critical to progression and therefore, unless CDOT concurs that a change in cycle length will work at these intersections or is planning to change the cycle length to this value at all signals in the corridor then this would not be a feasible mitigation. Unless CDOT concurs that this is considered reasonable mitigation to their traffic signals, this should not be described as recommended mitigation in the TIA.

    b. It was suggested that the intersection of Bonanza and Commons/Drive B change the traffic control to an all-way stop. It appears that this is in response to a poor LOS (F) in the WB approach. Also, potentially to address a pedestrian crossing issue at this location. As previously noted, this may be a reasonable recommendation. As requested, the applicant provided (on Pages 18 through 21) a section of the report detailing an all-way stop control warrant analysis. However, the analysis did not include the actual technical analyses performed. On Page 21 the report states the following:

3.9.4 Warrant D: 8-Hour Volume (Vehicles, Pedestrians, Bicycles)

We only have 4 hours of data, but each of the 4 hours of data passes the warrant. If the data is projected out to 8 hours, then it is anticipated that the warrants will continue to be passed.

However, the report does not include a summation of these numbers nor does it describe the procedure used to project off-peak traffic count data not possessed. In future versions of the TIA for this project, the actual technical analyses should be provided in the TIA along with any conclusions.

This section also references Warrant E of the MUTCD all-way stop control evaluation as follows:

3.9.5 Warrant E: Other Factors

It is anticipated that there will be some level of pedestrian traffic going from the residential development to the gas station across Bonanza Drive. The installation of an AWSC intersection would allow for safer crossing options for pedestrians and bicyclists, thus meeting condition C.

The MUTCD states that all-way stop control may be warranted “Where pedestrian and/or bicyclist movements support the installation of all-way stop control”. It is understood that this is a vague statement. But the applicant’s determination would suggest all-way stop control may be appropriate at any location that has pedestrians crossing. The Town of Erie has requirements for placing less restrictive traffic control devices in the public ROW (Pedestrian Crossing Guidelines) and it is questionable that all-way stop control would require less pedestrian usage than these less impactful devices to be considered appropriate.

In future versions of the TIA for this project, if this argument is to be made for the feasibility of this mitigation, then some effort to estimate the level of pedestrian crossing activity expected should be included.

NEIGHBORHOOD MEETING NOTICE

DATE: Thursday, October 30th, 2025

TIME: 6:00 p.m. to 7:00 p.m.

PLACE: Colorado National Golf Club
President's Room
2700 Vista Parkway
Erie, CO 80516

BC Land, LLC will be conducting a neighborhood meeting regarding a land use application that is located near a property you own and is currently under review with the Town of Erie. The meeting is an opportunity for you to hear about the land use application and to have the opportunity to provide comments or concerns to BC Land, LLC.

APPLICATION TYPE: Rezone & Minor Subdivision Plat

PROJECT NAME: Sierra Vista

PROJECT LOCATION: Northwest Corner of State Highway 7 and Bonanza Drive



PROJECT DESCRIPTION:

Sierra Vista is approximately 60.4 acres located at the northwest corner of State Highway 7 and Bonanza Drive. The general purpose for this rezone request is to convert approximately 54.5 acres from Low-Density Residential (LR) to 38.6 acres of Community Mixed Use (CMU) on the east and south sides of the property and 15.9 acres of Airport (AP) on the west side of the property. Additionally, BC Land, LLC is proposing to rezone 5.9 acres from Community Commercial (CC) to Community Mixed Use (CMU). Additional details will be shared at the meeting.

ADDITIONAL INFORMATION:

For additional information, to request copies of application materials, or to comment on the land use application, please contact:

Diana Rael
Norris Design
1101 Bannock Street
Denver, CO 80204
303-892-1166
drael@norris-design.com

Or

Heidi Majerik
Gauge Land Development
8827 East 35th Avenue
Denver, CO 80238
303-888-3866
heidi@gaugelanddevelopment.com

A public copy of the land use application materials is available for viewing in the Community Development office of Town Hall at 645 Holbrook Street, Erie, CO; phone 303-926-2770.

NORRIS DESIGN
PEOPLE + PLACEMAKING
1101 Bannock Street
Denver, Colorado 80204
303.892.1166

MEETING NOTES

PROJECT:	Sierra Vista	**DATE:**	10/30/25
SUBJECT:	Neighborhood Meeting 2	**TIME:**	6pm
MINUTES BY:	Mason Aeschbacher	**LOCATION:**	Colorado National Golf Club

COMPANY	ATTENDEES	EMAIL
Norris Design	Beccah Bailey	bbailey@norris-design.com
Norris Design	Diana Rael	drael@norris-design.com
Norris Design	Mason Aeschbacher	maeschbacher@norris-design.com
Gauge Land Development	Heidi Majerik	heidi@gaugelanddevelopment.com
LJA	Kevin Lovelace	klovelace@lja.com

~47 community members in attendance

Neighbor comments/concerns recorded below, *consultant team responses in italics*

SIERRA VISTA – NEIGHBORHOOD MEETING:

- Why was there the conceptual change from last meeting?
  - *Direct result from hearing that people had concerns about that much airport zoning area; let land owner know about the concerns from the previous meeting*
  - *Compromise for differing viewpoints; town agreed to reduce amount of airport zoning*
- There was a comment that the change in zoning on the conceptual plan changes the development scope and probably benefits the land owner financially a great deal. The person with the concern noted that they do not agree with this change.
  - *The development/consultant team is doing their best to balance what everyone wants*
- Will drive-thru fast food restaurants and gas stations be allowed? Do we have any say in what is built there?
  - *This is just for the zoning; specific development will go through Site Plan process and the public will have the chance to provide feedback at that time*
- Would current zoning allow drive-thrus and gas stations?
  - *Yes, the CC zoning would still allow these things if the rezoning is not approved*
  - *The LR will not allow these uses*
- MU zone uses are for concentrating uses near commercial centers, etc. (per zoning code). This area doesn't meet the criteria of "MU" in the zoning code
  - *There are sub-categories under "Mixed Use". CMU does not intend to be a super high-density residential area.*
  - *This does align with the Town's Comp Plan and what the Town has asked us to do*
- Will the airport have to buy the area zoned Airport Use?
  - *No, the Town/Airport is not required to buy it. They could, but at this time no one has approached the land owner about buying the land and using it as an airport*

  - *Airport Use is the name of the zone district, but it doesn't necessarily mean it will have airport uses*
  - *It could be other uses, anything that's allowed under the zoning*
  - *The land will be for sale to any interested buying*
- Are there examples of CMU that have been built?
  - *We will look into that and what those look like and send out examples via email*
  - *Later in the meeting, an attendee listed Erie Commons, the Village at Coal Creek, and Summerfield as examples of areas in Erie with CMU zoning.*
- What's the point of calling it Airport zoning?
  - *That is what the Town decided to call it.*
  - *It allows any use that may be supportive to an airport*
- Confused about what the reason for reducing Airport Use zoning – heard different things from presentation, FAA, and Aly (who said it was to allow pocket park and drainage). Can we go back to the other plan?
  - *Pocket parks are allowed in any zone district*
  - *We hear you and will pass this feedback on.*
  - *The FAA requires a certain amount of the Airport Use zoning*
- Concerns about Conceptual Ideas for Ingress/Egress
  - *CDOT has access control plan for this property (right-in, right-out) along Hwy 7*
  - *Site access is largely conceptual at this point, but we won't know until a later time*
- Airport Use and CMU are pretty much the same uses except for hotel/motel and residential.
  - *Correct.*
- Concerns from last meeting came from thinking Airport Use zoning would cause more air traffic. Now we have data to show the air traffic will not increase, but are still concerned that there will be restaurants and taverns next to rural residential homes. Also concerned about industrial overlay.
  - *Town Council is there to serve you. It's important to voice your concerns with them and planning staff.*
  - *We will pass on concerns.*
- Will there be a fence along the easement to the north of the property?
  - *We don't know because we are not at the site plan level yet.*
  - *This application does not change anything about the easements. Nothing (this rezoning, site plans, etc) can change these easements*
- Tell us about BC Land, LLC
  - *Blake Carlson of the Carlson family*
  - *Business is land development throughout Colorado*
  - *He's had the frontage to Hwy 7 for a while*
  - *Oil & Gas companies had the land, wanted to develop, couldn't, then Blake bought the land*
- Has there been any conversation about leaving a strip of the low-density residential to buffer on the north side? This would go a long way in easing the transition from existing residential to commercial uses
  - *Low-density residential on the north side of the property may be considered at the time of site plan*
- Has the question been broached to Erie about doing a land swap? Referenced a land swap for a park in Denver

  - *That is a question for the Town of Erie. The Comp Plan does not show this area as an open space, so it is unlikely that they would want to turn it into a park.*
  - *Would require a Comp Plan Amendment – could be a roadblock for the Town*
- If no one develops the AP zone, could that be rezoned to CMU?
  - *No, due to guidelines from FAA and their building restrictions/guidelines.*
- What is the time frame for the rezoning to be approved?
  - *Not sure when the owner will get a buyer*
  - *Goal is to go to hearing on the rezone by the end of 2025, this will be publicly noticed on the site*
    - *This has been delayed due to responding to community concern*
  - *BC Land will start marketing for a buyer as soon as the rezoning is approved*
  - *Site Development is 6-12 months for approval, then Building Permits (2-6 months) before ground breaking*
    - *These are just estimates though*
- Is it likely whoever does a site plan will ask for a Metro District?
  - *This is doubtful – there needs to be a certain amount of assessed value to create one, usually for bigger, single-family residential communities that are infrastructure-intensive and cost-prohibitive for purchasing a new house. Commercial users typically do not like being part of a Metro District*
- How did the line between CMU and AP zoning get chosen?
  - *Extending CMU along Hwy 7, logical to have that there*
  - *Bump out because Town has asked a neighborhood park (even though not required). This could go in either zone district, but it seemed to make more sense to place within the CMU area, whether in that bump out or internally within the zone district area*
    - *Created area to include a 3 acre park*
- Is the infrastructure there?
  - *Basic utilities studies need to be done*
  - *Sewer will come from airport and extend east into site – missing link for the Town to connect the gravity system to the existing lift station east of the property*
- Right-in, Right-out on Hwy 7 – there's nowhere to turn around for people who want to go east from the property.
  - *Purely conceptual, potential vehicular access; site plan will dive further into this.*
  - *CDOT has access control plans for Hwy 7, right-in/right-out is approved here in the current CDOT plan; could pursue a ¾ movement access, but we are not pursuing at this time*

TOWN OF ERIE
AFFIDAVIT OF NOTICE POSTING

Sierra Vista - Neighborhood Meeting





I, Beccah Bailey, ATTEST THAT NOTICE WAS POSTED IN ACCORDANCE WITH THE ERIE MUNICIPAL CODE, TITLE 10, – "UNIFIED DEVELOPMENT CODE AND DESIGN GUIDELINES," AT LEAST 15 DAYS BEFORE THE SCHEDULED HEARING TO BE HELD ON THE 30 DAY OF October, 2025 A.D. THE PHOTO, ABOVE, IS A TRUE AND CORRECT PHOTO OF THE NOTICE SO POSTED.

Beccah Bailey

(SIGNATURE OF PERSON LISTED ABOVE)

STATE OF COLORADO)
) ss.
COUNTY OF Denver)

ACKNOWLEDGED BEFORE ME THIS 14th DAY OF October, 2025 BY Beccah Bailey AS Associate.

WITNESS MY HAND AND OFFICIAL SEAL

Lesley Minervini
NOTARY PUBLIC

MY COMMISSION EXPIRES: 05-09-2026

LESLEY ANN MINERVINI
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20224018666
MY COMMISSION EXPIRES 05-09-2026

SIERRA VISTA NEIGHBORHOOD MEETING SIGN-IN SHEET			
NAME	ADDRESS	PHONE NUMBER	EMAIL
Grant & Jayne Ruesch	15755 Wild Horse Drive, Broomfield	303.517.0554	grant.ruesch@gmail.com
Chris Roarty	4297 Corte Bella Dr	815.979.5633	roarty@gmail.com
Jon Moramarco	Anthem Ranch		jmoramarco@yahoo.com
Lois Knight & Joel Foote	250 CR 3		
Kay & Rene Goerck	15751 Rito Alto Rd, Broomfield	440.799.2246	ourgar@aol.com
Ira Grunther	3920 Wild Horse Dr	917.416.1955	igrunther15@gmail.com
Gary Gallagher	15794 White Rock Dr	970.485.9395	cottontop4647@gmail.com
Mary Kay Gilson	4241 Corte Bella Dr, Broomfield	720.203.3910	marykay@boulderzumba.com
Vicki & Terri Brandt	4169 Centennial Dr	281.798.5245	brandts0@yahoo.com
Pete Scott & Jacque Wedding-Scott	4125 Centennial Dr	31916.6115	jwscent107@gmail.com
Mike & Carrie Eggleston	3020 Cherokee Ct., Erie	303.912.5112	22eggs@gmail.com
John & Char Neill			
Lou Mazzola	2960 Cherokee Ct		mazzola.lj@gmail.com
Pamela Nocerino	3040 Cherokee St, Erie		pnocerino108@gmail.com
Tim Drnec	3040 Cherokee St, Erie		
Bob & Dorothy Mussack			
Julie Barrett	238		
Patty Anderson	3025 Cherokee Ct	303.478.5990	pattyanderson1960@gmail.com
Kent Lee Davis	2350 Cessna Dr	303.883.2024	kentleedavis@gmail.com
Rick & Sue Rudy	15623 Deer Mtn Cir	720.771.6905	suerudy811@gmail.com
Shawn Stickle	2710 Sunset Way	303.888.5182	shawnstickle@yahoo.com
Steve & Peggi Aitken	4805 Bierstadt Loop	970.274.2614	
Jim Lawson	2935 Cherokee Ct	808.781.3995	greatestgoodforall@gmail.com
Krissy Saf	105 Mooney Place	720.626.3253	
John Crum	2703 Sunset St	202.487.5185	jplcrum@gmail.com
Jerry McQuie		720.379.3208	jmcquie@comcast.net
Bill Crug	105 Mooney Place	720.217.9722	
Mike O'Donnall	2985 Cherokee Ct	720.300.5949	mike@frontiermetal.com
Rebecca Godkin	16685 Las Brisas Dr	720.939.6447	rgodkin1@msn.com
Pama Williams	4274 Corte Bella		paanma@aol.com
Kevin King	370 County Rd 3		coloradokevin@hotmail.com
Mike Erwin	2665 Bonanza Dr	303.810.8845	merwinak@hotmail.com

ownername1	mailaddress1	mailaddress2	mailcity	mailstate	Zip
BEYERLE CLINTON	3068 TOM TOM DR		LAKE HAVASU CITY	AZ	86406
GUGELER MIKE	2420 CESSNA DR		ERIE	CO	80516
ERIE TOWN OF	PO BOX 9		ERIE	CO	80516
FRASER RICHARD	15842 LAVENDER PL		BROOMFIELD	CO	80023
SMITH ANDRE	2069 E 101ST WAY		THORNTON	CO	80229
FRANSEEN STEVEN RAYMOND	10906 LIVINGSTON DR		NORTHGLENN	CO	80234
ANDERSON JUSTIN	1430 18TH ST APT 8		BOULDER	CO	80302
TARA BROCK	1929 E CLIFF SWALLOW TRL		GREEN VALLEY	AZ	85614
ERIE TOWN OF	PO BOX 750		ERIE	CO	80516
RANNEY PATRICIA K	120 PIPER DR		ERIE	CO	80516
GOLDSTEIN CLIFFORD W LIVING TRUST & GOLDSTEIN ROBERTA L LIVING TRUS	2955 PIPER DR S		ERIE	CO	80516
KENDALL WILLIAM R & KENDALL KAROL A	2965 PIPER DR S		ERIE	CO	80516
JONES SCOTT L	2975 PIPER DR S		ERIE	CO	80516
MILLER RICHARD L & MILLER PATRICIA E	3015 PIPER DR S		ERIE	CO	80516
FRASER BRYAN KEITH & FRASER DAWN MARIE	3025 PIPER DR S		ERIE	CO	80516
SINGH JULIE KRAUSE & SINGH ATAR	2920 CHEROKEE CT		ERIE	CO	80516
ALLDREDGE MARK EVANS & ALLDREDGE MARIE K	2940 CHEROKEE CT		ERIE	CO	80516
MAZZOLA LOUIS J & MAZZOLA LAURIE J	2960 CHEROKEE CT		ERIE	CO	80516
GUTSCHENRITTER TONY L & GUTSCHENRITTER ROXANNE K	2990 CHEROKEE CT		ERIE	CO	80516
EGGLESTON CARRIE J & EGGLESTON MICHAEL E	3020 CHEROKEE CT		ERIE	CO	80516
DRNEC TIMOTHY LOUIS & NOCERINO PAMELA ANN	3040 CHEROKEE CT		ERIE	CO	80516
ANDERSON PATRICIA ANN	3025 CHEROKEE CT		ERIE	CO	80516
KIRWAN DAWN LEA	3150 QUEEN CT		BROOMFIELD	CO	80020
ODONNELL MICHAEL J & ODONNELL PATRICIA L	2985 CHEROKEE CT		ERIE	CO	80516
LORENZ-HUMPHRIES REVOCABLE LIVING TRUST	2965 CHEROKEE CT		ERIE	CO	80516
GARRETT TONI SURVIVORS TRUST	215 ALVARADO RD		BERKELEY	CA	94705
SCOTT AMANDA & TYNDALL MICHAEL	2940 PIPER DR S		ERIE	CO	80516
LEHNERT VOTAN M & SEABORG CHRISTINA	2970 PIPER DR S		ERIE	CO	80516
RAKE CAMERON P & RAKE DAWN M	2980 PIPER DR S		ERIE	CO	80516
BOTT STACEY BOLAND	3010 PIPER DR S		ERIE	CO	80516
BELL BURKE A	3030 PIPER DR S		ERIE	CO	80516
DEMERS MARC	18801 SE MACK DAIRY RD		JUPITER	FL	33478
MOULTON DANIEL & MOULTON STACI	380 BARON CT		ERIE	CO	80516
WHITE MARTIN L & WHITE LEE M	350 BARON CT		ERIE	CO	80516
REYNOLDS ERIE PROPERTY LLC	7600 LANDMARK WAY UNIT 15		GREENWOOD VILLAGE	CO	80111
ANDRAS RUDOLPH P	295 SKYLANE DR		ERIE	CO	80516
RUSSO MARK F	285 SKYLANE DR		ERIE	CO	80516
BIARD JOHN R & BIARD PAMELA H	275 SKYLANE DR		ERIE	CO	80516
BALKCOM RACHEL	265 SKYLANE DR		ERIE	CO	80516
BEDNAR BRYON J & BEDNAR NANCY C	280 SKYLANE DR		ERIE	CO	80516
THOMAS JOHN K & THOMAS RINKU S	C/O PROPERTIES PLUS	109 N PUBLIC RD	LAFAYETTE	CO	80026
UNRUH JOINT REVOCABLE TRUST	255 PIPER DR		ERIE	CO	80516
GREGORY KEVIN R & GREGORY RENEE M	265 PIPER DR		ERIE	CO	80516
BC LAND LLC	14570 CLAY ST		BROOMFIELD	CO	80023
SW MANILA LLC	905 W 124TH AVE STE 200		DENVER	CO	80234
YAMAMOTO HIDEAKI & YAMAMOTO DIANE S	270 SKYLANE DR		ERIE	CO	80516
MUSSACK ROBERT B, MUSSACK DOROTH M, MUSSACK ROBERT R, CSEKE MYR	350 COUNTY ROAD 3		ERIE	CO	80516
FOOTE JOEL S & KNIGHT LOIS HAGER	250 COUNTY ROAD 3		ERIE	CO	80516
KING KEVIN H & KING CATHY A	370 COUNTY ROAD 3		ERIE	CO	80516
VISTA RIDGE DEVELOPMENT CORP	C/O JAMES SPEHALSKI	9750 W CAMBRIDGE PL	LITTLETON	CO	80127
KLUTH SAMUEL W & KLUTH SHANNON R	2700 SUNSET WAY		ERIE	CO	80516
STICKLE SHAWN B & STICKLE MARIA E	2710 SUNSET WAY		ERIE	CO	80516
ROACH KEITH ALLAN	2720 SUNSET WAY		ERIE	CO	80516
GODBOLE CHETAN & KALE DAKSHA	2730 SUNSET WAY		ERIE	CO	80516
GRADY PATRICK R & GRADY JESSICA B	11633 SHOSHONE WAY		DENVER	CO	80234
SPIES KENT L & LAPLUME MICHELE A	2750 SUNSET WAY		ERIE	CO	80516
HUERTA NICHOLAS A	1110 SUNSET WAY		ERIE	CO	80516
ONESKY CHRISTOPHER A & ONESKY LEANN RENEE LUCERO	1120 SUNSET WAY		ERIE	CO	80516
FONG YVONNE Y	1130 SUNSET WAY		ERIE	CO	80516
PETERSON LUCAS NATHANIEL & PETERSON TRACY L	1140 SUNSET WAY		ERIE	CO	80516
DANIEL J ELLIS FAMILY PARTNERSHIP II LLP	3727 WONDERLAND HILL AVE		BOULDER	CO	80304
CARTWRIGHT MICHAEL C & CARTWRIGHT DONNA R	1160 SUNSET WAY		ERIE	CO	80516
TAYLOR MILTON C & TAYLOR MARIE CHAMBERLAIN	1170 SUNSET WAY		ERIE	CO	80516
GRAF RICHARD J & GRAF GLENDA A	1180 SUNSET WAY		ERIE	CO	80516
JACQUEMARD RICHARD M JR & BURTON KELLY LEE	1190 SUNSET WAY		ERIE	CO	80516
ANDERSEN TESS KATHERINE & ANDERSEN CHRISTIAN PATRICK	2741 SUNSET WAY		ERIE	CO	80516
WESTFELDT ELIZABETH BURKE CROSBY & WESTFELDT NATHAN DYLAN	2731 SUNSET WAY		ERIE	CO	80516
BAUMANN FAMILY TRUST	2721 SUNSET WAY		ERIE	CO	80516
SCHMIDT JONATHAN	2711 SUNSET WAY		ERIE	CO	80516
GILDHOUSE SHANNON D & GILDHOUSE MELISSA K	2701 SUNSET WAY		ERIE	CO	80516
SUAZO GEORGE H JR & SUAZO EILEEN G	2702 SUNSET ST		ERIE	CO	80516
PALASTHY SZOMAK & CZEGLEDI SZONJA MARIA	2712 SUNSET ST		ERIE	CO	80516
TAMAYO CARLOS A & TAMAYO INGA	2722 SUNSET ST		ERIE	CO	80516
MENDOZA VALERIE LATONA & THOMAS WAYNE B TRUST	2732 SUNSET ST		ERIE	CO	80516
TERRILL SUSAN M & TERRILL TERRY R	2733 SUNSET ST		ERIE	CO	80516
RAFOUL MICHAEL	2723 SUNSET ST		ERIE	CO	80516
HUTCHINS RICHARD S & HUTCHINS KELLY	2713 SUNSET ST		ERIE	CO	80516
CRUM JOHN PATRICK & CRUM HUNTLEIGH J	2703 SUNSET ST		ERIE	CO	80516

ERIE STORAGE LIMITED LIABILITY COMPANY	PO BOX 247		EASTLAKE	CO	80614
TBN INVESTMENTS CO LLC & FRANCIS ROYALITIES LLC	4506 21ST STREET DR		GREELEY	CO	80634
HUNTINGTON TECHNOLOGY FINANCE	2285 FRANKLIN RD	PO BOX 2017	BLOOMFIELD HILLS	MI	48303
KUM & GO LLC	2424 RIDGE RD		ROCKWALL	TX	75087
BONANZA DRIVE DEVELOPMENT CORPORATION	C/O JAMES SPEHALSKI	9750 W CAMBRIDGE PL	LITTLETON	CO	80127
MOUNTAIN VIEW FIRE PROTECTION DISTRICT	3561 N STAGECOACH RD UNIT		LONGMONT	CO	80504
VIRTUS LS ERIE LLC	835 W 6TH ST STE 1500		AUSTIN	TX	78703
MUTH PROPERTIES LLC	26201 W 108TH ST		OLATHE	KS	66061
PREMIER INVESTMENT PROPERTIES OF DENVER LLC	12835 E ARAPAHOE RD # TOWI		CENTENNIAL	CO	80112
MC VISTA COMMONS LLC	1590 JUNIPER HILL DR		ASPEN	CO	81611
CITY AND COUNTY OF BROOMFIELD	ONE DESCOMBES DR.		BROOMFIELD	CO	80020
CHANDY SHANU M	16708 BUCKSKIN WAY		BROOMFIELD	CO	80023
JOHNNIDES CHRISTOPHER G AND ANN	16714 BUCKSKIN WAY		BROOMFIELD	CO	80023
LINDQUIST FAMILY PROTECTION TRUST	16728 BUCKSKIN WAY		BROOMFIELD	CO	80023
CITY AND COUNTY OF BROOMFIELD	ONE DESCOMBES DR.		BROOMFIELD	CO	80020
SOHOCKI NATHAN AND JULIE	16689 BUCKSKIN WAY		BROOMFIELD	CO	80023
JACK STANLEY K AND CORENE M	16703 BUCKSKIN WAY		BROOMFIELD	CO	80023
POPE MARK S AND PAMELA R	16717 BUCKSKIN WAY		BROOMFIELD	CO	80023
FIGUEROA FRANK EDWARD	16729 BUCKSKIN WAY		BROOMFIELD	CO	80023
MORGAN KEVIN	3630 VESTAL LOOP		BROOMFIELD	CO	0023-4657
MARKARIAN JEVON S AND JENNIE M	3654 VESTAL LOOP		BROOMFIELD	CO	80023
LUKENS DANIEL E T	3660 VESTAL LOOP		BROOMFIELD	CO	0023-4657
ZADOROZNY RICHARD AND JILL	3670 VESTAL LOOP		BROOMFIELD	CO	80023
KLEIN MARTIN & SAUNDRA FAMILY TRUST	4186 CENTENNIAL DR.		BROOMFIELD	CO	80023
JACKSON SANDRA L. FAMILY TRUST	4194 CENTENNIAL DR.		BROOMFIELD	CO	80023
SUMNER LIVING TRUST	16700 LA BRISAS DR.		BROOMFIELD	CO	80023
GRUMMON FAMILY TRUST	16696 LAS BRISAS DR.		BROOMFIELD	CO	80023
PLUNKETT STEPHEN R. TRUST	16699 LAS BRISAS DR.		BROOMFIELD	CO	80023
KRAMER ANDREW T	4252 CORTE BELLA DR.		BROOMFIELD	CO	80023
WILLIAMS JOHN PATRICK	4274 CORTE BELLA DR.		BROOMFIELD	CO	80023
ROARTY JOSEPH P AND CHRISTINE D LIVING TRUST	4297 CORTE BELLA DR		BROOMFIELD	CO	80023
SCHWARTZBURG BONNIE C. REVOCABLE TRUST	4285 CORTE BELLA DR.		BROOMFIELD	CO	80023
LEE BURTON JAMES	4263 CORTE BELLA DR.		BROOMFIELD	CO	80023
HOOVER MARY KAY	4241 CORTE BELLA DR.		BROOMFIELD	CO	80023
BURTON SANDRA BAKER	4211 CORTE BELLA DR.		BROOMFIELD	CO	80023
HOUSER FAMILY TRUST	4199 CORTE BELLA DR.		BROOMFIELD	CO	80023
KIRSNER BERNARD M	4185 CORTE BELLA DR.		BROOMFIELD	CO	80023
DUKES CHARLES D.	4163 CORTE BELLA DR.		BROOMFIELD	CO	0023-8062
HAIN ROBERT C AND MARY ANN LIVING TRUST	4149 CORTE BELLA DR.		BROOMFIELD	CO	80023
CONFETTI FRED O AND SANDRA G FAMILY TRUST	4131 CORTE BELLA DR.		BROOMFIELD	CO	80023
HALGREN LEE A	4119 CORTE BELLA DR.		BROOMFIELD	CO	80023
HEPP NICHOLAS JOHN	4101 CORTE BELLA DR.		BROOMFIELD	CO	0023-8062
COSTA LOUISE A	4091 CORTE BELLA DR.		BROOMFIELD	CO	80023
WILLIAMS NANCY B	4073 CORTE BELLA DR		BROOMFIELD	CO	80023
LAMBERTSEN KAREN E.	4065 CORTE BELLA DR.		BROOMFIELD	CO	80023
SHOTTON MICHAEL	4082 CORTE BELLA DR.		BROOMFIELD	CO	80023
DAIGNAULT LINDA L'ESPERANCE	4098 CORTE BELLA DR		BROOMFIELD	CO	80023
KENNEDY ANITA MARIE	4112 CORTE BELLA DR.		BROOMFIELD	CO	80023
FERGUSON RONDELL A	4171 CENTENNIAL DR.		BROOMFIELD	CO	80023
BRANDT FAMILY TRUST	4169 CENTENNIAL DR.		BROOMFIELD	CO	80023
ANTHEM RANCH COMMUNITY ASSOCIATION	16151 LOWELL BLVD.		BROOMFIELD	CO	80023
MORIUCHI AMANDA	3675 VESTAL LOOP		BROOMFIELD	CO	80023
HORVATH MIKLOS AND HEATHER E	3669 VESTAL LOOP		BROOMFIELD	CO	80023
CARMICHAEL JASON	3663 VESTAL LOOP		BROOMFIELD	CO	80023
DONNELLY KATHRYN G AND SHAWN P	3657 VESTAL LOOP		BROOMFIELD	CO	80023
EGGERS JAMES G	3649 VESTAL LOOP		BROOMFIELD	CO	80023
MACK RYAN AND DANIELE	3645 VESTAL LOOP		BROOMFIELD	CO	80023
RODGERS DAVID J	3641 VESTAL LOOP		BROOMFIELD	CO	80023
PALOMINO LEONCIO AND OFELIA	8333 NORTHEAST 121ST PL		KIRKLAND	WA	98034
CARR SARAH E	3629 VESTAL LOOP		BROOMFIELD	CO	80023
SU YARI	3605 VESTAL LOOP		BROOMFIELD	CO	80023
EPSTEIN BRETT M.	3611 VESTAL LOOP		BROOMFIELD	CO	80023
MARTINEZ RICHARD J TRUST	3623 VESTAL LOOP		BROOMFIELD	CO	80023
BUFFALO FORTRESS CO LLC	650 S. LASHLEY LANE		BOULDER	CO	80305
NORTHERN COLORADO WATER	CONSERVANCY DISTRICT ETC	220 WATER AVE	BERTHOUD	CO	80513
KLEIN RICHARD	4815 BIERSTADT LOOP		BROOMFIELD	CO	80023
AITKEN REVOCABLE TRUST	4805 BIERSTADT LOOP		BROOMFIELD	CO	80023
COOK RONALD T. SR. TRUST	4795 BIERSTADT LOOP		BROOMFIELD	CO	80023
CHAMBERLAIN GRACE	4794 BIERSTADT LOOP		BROOMFIELD	CO	80023
COREY JOSEPH	4804 BIERSTADT LOOP		BROOMFIELD	CO	80023
GOOD GERALD	16708 ANTERO ST.		BROOMFIELD	CO	80023
LAUREN JACK G	16702 ANTERO ST.		BROOMFIELD	CO	80023
BROWN SUSAN N	16696 ANTERO ST.		BROOMFIELD	CO	80023

SIERRA VISTA ZONING

LOCATED IN THE SOUTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

60.392 ACRES - 3 TRACTS

ZON2025-00005

LEGAL DESCRIPTION AP ZONING PARCEL (TRACT A)

A PARCEL OF LAND BEING A PORTION ON THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING ALSO A PORTION OF TRACT A AND TRACT B OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31; THENCE NORTH 89°40'29" EAST, ON THE NORTH LINE OF SAID SOUTH HALF, A DISTANCE OF 246.47 FEET TO THE NORTHWESTERLY CORNER OF SAID TRACT B, SAID POINT BEING THE POINT OF BEGINNING;

THENCE CONTINUING NORTH 89°40'29" EAST, ON THE LINE COMMON TO SAID NORTH LINE OF THE SOUTH HALF AND THE NORTH LINE OF SAID TRACT B, A DISTANCE OF 1,044.88 FEET;

THENCE SOUTH 89°40'54" WEST A DISTANCE OF 300.00 FEET;

THENCE SOUTH 00°20'01" WEST A DISTANCE OF 435.63 FEET;

THENCE SOUTH 89°40'54" WEST A DISTANCE OF 469.43 FEET TO A POINT ON THE WESTERLY LINE OF SAID TRACT A;

THENCE NORTH 17°15'42" WEST, ON THE WESTERLY LINE OF SAID TRACT A, A DISTANCE OF 180.98 FEET TO A POINT ON THE WESTERLY LINE OF SAID TRACT B;

THENCE ON SAID WESTERLY LINE THE FOLLOWING (2) TWO COURSES:

1. NORTH 17°15'27" WEST, ON SAID WESTERLY LINE, A DISTANCE OF 636.15 FEET;
2. NORTH 12°59'44" WEST A DISTANCE OF 123.44 FEET TO THE POINT OF BEGINNING.

CONTAINING A CALCULATED AREA OF 15.875 ACRES (691,497 SQUARE FEET), MORE OR LESS.

LEGAL DESCRIPTION (PROPOSED) CMU ZONING PARCEL (TRACT B)

A PARCEL OF LAND BEING A PORTION ON THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING ALSO A PORTION OF TRACT A, TRACT B AND TRACT C OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31; THENCE NORTH 89°40'29" EAST, ON THE NORTH LINE OF SAID SOUTH HALF, A DISTANCE OF 246.47 FEET TO THE NORTHWESTERLY CORNER OF SAID TRACT B; THENCE CONTINUING NORTH 89°40'29" EAST, ON THE LINE COMMON TO SAID NORTH LINE OF THE SOUTH HALF AND THE NORTH LINE OF SAID TRACT B, A DISTANCE OF 1,044.88 FEET THE POINT OF BEGINNING;

THENCE CONTINUING NORTH 89°40'29" EAST, ON THE LINE COMMON TO SAID NORTH LINE OF THE SOUTH HALF AND THE NORTH LINE OF SAID TRACT B, A DISTANCE OF 1,285.29 FEET TO THE NORTHEASTERLY CORNER OF SAID TRACT B, BEING ALSO THE WESTERLY RIGHT-OF-WAY LINE OF BONANZA DRIVE;

THENCE ON THE LINE COMMON TO SAID TRACT B AND SAID WESTERLY RIGHT-OF-WAY LINE THE FOLLOWING (2) TWO COURSES:

1. SOUTH 04°02'11"W A DISTANCE OF 564.17 FEET;
2. SOUTH 00°18'10" WEST A DISTANCE OF 183.35 FEET TO THE SOUTHEASTERLY CORNER OF SAID TRACT B;

THENCE SOUTH 00°19'43" WEST, ON THE LINE COMMON TO THE EASTERLY LINE OF SAID TRACT C AND SAID WESTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 156.53 FEET;

THENCE SOUTH 89°40'54" WEST A DISTANCE OF 1,248.97 FEET;

THENCE NORTH 00°20'01" EAST A DISTANCE OF 902.30 FEET TO THE POINT OF BEGINNNG.

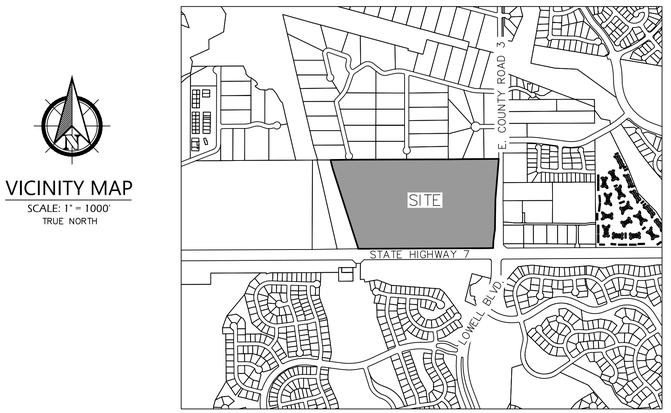
CONTAINING A CALCULATED AREA OF 26.105 ACRES (1,137,137 SQUARE FEET), MORE OR LESS.

GENERAL NOTES

1. BASIS OF BEARINGS: THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN IS ASSUMED TO BEAR NORTH 89°29'51" EAST BASED ON NAD83 (2011) COLORADO STATE PLANE NORTH ZONE (501) COORDINATES, BEING MONUMENTED AT THE WEST END BY A 2" ALUMINUM CAP STAMPED, "PLS 14083 1995" RECOVERED 0.2' BELOW THE SURFACE, BEING THE NORTHWEST CORNER OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1 AND ON THE EAST END BY A 2-1/2" ALUMINUM CAP STAMPED, "PLS 20142 2015" RECOVERED 0.3' BELOW THE SURFACE, BEING THE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1.

2. 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.

3. THIS MAP WAS PREPARED WITHOUT ANY BENEFIT OF A CURRENT TITLE COMMITMENT AND DOES NOT CONSTITUTE A TITLE SEARCH BY LJA SURVEYING, INC.TO DETERMINE OWNERSHIP, RIGHTS-OF-WAY, EASEMENTS OR OTHER MATTERS OF PUBLIC RECORD.



VICINITY MAP
SCALE: 1" = 1000'
TRUE NORTH

LEGAL DESCRIPTION (EXISTING) CMU ZONING PARCEL (TRACT C)

A PARCEL OF LAND BEING A PORTION ON THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING ALSO A PORTION OF TRACT A, TRACT B AND TRACT C OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31; THENCE NORTH 89°40'29" EAST, ON THE NORTH LINE OF SAID SOUTH HALF, A DISTANCE OF 246.47 FEET TO THE NORTHWESTERLY CORNER OF SAID TRACT B;

THENCE ON THE WESTERLY LINE OF SAID TRACT B THE FOLLOWING (2) TWO COURSES:

1. SOUTH 12°59'44" EAST A DISTANCE OF 123.44 FEET;
2. SOUTH 17°15'27" EAST A DISTANCE OF 636.15 FEET TO A POINT ON THE WESTERLY LINE OF SAID TRACT A;

THENCE SOUTH 17°15'42" EAST, ON SAID WESTERLY LINE, A DISTANCE OF 180.98 FEET TO THE POINT OF BEGINNING;

THENCE NORTH 89°40'54" EAST A DISTANCE OF 469.43 FEET;

THENCE NORTH 00°20'01" EAST A DISTANCE OF 435.63 FEET;

THENCE NORTH 89°40'54" EAST A DISTANCE OF 300.00 FEET;

THENCE SOUTH 00°20'01" WEST A DISTANCE OF 435.63 FEET;

THENCE NORTH 89°40'54" EAST A DISTANCE OF1,248.97 FEET TO THE EXTERIOR OF SAID SIERRA VISTA MINOR SUBDIVISION, BEING ALSO THE WESTERLY RIGHT-OF-WAY LINE OF BONANZA DRIVE;

THENCE ON THE LINE COMMON TO SAID EXTERIOR AND SAID WESTERLY RIGHT-OF-WAY LINE THE FOLLOWING (6) SIX COURSES:

1. SOUTH 00°19'43" WEST A DISTANCE OF 34.83 FEET ;
2. SOUTH 03°50'44" WEST A DISTANCE OF 60.39 FEET TO A POINT OF CURVE;
3. ON THE ARC OF A CURVE TO THE LEFT HAVING A RADIUS OF 512.50 FEET, A CENTRAL ANGLE OF 02°36'58" AND AN ARC LENGTH OF 23.40';
4. SOUTH 01°13'46" WEST A DISTANCE OF 8.34 FEET;
5. SOUTH 06°58'07" WEST A DISTANCE OF 120.00 FEET;
6. SOUTH 01° 13' 46" EAST A DISTANCE OF 98.28 FEET TO SAID EXTERIOR, BEING ALSO THE NORTH RIGHT-OF-WAY LINE OF SAID COLORADO STATE HIGHWAY NO. 7 (EAST 168TH AVENUE);

THENCE ON THE LINE COMMON TO SAID EXTERIOR AND SAID NORTH RIGHT-OF-WAY LINE THE FOLLOWING (4) FOUR COURSES:

1. SOUTH 89°40'54" WEST A DISTANCE OF 848.15 FEET;
2. SOUTH 89°40'42" WEST A DISTANCE OF 361.51 FEET TO THE SOUTHEAST CORNER OF SAID TRACT A;
3. SOUTH 89°40'31" WEST A DISTANCE OF 666.53 FEET;
4. NORTH 89°59'45" WEST A DISTANCE OF 13.49 FEET TO THE SOUTHWEST CORNER OF SAID TRACT A;

THENCE NORTH 17° 15' 42" WEST, ON THE WESTERLY LINE, A DISTANCE OF 359.21 FEET TO THE POINT OF BEGINNING.

CONTAINING A CALCULATED AREA OF 18.412 ACRES (802,034 SQUARE FEET), MORE OR LESS.

PLANNING COMMISSION CERTIFICATE

THIS ZONING MAP, ZON2025-00005, WAS VIEWED BY THE PLANNING COMMISSION ON THE

_____ DAY OF _____, 20____ A.D.

_____

CHAIRPERSON OF ERIE PLANNING COMMISSION

TOWN COUNCIL APPROVAL CERTIFICATE

THIS ZONING MAP IS TO BE KNOWN AS THE "SIERRA VISTA ZONING MAP" AND IS APPROVED AND ACCEPTED BY ORDINANCE NO. _____, PASSED AND ADOPTED AT A MEETING OF THE TOWN COUNCIL OF ERIE, COLORADO, HELD ON _____, 20___.

_____

MAYOR

ATTEST: _____
TOWN CLERK

SURVEYOR'S CERTIFICATE

I, PATRICK S. JERNIGAN, A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS ZONING MAP TRULY AND CORRECTLY REPRESENTS THE ABOVE DESCRIBED LEGAL DESCRIPTION FOR EACH ZONE DISTRICT.

I ATTEST THE ABOVE ON THIS 12 DAY OF MARCH 20 26.

COLORADO LICENSED
PATRICK S. JERNIGAN
PLS 37042
03/12/2026
PROFESSIONAL LAND SURVEYOR

PATRICK S. JERNIGAN
COLORADO REGISTERED PROFESSIONAL LAND SURVEYOR # 37042
FOR AND ON BEHALF OF LJA SURVEYING, INC.

Rev. Date: 8/25/2025	Rev. Date:	
LJA SURVEYING		4700 S. Syracuse Street Suite 500 Denver, CO 80237 303-390-8510 www.lja.com
Date: 3/11/2026	Job No.: 1061-0006	Sheet: 1 of 2

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SIERRA VISTA ZONING

LOCATED IN THE SOUTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

60.392 ACRES - 3 TRACTS

ZON2025-00005

TRUE NORTH

100 0 50 100
SCALE
1 inch = 100 ft.

POINT OF COMMENCEMENT
NW 1/4 CORNER OF S/2 OF SE/4, SEC 31
2" ALUMINUM CAP STAMPED "LS 14083 1995"

DENT & GEORGE PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731003018

DE FOSSE & BELL PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731004018

ANDERSON PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731004009

MILLER PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731004008

YAMAMOTO PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731008005

BEDNAR PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731008006

THOMAS PROPERTY (EXISTING ZONE) RURAL RESIDENTIAL (RR) (WELD COUNTY) PARCEL NO: 146731008007

NE CORNER
S/2 OF SE/4, SEC 31
2.5" ALUMINUM CAP STAMPED "LS 20142 2015"

FOOTE & KNIGHT PROPERTY (EXISTING ZONE) PLANNED DEVELOPMENT (PD) (WELD COUNTY) PARCEL NO: 146732000033

COUNTRY ROAD 3 INVESTORS LLC (EXISTING ZONE) PLANNED DEVELOPMENT (PD) (WELD COUNTY) PARCEL NO: 146732363001

COUNTY ROAD 3 INVESTORS LLC PROPERTY (EXISTING ZONE) PLANNED DEVELOPMENT (PD) (WELD COUNTY) PARCEL NO: 146732364003

COMMONS DR.

KG STORE 316 LLC PROPERTY (EXISTING ZONE) PLANNED DEVELOPMENT (PD) (WELD COUNTY) PARCEL NO: 146732364002

COUNTRY ROAD 3 INVESTORS LLC PROPERTY (EXISTING ZONE) PLANNED DEVELOPMENT (PD) (WELD COUNTY) PARCEL NO: 146732364004

TOWN OF ERIE (EXISTING ZONE) AIRPORT (AP) (WELD COUNTY) PARCEL NO: 146731000030

PULTE HOME CORPORATION PROPERTY (EXISTING ZONE) PLANNED UNIT DEVELOPMENT (PUD) (BROOMFIELD COUNTY) PARCEL NO: 157306106153

BASIS OF BEARINGS
NORTH LINE, S 1/2 OF SE 1/4, SECTION 31
N89°40'29"E 2631.65'

N89°40'29"E 2330.17'

1044.88'

1285.29'

POINT OF BEGINNING (TRACT A)

POINT OF BEGINNING (TRACT B)

POINT OF BEGINNING (TRACT C)

20' DRAINAGE & UTILITY EASEMENT
BOOK 830, REC. NO. 1752380
REC. NO. 4624407

20' ACCESS EASEMENT
BOOK 880 PAGE 1801566
REC. NO. 2424253

38' UTILITY & ACCESS EASEMENT
REC. NO. 4268505

10' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS
BOOK 1302, REC. NO. 2254297
BOOK, 1376, REC. NO. 2268776

30' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS
BOOK 1050, REC. NO. 1989356
BOOK, 1274, REC. NO. 2225425
REC. NO. 2254297
REC. NO. 2268776

N12°59'44"W
123.44'

N17°15'27"W 636.75'

PROPOSED ZONING:
AIRPORT (AP)
15.9 ACRES

466.67'

S00°20'01"W 902.30'

PROPOSED ZONING:
COMMUNITY MIXED USE (CMU)
26.1 ACRES

N89°40'54"E 300.00'

EXISTING ZONING:
LOW DENSITY RESIDENTIAL (LR)

EXISTING ZONING:
LOW DENSITY RESIDENTIAL (LR)

435.63'

N00°20'01"E 435.63'

180.98'

N89°40'54"E 469.43'

N17°15'42"W
540.19'

359.21'

S89°40'54"W 1248.97'

PROPOSED ZONING:
COMMUNITY MIXED USE (CMU)
18.4 ACRES

EXISTING ZONING:
COMMUNITY COMMERCIAL (CC)
AND
LOW DENSITY RESIDENTIAL (LR)

S03°50'44"W
60.39'

S01°13'46"W
8.34'

S06°58'07"W 120.00'

S01°13'46"W
98.28'

C1

34.38'

S00°19'43"W 190.91'

156.53'

S00°18'10"W
183.35'

S04°02'11"W 564.17'

EAST LINE, SE 1/4, SECTION 31
NO BEARING CALCULATED LINE ONLY

BONANZA DRIVE (COUNTY ROAD NO. 3)
(VARIABLE WIDTH R.O.W.)
BOOK 86, PAGE 273; BOOK 1631, PAGE 123; REC. NO. 2572958; REC. NO. 4431602

WEST LINE, SE 1/4, SECTION 31
N00°01'10"E 1320.38'

SW CORNER
SE. 1/4 SEC. 31
T1N R68W
RANGE BOX LID SEALED SHUT AND COULD NOT BE OPENED. POSITION SET BY REFERENCE MONUMENTS.

N89°59'45"W
13.49'

N89°40'31"E 666.53'

S89°40'42"W 361.51'

N89°40'54"E 848.15'

50' ACCESS, UTILITY, AND DRAINAGE EASEMENT
REC. NO. 4431602

N89°42'49"E 637.57'

STATE HIGHWAY NO. 7
(E. BASELINE ROAD)
(150' CDOT R.O.W.)
REC. NO. 2170911

SOUTH LINE, SE 1/4, SECTION 31
CALCULATED LINE ONLY

NW CORNER
NE. 1/4 SEC. 5, T1S R68W
3.25" ALUMINUM CAP STAMPED "PLS 24942 2001"

UNITED POWER
REC. NO. 4513360

SE CORNER SEC. 31, T1N R68W
RANGE BOX UNDER ASPHALT
CALCULATED POSITION ONLY

COLORADO LICENSED
JARROD S. JENSEN
PLS 37042
03/12/2026
PROFESSIONAL LAND SURVEYOR

Rev. Date: 8/25/2025	Rev. Date:	
LJA SURVEYING		4700 S. Syracuse Street Suite 500 Denver, CO 80237 303-390-8510 www.lja.com
Date: 3/11/2026	Job No: 1061-0006	Sheet: 2 of 2

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SIERRA VISTA MINOR SUBDIVISION FILING NO. 2

A REPLAT OF TRACTS A, B, AND C, SIERRA VISTA MINOR SUBDIVISION, LOCATED IN THE SOUTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

60.392 ACRES - 3 TRACTS

SUB2025-00006



VICINITY MAP
SCALE: 1" = 1000'
TRUE NORTH

DEDICATION STATEMENT

KNOW ALL BY THESE PRESENTS THAT THE UNDERSIGNED, BEING THE OWNERS OF THE LAND DESCRIBED HEREON HAVE LAID OUT, PLATTED, AND SUBDIVIDED INTO TRACTS, AS SHOWN HEREON UNDER THE NAME AND STYLE OF SIERRA VISTA MINOR SUBDIVISION FILING NO. 2, A REPLAT OF TRACTS A, B, AND C, SIERRA VISTA MINOR SUBDIVISION, AND DOES BY THESE PRESENTS, OF ITS OWN FREE WILL AND VOLUNTARILY, WITHOUT COERCION, THREAT, OR BUSINESS COMPULSION.

CONTAINED WITHIN THE TITLE COMMITMENT PREPARED BY LAND TITLE GUARANTEE COMPANY, ORDER NUMBER _____, WITH A COMMITMENT DATE OF _____:

A PARCEL OF LAND SITUATED IN THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 1 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN IS ASSUMED TO BEAR NORTH 89°29'51" EAST BASED ON NAD83 (2011) COLORADO STATE PLANE NORTH ZONE (501) COORDINATES, BEING MONUMENTED AT THE WEST END BY A 2" ALUMINUM CAP STAMPED, "PLS 14083 1995" RECOVERED 0.2' BELOW THE SURFACE, BEING THE NORTHWEST CORNER OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1 AND ON THE EAST END BY A 2-1/2" ALUMINUM CAP STAMPED, "PLS 20142 2015" RECOVERED 0.3' BELOW THE SURFACE, BEING THE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 1.

TRACT A, TRACT B, AND TRACT C OF SIERRA VISTA MINOR SUBDIVISION, RECORDED SEPTEMBER 17, 2018 IN THE RECORDS OF THE WELD COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 4431602

CONTAINING A CALCULATED AREA OF 2,630,667.460 SQUARE FEET OR 60.392 ACRES, MORE OR LESS.

HAVE BY THESE PRESENTS LAID OUT, PLATTED AND SUBDIVIDED THE SAME INTO TRACTS, AS SHOWN ON THIS PLAT, UNDER THE NAME AND SUBDIVISION OF SIERRA VISTA MINOR SUBDIVISION FILING NO. 2 AND DO HEREBY DEDICATE TO THE TOWN OF ERIE THE UTILITY, SANITARY SEWER AND WATER EASEMENTS SHOWN HEREON.

BC LAND, LLC, A COLORADO LIMITED LIABILITY COMPANY

OWNER: BLAKE CARLSON

BY: _____ DATE:_____
BLAKE CARLSON

TITLE: MANAGER OF BC LAND

ATTEST:
SECRETARY/TREASURER
STATE OF COLORADO)
) SS.
COUNTY OF _____)

ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____, 20____

BY: _____ AS _____

OWNER - BC LAND, LLC.
WITNESS MY HAND AND OFFICIAL SEAL

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

LAND SUMMARY CHART

TYPE	AREA	% OF TOTAL
TRACTS A - C	60.392	100%

TRACT SUMMARY TABLE

TRACT	AREA (SQ.FT.)	AREA (AC.±)	USE	OWNED / MAINTAINED
TRACT A	691,497	15.875	FUTURE DEVELOPMENT	BC LAND, LLC
TRACT B	1,137,137	26.105	FUTURE DEVELOPMENT	BC LAND, LLC
TRACT C	802,034	18.412	FUTURE DEVELOPMENT	BC LAND, LLC

TITLE VERIFICATION CERTIFICATE

WE, LAND TITLE GUARANTEE COMPANY, DO HEREBY CERTIFY THAT WE HAVE EXAMINED THE TITLE OF ALL LAND PLATTED HEREON AND THAT TITLE TO SUCH LAND IS IN THE DEDICATOR(S) FREE AND CLEAR OF ALL LIENS, TAXES AND ENCUMBRANCES, EXCEPT AS FOLLOWS: THOSE ITEMS AND OWNERSHIP INTERESTS SHOWN IN TITLE COMMITMENT _____, EFFECTIVE _____

LAND TITLE GUARANTEE COMPANY

BY: _____ DATE_____

NAME:_____

TITLE: _____

STATE OF COLORADO)
) SS.
COUNTY OF BOULDER)
ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____ 20____.

BY: _____ AS_____

WITNESS MY HAND AND OFFICIAL SEAL

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

PLANNING AND DEVELOPMENT APPROVAL CERTIFICATE

THIS PLAT IS HEREBY APPROVED BY THE TOWN OF ERIE PLANNING AND DEVELOPMENT DIRECTOR ON THE ____ DAY OF _____ A.D., 20____.

_____
PLANING AND DEVELOPMENT DIRECTOR

PLAT NOTES

1. 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.
2. ANY PERSON WHO KNOWINGLY REMOVES, ALTERS OR DEFACES ANY PUBLIC LAND SURVEY MONUMENT OR ACCESSORY COMMITS A CLASS TWO (2) MISDEMEANOR PURSUANT TO STATE STATUTE 18-4-508, C.R.S.
3. BASIS OF BEARINGS: THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 31 WAS ASSUMED TO BEAR N 89°40'29" EAST AND IS MONUMENTED AS SHOWN HEREON, WITH ALL MEASURED BEARINGS SHOWN HEREON, WITH ALL MEASURED BEARINGS SHOWN HEREON RELATIVE THERETO.
4. BASED UPON A REVIEW OF FLOOD INSURANCE RATE MAP COMMUNITY PANEL NO. 0813C0443K, MAP REVISED AUGUST 14,2019, THE SUBJECT PROPERTY IS NOT WITHIN THE 100-YEAR FLOOD PLAIN LIMITS.
5. TRACT MONUMENTATION SHALL BE IN ACCORDANCE WITH THE COLORADO REVISED STATUTES (CRS 38-51-105).
6. THE LINEAL DISTANCE UNIT USED IN THE PREPARATION OF THIS PLAT IS THE UNITED STATES SURVEY FOOT. THE UNITED STATES DEPARTMENT OF COMMERCE, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DEFINES THE UNITED STATES SURVEY FOOT AS 120/3937 METERS.
7. LAND TITLE GUARANTEE COMPANY COMMITMENT NUMBER: _____ EFFECTIVE DATE _____ WAS ENTIRELY RELIED UPON FOR RECORDED INFORMATION REGARDING RIGHTS OF WAY, EASEMENTS AND ENCUMBRANCES IN THE PREPARATION OF THIS PLAT. NO LIABILITY IS ACCEPTED BY LJA, SURVEYING, LLC. FOR THE ACCURACY OF INFORMATION CONTAINED IN SAID COMMITMENT.
8. DUE TO THE PROXIMITY OF THE PROPERTY TO THE ERIE MUNICIPAL AIRPORT , THERE WILL BE AIRCRAFT PASSING OVER THE PROPERTY, AIRCRAFT PASSING OVER THE PROPERTY, AIRCRAFT PASSAGE MAY RESULT IN NOISE AND OTHER IMPACTS ON THE PROPERTY. AIRCRAFT MAY CROSS PROPERTY AT LOW ALTITUDE HEIRS, SUCCESSORS AND ASSIGNS SPECIFICALLY ACKNOWLEDGE THE RIGHT OF PASSAGE OVER THE PROPERTY FOR AIRCRAFT AND AGREE TO HOLD HARMLESS THE TOWN OF ERIE FOR AIRCRAFT OPERATIONS.
9. THE SOLE INTENTION AND PURPOSE OF THE SIERRA VISTA MINOR SUBDIVISION IS TO CREATE TRACTS OF LAND IN ORDER TO ENABLE THE SALE OF THE INDIVIDUAL TRACTS SHOWN HEREIN. ALL TRACTS WILL NEED TO BE REPLATTED TO LOTS TO ACCOMMODATE DEVELOPMENT.
10. NO DEVELOPMENT RIGHTS ARE GRANTED BY THE SIERRA VISTA MINOR SUBDIVISION AND NO DEVELOPMENT SHALL BE ALLOWED ON ANY TRACT CREATED HEREIN UNTIL THE FOLLOWING REQUIREMENTS ARE FULLY COMPLIED WITH. NO DEVELOPMENT OR BUILDING OF IMPROVEMENTS SHALL BE ISSUED FOR ANY PURPOSE UNTIL THERE IS FULL COMPLIANCE WITH ALL TOWN OF EIRE MUNICIPAL CODE REQUIREMENTS, INCLUDING BUT NOT LIMITED TO: COMPLETION OF SUBDIVISION PROCEDURES FINAL PLAT; A DEVELOPMENT AGREEMENT (AND ANY OTHER AGREEMENTS THAT MAY BE REQUIRED BY THE TOWN OF ERIE MUNICIPAL CODE); AND IF NECESSARY COMPLETION OF THE SITE PLAN REVIEW PROCEDURE.
11. UTILITIES, VEHICULAR AND PEDESTRIAN ACCESS ROUTES, AND IMPROVEMENT GUARANTEE REQUIREMENTS WILL BE REQUIRED PER THE TOWN OF ERIE MUNICIPAL CODE, PRIOR TO THE ISSUANCE OF ANY BUILDING PERMIT.
12. THE RESTRICTIONS AND REQUIREMENTS SET FORTH BY THE SIERRA VISTA MINOR SUBDIVISION SHALL RUN WITH THE LAND INCLUDED WITH THE SIERRA VISTA MINOR SUBDIVISION AND SHALL INSURE TO THE BENEFIT OF AND BE BINDING UPON THE SUCCESSORS AND ASSIGNS OF THE OWNER. ALL OBLIGATIONS AND RESPONSIBILITIES OF THE OWNERS HEREIN SHALL PASS TO EACH AND EVERY SUCCESSOR AND/OR ASSIGN. IT IS THE RESPONSIBILITY OF ANY PURCHASER OF A TRACT WITHIN THIS SIERRA VISTA MINOR SUBDIVISION TO FULLY INVESTIGATE THE REQUIREMENTS PRIOR TO SUCH PURCHASE.
13. ALL LAND DESIGNATED AS AP ZONING SHALL CONFORM TO THE TOWN OF ERIE MUNICIPAL CODE AIRPORT OVERLAY DISTRICT GUIDELINES AS STATED IN TOWN OF ERIE MUNICIPAL CODE SECTION 10-2-6.
14. TRACT B SHALL APPLY THE FOLLOWING NEIGHBORHOOD PROTECTION PLANS TO THE NORTHERN PROPERTY LINE WHEN ADJACENT TO LOW-DENSITY RESIDENTIAL NEIGHBORHOODS:

a. THE MAXIMUM HEIGHT OF ANY PORTION OF A PRIMARY STRUCTURE SHALL NOT EXCEED 40 FEET IN HEIGHT, WHEN ABUTTING A LOW DENSITY RESIDENTIAL LOT.

b. THE MINIMUM SETBACK PERMITTED ABUTTING A LOW DENSITY RESIDENTIAL LOT IS 40 FEET.

c. NO COMMERCIAL USE WILL BE PERMITTED WITHIN 100 FEET OF A LOW DENSITY RESIDENTIAL LOT OR NEIGHBORHOOD.

SURVEYOR'S CERTIFICATE

I, PATRICK S. JERNIGAN, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS MAP WAS MADE BY ME OR UNDER MY DIRECT SUPERVISION, AND IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF, THAT AT LEAST ONE-SIXTH (1/6) OF THE PERIPHERAL BOUNDARY OF THE PARCEL SHOWN HEREON IS CONTIGUOUS WITH THE PRESENT BOUNDARY OF THE TOWN OF JOHNSTOWN, AND THAT THIS PLAT COMPLIES WITH SECTION 31-12-107(1)(d), COLORADO REVISED STATUTES, CONCERNING ANNEXATION PLATS.

FOR REVIEW ONLY

_____
PATRICK S. JERNIGAN
COLORADO PLS NO. 37042
FOR AND ON BEHALF OF LJA SURVEYING, INC
4700 S. SYRACUSE STREET, SUITE 500,
DENVER, COLORADO 80237

Rev. Date: 8/25/2025	Rev. Date:	
LJA SURVEYING		4700 S. Syracuse Street Suite 500 Denver, CO 80237 303-390-8510 www.lja.com
Date: 2/12/2026	Job No.: 1061-0006	Sheet: 1 of 2

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SIERRA VISTA MINOR SUBDIVISION FILING NO. 2

A REPLAT OF TRACTS A, B, AND C, SIERRA VISTA MINOR SUBDIVISION, LOCATED IN THE SOUTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

60.392 ACRES - 3 TRACTS

SUB2025-00006

100 0 50 100
SCALE
1 inch = 100 ft.
TRUE NORTH

LEGEND

REC. NO. = RECEPTION NUMBER
S.E. = SANITARY EASEMENT HEREBY GRANTED
U.E. = UTILITY EASEMENT HEREBY GRANTED
W.E. = WATER EASEMENT HEREBY GRANTED

20 0 10 20
SCALE
1 inch = 20 ft.
TRUE NORTH

DETAIL "A"

S51°33'35"E 36.30'
S00°17'13"W 22.55'
S55°44'08"W 35.82'
N00°51'29"W 22.03'
SW CORNER SE. 1/4 SEC. 31 T1N R68W
LID OF BOX COULD NOT BE OPENED CALCULATED BY REFERENCE MONUMENTS

LOT 18
LOT 16
LOT 7
ERIE AIR PARK SUBDIVISION BOOK 830, REC. NO. 1752380 (ZONED RURAL RESIDENTIAL)
LOT 6
LOT 5
LOT 6
LOT 7
ERIE AIR PARK SUBDIVISION REPLAT B BOOK 1477, REC. NO. 242253 (ZONED RURAL RESIDENTIAL)

NW 1/4 CORNER OF S/2 OF SE/4, SEC 31
2" ALUMINUM CAP STAMPED "LS 14083 1995"

NE CORNER S/2 OF SE/4, SEC 31
2.5" ALUMINUM CAP STAMPED "LS 20142 2015"

20' DRAINAGE & UTILITY EASEMENT BOOK 830, REC. NO. 1752380 REC. NO. 4624407
20' ACCESS EASEMENT BOOK 880 PAGE 1801566 REC. NO. 2424253
38' UTILITY & ACCESS EASEMENT REC. NO. 4268505

BASIS OF BEARINGS
N89°40'29"E 2330.17'

N89°35'08"W 555.82' (R2)
N89°40'29"E 246.47'
S76°36'24"E 268.42' (TIE TO S.E.)
30' S.E. (TO BE DEDICATED BY SEPARATE INSTRUMENT)
N12°59'44"W 123.44'
N12°14'16"E 123.38' (R3)
S12°57'15"E 20.72'
N89°40'29"E 1037.94'
1044.88' S89°35'08"E (R1)
30' W.E.
N89°40'29"E 1065.86'
S89°40'29"W 1013.19'
30' S.E.
S00°19'31"E 30.00'
NORTH LINE, S 1/2 OF SE 1/4, SECTION 31
1285.29' N89°35'08"W 555.82' (R2)
S89°40'29"W 1218.23'
30' W.E.
S89°40'29"W 15.04'
55.00'
S04°02'31"W 30.09'

10' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS BOOK 1302, REC. NO. 2254297 BOOK, 1376, REC. NO. 2268776
30' NON-EXCLUSIVE PERPETUAL EASEMENT FOR INGRESS, EGRESS AND ACCESS TO AND USE OF RUNWAYS BOOK 1050, REC. NO. 1989356 BOOK, 1274, REC. NO. 2225425 REC. NO. 2254297 REC. NO. 2268776

LOT A
RECORDED EXEMPTION NO. 1467-32-3-RE-645 REC. NO. 1977544 WELD COUNTY (ZONED PLANNED DEVELOPMENT)

TRACT A
691,497 SF
15.875 AC

466.67'
25' W.E.
S00°20'01"W 902.30'
S00°20'01"W 847.30'
N89°40'54"E 300.00'
N00°20'01"E 435.63'
435.63'

TRACT B
1,137,137 SF
26.105 AC

N17°15'42"W 636.15'
N16°37'20"W 636.25' (R3)
S17°15'42"E 1010.49'
40' S.E.
N17°15'42"W 540.19'
N16°37'20"W 540.23' (R3)
359.21'
180.98'
146.61'
WEST LINE, SE 1/4, SECTION 31

TOWN OF ERIE
WELD COUNTY
BOOK 1274, REC. NO. 02225423
(ZONED AIRPORT)

UNITED POWER
REC. NO. 4513360
25' W.E.
N04°02'11"E 533.28'
S04°02'11"W 534.38'
S04°02'11"W 564.17'
S04°46'24"W 564.23' (R3)
EAST LINE SE 1/4, SECTION 31
NO BEARING CALCULATED LINE ONLY
N00°19'05"E 300.67'
S00°19'05"W 299.58'
S00°18'10"W 183.35'
S01°04'07"W 183.40' (R3)
S00°19'43"W 190.91'
S01°04'07"W (R3)

LOT 1
VISTA RIDGE FILING NO. 6, 4TH AMMENDMENT MINOR SUBDIVISION REC. NO. 3555044 (ZONED PLANNED DEVELOPMENT)

TRACT A1
VISTA RIDGE FILING NO. 6, 4TH AMENDMENT REC. NO. 3994401 (ZONED PLANNED DEVELOPMENT)

COMMONS DR.

LOT 2
VISTA RIDGE FILING NO. 6, 4TH AMENDMENT REC. NO. 3994401 (ZONED PLANNED DEVELOPMENT)

LINE TABLE		
LINE	BEARING	LENGTH
L1	S89°40'54"W	145.09'
L2	N89°40'54"E	145.10'

S89°40'54"W 20.00'
N00°19'05"E 40.00'
40' U.E.
25.00'
L2
L1
40.00'
156.53'
34.38'
S03°50'44"W 60.39'
S04°35'08"W 60.39' (R3)
N00°19'05"E 303.74'
30' S.E.
C1
S01°13'46"W 8.34'
S01°58'10"W 8.34' (R3)
N00°19'05"E 343.61'
S06°58'07"W 120.00'
S07°42'31"W 120.00' (R3)
S01°13'46"W 98.28'
S01°58'10"W 98.28' (R3)
64.86'

50' ACCESS, UTILITY, AND DRAINAGE EASEMENT REC. NO. 4431602

BONANZA DRIVE (COUNTY ROAD NO. 3)
(VARIABLE WIDTH R.O.W.)
BOOK 86, PAGE 273; BOOK 1631, PAGE 123; REC. NO. 2572958; REC. NO. 4431602

N89°40'54"E 469.43'
N89°40'54"E 330.00'
S89°40'54"W 330.00'
N00°20'01"E 25.00'
25' W.E.
N89°40'54"E 40.00'
S00°20'01"W 30.00'
S89°39'59"E 20.00'
N89°40'54"E 1078.87'
S89°40'54"W 1248.97'
25' W.E.
N00°20'01"E 244.23'
S00°20'01"W 266.91'

TRACT C
802,034 SF
18.412 AC

S78°53'24"E 227.19'
S72°45'31"E 292.39'
N60°51'08"E 212.29'
40' S.E.
N78°53'24"W 224.93'
N72°45'31"W 336.45'
S60°51'08"W 214.77'
N21°48'37"W 105.04'
S21°48'37"E 82.57'
45.12'
40' S.E.
S89°40'42"W 1042.81'

SEE DETAIL "A"

N89°59'45"W 13.49'
N89°32'45"W 13.43' (R3)
N89°40'31"E 666.53'
N89°34'53"W (R3)
S89°40'42"W 361.51'
N89°34'53"W (R3)
N89°40'54"E 848.15'
N89°34'53"W (R3)

150' R.O.W.
75'
75'

STATE HIGHWAY NO. 7
(E. 168TH AVENUE)
(150' R.O.W.)
REC. NO. 2170911

BROOMFIELD CITY LIMITS
SOUTH LINE, SE 1/4, SECTION 31
NO BEARING CALCULATED LINE ONLY

SE CORNER SEC. 31, T1N R68W
UNDER ASPHALT
CALCULATED POSITION ONLY

SW CORNER
SE. 1/4 SEC. 31
T1N R68W
LID OF BOX COULD NOT BE OPENED
CALCULATED BY REFERENCE MONUMENTS

NW CORNER
NE. 1/4 SEC. 5
T1S R68W
3.25" ALUMINUM CAP
STAMPED "PLS 24942 2001"

CURVE TABLE					
CURVE	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C1	23.40'	512.50'	2°36'58"	S02° 32' 15"W	23.40

MONUMENT SYMBOL LEGEND

- RECOVERED SECTION CORNER AS NOTED HEREON
- 1 RECOVERED REFERENCE MONUMENT WITH A 1.5" ALUMINUM CAP STAMPED "PLS 38621 RYNEARSON RM"
- 2 RECOVERED NO. 5 REBAR WITH A 2" ALUMINUM CAP STAMPED "PLS 4846 W. M. STENGEL"
- 3 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP
- 4 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 20142"
- 5 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 38621 STRAITON"

MONUMENT SYMBOL LEGEND

- 6 RECOVERED IRON ROD WITH A 1.25" YELLOW PLASTIC CAP STAMPED "PLS 25965"
- 7 RECOVERED IRON ROD WITH A 2" ALUMINUM CAP STAMPED "PLS 28286" 0.2 ABOVE GROUND
- 8 RECOVERED NO. 5 REBAR WITH A 2" ALUMINUM CAP STAMPED "PLS 4846 W. M. STENGEL" BENT
- 9 RECOVERED IRON RODS NOT HELD BY THIS SURVEY
- 10 RECOVERED IRON ROD REFERENCE MONUMENT STAMPED "4RV WIT"

MONUMENT SYMBOL LEGEND

- 1 SET 18" LONG NO. 5 REBAR WITH 1.25" ORANGE PLASTIC CAP STAMPED "LJA SURVEYING PLS 37042" FLUSH WITH THE GROUND
- (R1) DIMENSION PER LEGAL DESCRIPTION ERIE AIR PARK SUBDIVISION AT RECEPTION NUMBER 1752380
- (R2) DIMENSION PER LEGAL DESCRIPTION ERIE AIR PARK SUBDIVISION REPLAT B AT RECEPTION NUMBER 242253
- (R3) DIMENSION PER LEGAL DESCRIPTION SIERRA VISTA MINOR SUBDIVISION AT RECEPTION NUMBER 4431602

FOR REVIEW ONLY

Rev. Date: 8/25/2025 Rev. Date:

LJA SURVEYING
4700 S. Syracuse Street Suite 500 Denver, CO 80237 303-390-8510 www.lja.com

Date: 2/12/2026 Job No.: 1061-0006 Sheet: 2 of 2

I:\JOB FOLDERS\1061\1061-0006\SURVEY\06 CAD\PRODUCTION FILES\PLAT\1061-0006_SIERRA VISTA_DETAILS PRINTED ON: 2/12/2026 7:04 AM

NOTICE OF PUBLIC HEARING
PLANNING COMMISSION
TOWN OF ERIE

Notice is hereby given that on Wednesday, April 1, 2026, at 6:30 PM, or as soon as possible thereafter at the Erie Town Hall Board Room, 645 Holbrook Street, Erie, CO 80516, a PUBLIC HEARING will be held upon the application made by BC Land, LLC, 14570 Clay St., Broomfield, CO 80023 for the purpose of considering a Minor Subdivision and Rezoning Land Use Application pursuant to the Codes of the Town of Erie and applicable State Statutes.

The affected property is located: at the Northwest corner of Highway 7 and East County Line Road 3

The legal description of the property is: A Replat of Tracts A, B, and C, Sierra Vista Minor Subdivision, Located in the South 1/2 of the Southeast 1/4 of Section 31, Township 1 North, Range 68 West of the 6th P.M., Town of Erie, County of Weld, State of Colorado

The application is on file with the Town of Erie.

Interested and affected parties are encouraged to attend. The Planning Commission will be taking comments prior to making a determination or taking any action on this matter.

Debbie Stamp
Town Clerk

FOR QUESTIONS OR COMMENTS, CONTACT
TOWN OF ERIE
PLANNING & DEVELOPMENT DEPARTMENT
P.O. BOX 750
ERIE, COLORADO 80516
PHONE: (303) 926-2770
FAX: (303) 926-2706

Please publish in the Colorado Hometown Weekly on Wednesday, March 11, 2026.
Please send the affidavit of publication and billing to:

Town Clerk
Town of Erie
PO Box 750
Erie, CO 80516

TOWN OF ERIE
AFFIDAVIT OF NOTICE POSTING

Sierra Vista Minor Subdivision & Rezoning Planning Commission

(PROJECT NAME & PUBLIC HEARING TYPE – PLANNING COMMISSION, BOARD OF TRUSTEES, BOA)





I, *MASON AESCHBACHER*, ATTEST THAT NOTICE WAS POSTED IN ACCORDANCE WITH THE ERIE MUNICIPAL CODE, TITLE 10, – "UNIFIED DEVELOPMENT CODE AND DESIGN GUIDELINES," AT LEAST 15 DAYS BEFORE THE SCHEDULED HEARING TO BE HELD ON THE 1ST DAY OF APRIL 2026 A.D. THE PHOTO, ABOVE, IS A TRUE AND CORRECT PHOTO OF THE NOTICE SO POSTED.

(SIGNATURE OF PERSON LISTED ABOVE)

ELENI ROSE HEMPHILL
Notary Public
State of Colorado
Notary ID # 20224016217
My Commission Expires 05-11-2026

STATE OF COLORADO)
) ss.
COUNTY OF Denver)

ACKNOWLEDGED BEFORE ME THIS 11 DAY OF March, 2026 BY Mason Aeschbacher AS applicant representative.

WITNESS MY HAND AND OFFICIAL SEAL

NOTARY PUBLIC

MY COMMISSION EXPIRES: 5/11/26

1186

TOWN OF ERIE

AFFIDAVIT OF MAILING - PUBLIC HEARING NOTICE

I, Mason Aeschbacher, as the applicant/representative for the Sierra Vista Minor Subdivision & Rezoning (*project name & application type*), hereby attest that on this 11 day of March, 20 26, a true and correct copy of the Town of Erie Public Hearing Notice for the public hearing with the Planning Commission (*Planning Commission or Board of Trustees*) scheduled for April 1, 2026 (*public hearing date*), marked as Exhibit "A" attached hereto and by reference incorporate herein, was mailed to those referenced in Exhibit "B" in accordance with the requirements of the Unified Development Code of the Town of Erie.

I further attest that the addresses shown in Exhibit "B" are true and correct addresses as determined from the records of the associated County Property Portal Records Search and that said Notices were placed in the United States Mail with the appropriate postage affixed thereon.

Applicant/Representative's Signature

03/11/2026
Date

STATE OF COLORADO)
) ss.
COUNTY OF Denver)

ACKNOWLEDGED BEFORE ME THIS 11 DAY OF March, 2026 BY Mason Aeschbacher AS applicants representative.

WITNESS MY HAND AND OFFICIAL SEAL:

NOTARY PUBLIC

MY COMMISSION EXPIRES: 5/11/26

ELENI ROSE HEMPHILL
Notary Public
State of Colorado
Notary ID # 20224016217
My Commission Expires 05-11-2026

Exhibit "A"

Planning & Development Department

TOWN OF ERIE PUBLIC HEARING NOTICE

March 12, 2026

The Town of Erie Planning & Development Department has scheduled the following item for consideration:

Applicant/Developer: BC Land, LLC

Project Description: Sierra Vista is approximately 60.4 acres located at the northwest corner of State Highway 7 and Bonanza Drive. The general purpose for this rezone request is to convert approximately 54.5 acres from Low-Density Residential (LR) to 38.6 acres of Community Mixed Use (CMU) on the east and south sides of the property and 15.9 acres of Airport (AP) on the west side of the property. Additionally, BC Land, LLC is proposing to rezone 5.9 acres from Community Commercial (CC) to Community Mixed Use (CMU).

Location: Northwest Corner of State Highway 7 and Bonanza Drive



Planning & Development Department

Planner:	Chris LaRue
Board or Commission:	Planning Commission
Hearing For:	Sierra Vista Rezone & Minor Subdivision Plat
Date of Hearing:	Wednesday, April 1, 2026
Time:	6:30 PM
Place:	Planning Commission meetings will be held in person in the Town Hall Board Room, 645 Holbrook Street (lower level, northeast entrance) **UNLESS** otherwise noted in the **Town Calendar on the Town's website**. You can access the Town Calendar by going to the Town's website, www.erieco.gov and scrolling to the bottom of the page to "Events & Meetings". Select the "Planning Commission Meeting" in the box or click "View All" for more information, dates, and access to the meeting agenda. Please note: Public Comment can be given both in person and via Zoom (please see the Town Calendar at www.erieco.gov for Zoom information).

This letter is your notice of the above referenced hearing(s). We are sending you this notice as required by Erie Municipal Code Title X, Chapter 7.2.F.4.a. or as a referral agency of the Town. Copies of the application and support material for this project are on file and available for public inspection. Applicant materials are typically posted to the Town of Erie Agenda Center, online at https://erie.legistar.com, the Friday before the public hearing date. Public comment is welcome during public hearings; or, you may send email comments to clarue@erieco.gov; or, written comments to Town of Erie - Planning, P.O. Box 750, Erie, CO 80516-0750. **If you have any questions, please call Planning at 303-926-2770.**

Exhibit "B"

ERIE TOWN OF
PO BOX 9
ERIE, CO 80516

ERIE TOWN OF
PO BOX 750
ERIE, CO 80516

RANNEY PATRICIA K
120 PIPER DR
ERIE, CO 80516

GOLDSTEIN CLIFFORD W LIVING TRUST &
GOLDSTEIN ROBERTA L LIVING TRUST
2955 PIPER DR S
ERIE, CO 80516

KENDALL WILLIAM R & KENDALL KAROL A
2965 PIPER DR S
ERIE, CO 80516

JONES SCOTT L
2975 PIPER DR S
ERIE, CO 80516

MILLER RICHARD L & MILLER PATRICIA E
3015 PIPER DR S
ERIE, CO 80516

FRASER BRYAN KEITH & FRASER DAWN
MARIE
3025 PIPER DR S
ERIE, CO 80516

SINGH JULIE KRAUSE & SINGH ATAR
2920 CHEROKEE CT
ERIE, CO 80516

ALLDREDGE MARK EVANS & ALLDREDGE
MARIE K
2940 CHEROKEE CT
ERIE, CO 80516

MAZZOLA LOUIS J & MAZZOLA LAURIE J
2960 CHEROKEE CT
ERIE, CO 80516

GUTSCHENRITTER TONY L &
GUTSCHENRITTER ROXANNE K
2990 CHEROKEE CT
ERIE, CO 80516

EGGLESTON CARRIE J & EGGLESTON
MICHAEL E
3020 CHEROKEE CT
ERIE, CO 80516

DRNEC TIMOTHY LOUIS & NOCERINO
PAMELA ANN
3040 CHEROKEE CT
ERIE, CO 80516

ANDERSON PATRICIA ANN
3025 CHEROKEE CT
ERIE, CO 80516

KIRWAN DAWN LEA
3150 QUEEN CT
BROOMFIELD, CO 80020

ODONNELL MICHAEL J & ODONNELL
PATRICIA L
2985 CHEROKEE CT
ERIE, CO 80516

LORENZ-HUMPHRIES REVOCABLE LIVING
TRUST
2965 CHEROKEE CT
ERIE, CO 80516

GARRETT TONI SURVIVORS TRUST
215 ALVARADO RD
BERKELEY, CA 94705

SCOTT AMANDA & TYNDALL MICHAEL
2940 PIPER DR S
ERIE, CO 80516

LEHNERT VOTAN M & SEABORG CHRISTINA
2970 PIPER DR S
ERIE, CO 80516

RAKE CAMERON P & RAKE DAWN M
2980 PIPER DR S
ERIE, CO 80516

BOTT STACEY BOLAND
3010 PIPER DR S
ERIE, CO 80516

BELL BURKE A
3030 PIPER DR S
ERIE, CO 80516

DEMERS MARC
18801 SE MACK DAIRY RD
JUPITER, FL 33478

MOULTON DANIEL & MOULTON STACI
380 BARON CT
ERIE, CO 80516

WHITE MARTIN L & WHITE LEE M
350 BARON CT
ERIE, CO 80516

REYNOLDS ERIE PROPERTY LLC
7600 LANDMARK WAY UNIT 1515
GREENWOOD VILLAGE, CO 80111

ANDRAS RUDOLPH P
295 SKYLANE DR
ERIE, CO 80516

RUSSO MARK F
285 SKYLANE DR
ERIE, CO 80516

BIARD JOHN R & BIARD PAMELA H
275 SKYLANE DR
ERIE, CO 80516

BALKCOM RACHEL
265 SKYLANE DR
ERIE, CO 80516

BEDNAR BRYON J & BEDNAR NANCY C
280 SKYLANE DR
ERIE, CO 80516

THOMAS JOHN K & THOMAS RINKU S
C/O PROPERTIES PLUS
109 N PUBLIC RD
LAFAYETTE, CO 80026

UNRUH JOINT REVOCABLE TRUST
255 PIPER DR
ERIE, CO 80516

GREGORY KEVIN R & GREGORY RENEE M
265 PIPER DR
ERIE, CO 80516

BC LAND LLC
14570 CLAY ST
BROOMFIELD, CO 80023

SW MANILA LLC
905 W 124TH AVE STE 200
DENVER, CO 80234

YAMAMOTO HIDEAKI & YAMAMOTO DIANE S
270 SKYLANE DR
ERIE, CO 80516

MUSSACK ROBERT B, MUSSACK DOROTH M,
MUSSACK ROBERT R, CSEKE MYRA M, &
KARDELL MONA M
350 COUNTY ROAD 3
ERIE, CO 80516

FOOTE JOEL S & KNIGHT LOIS HAGER
250 COUNTY ROAD 3
ERIE, CO 80516

KING KEVIN H & KING CATHY A
370 COUNTY ROAD 3
ERIE, CO 80516

VISTA RIDGE DEVELOPMENT CORP
C/O JAMES SPEHALSKI
9750 W CAMBRIDGE PL
LITTLETON, CO 80127

KLUTH SAMUEL W & KLUTH SHANNON R
2700 SUNSET WAY
ERIE, CO 80516

STICKLE SHAWN B & STICKLE MARIA E
2710 SUNSET WAY
ERIE, CO 80516

ROACH KEITH ALLAN
2720 SUNSET WAY
ERIE, CO 80516

GODBOLE CHETAN & KALE DAKSHA
2730 SUNSET WAY
ERIE, CO 80516

GRADY PATRICK R & GRADY JESSICA B
11633 SHOSHONE WAY
DENVER, CO 80234

SPIES KENT L & LAPLUME MICHELE A
2750 SUNSET WAY
ERIE, CO 80516

HUERTA NICHOLAS A
1110 SUNSET WAY
ERIE, CO 80516

ONESKY CHRISTOPHER A & ONESKY LEANN
RENEE LUCERO
1120 SUNSET WAY
ERIE, CO 80516

FONG YVONNE Y
1130 SUNSET WAY
ERIE, CO 80516

PETERSON LUCAS NATHANIEL & PETERSON
TRACY L
1140 SUNSET WAY
ERIE, CO 80516

DANIEL J ELLIS FAMILY PARTNERSHIP II LLP
3727 WONDERLAND HILL AVE
BOULDER, CO 80304

CARTWRIGHT MICHAEL C & CARTWRIGHT
DONNA R
1160 SUNSET WAY
ERIE, CO 80516

TAYLOR MILTON C & TAYLOR MARIE
CHAMBERLAIN
1170 SUNSET WAY
ERIE, CO 80516

GRAF RICHARD J & GRAF GLENDA A
1180 SUNSET WAY
ERIE, CO 80516

JACQUEMARD RICHARD M JR & BURTON
KELLY LEE
1190 SUNSET WAY
ERIE, CO 80516

ANDERSEN TESS KATHERINE & ANDERSEN
CHRISTIAN PATRICK
2741 SUNSET WAY
ERIE, CO 80516

WESTFELDT ELIZABETH BURKE CROSBY &
WESTFELDT NATHAN DYLAN
2731 SUNSET WAY
ERIE, CO 80516

BAUMANN FAMILY TRUST
2721 SUNSET WAY
ERIE, CO 80516

SCHMIDT JONATHAN
2711 SUNSET WAY
ERIE, CO 80516

GILDHOUSE SHANNON D & GILDHOUSE MELISSA K
2701 SUNSET WAY
ERIE, CO 80516

SUAZO GEORGE H JR & SUAZO EILEEN G
2702 SUNSET ST
ERIE, CO 80516

PALASTHY SZOMAK & CZEGLEDI SZONJA MARIA
2712 SUNSET ST
ERIE, CO 80516

TAMAYO CARLOS A & TAMAYO INGA
2722 SUNSET ST
ERIE, CO 80516

MENDOZA VALERIE LATONA & THOMAS WAYNE B TRUST
2732 SUNSET ST
ERIE, CO 80516

TERRILL SUSAN M & TERRILL TERRY R
2733 SUNSET ST
ERIE, CO 80516

RAFOUL MICHAEL
2723 SUNSET ST
ERIE, CO 80516

HUTCHINS RICHARD S & HUTCHINS KELLY
2713 SUNSET ST
ERIE, CO 80516

CRUM JOHN PATRICK & CRUM HUNTLEIGH J
2703 SUNSET ST
ERIE, CO 80516

GUZMAN MIGUEL & GUZMAN LAURA ROBINSON
2704 SUNSET PL
ERIE, CO 80516

BROWN ANDREW M & BROWN LAURA J
2714 SUNSET PL
ERIE, CO 80516

ERIE STORAGE LIMITED LIABILITY COMPANY
PO BOX 247
EASTLAKE, CO 80614

TBN INVESTMENTS CO LLC (70%) & FRANCIS ROYALITIES LLC (30%)
4506 21ST STREET DR
GREELEY, CO 80634

BONANZA DRIVE DEVELOPMENT CORPORATION
C/O JAMES SPEHALSKI
9750 W CAMBRIDGE PL
LITTLETON, CO 80127

MOUNTAIN VIEW FIRE PROTECTION DISTRICT
3561 N STAGECOACH RD UNIT 200
LONGMONT, CO 80504

VIRTUS LS ERIE LLC
835 W 6TH ST STE 1500
AUSTIN, TX 78703

MUTH CAR WASH LLC
26236 W 110TH TER
OLATHE, KS 66061

PREMIER INVESTMENT PROPERTIES OF DENVER LLC
12835 E ARAPAHOE RD # TOWER 1 STE 120
CENTENNIAL, CO 80112

MC VISTA COMMONS LLC
1590 JUNIPER HILL DR
ASPEN, CO 81611

ZINO JOSEPH D
16665 PINNACLE CT.
BROOMFIELD, CO 80023

FLYNN CHAD AND JUSTINE
16690 PINNACLE CR
BROOMFIELD, CO 80023

CITY AND COUNTY OF BROOMFIELD
ONE DESCOMBES DR.
BROOMFIELD, CO 80020

HASANBEGOVIC NEDIM
16683 PINNACLE CT.
BROOMFIELD, CO 80023

KING KATHLEEN
16697 PINNACLE CT.
BROOMFIELD, CO 80023

CHANDY SHANU M
16708 BUCKSKIN WAY
BROOMFIELD, CO 80023

JOHNNIDES CHRISTOPHER G AND ANN
16714 BUCKSKIN WAY
BROOMFIELD, CO 80023

COOPRIDER CHARLES E
3542 VESTAL LOOP
BROOMFIELD, CO 80023

CORN RYAN D.
3564 VESTAL LOOP
BROOMFIELD, CO 80023

LINDQUIST FAMILY PROTECTION TRUST
16728 BUCKSKIN WAY
BROOMFIELD, CO 80023

LORENZO ANTHONY AND ELIZABETH KRATERFIELD
3541 VESTAL LOOP
BROOMFIELD, CO 80023

SANTISTEBAN RUDY A. FLORES
3563 VESTAL LOOP
BROOMFIELD, CO 80023

THAKORE DARSHAK M
3587 VESTAL LOOP
BROOMFIELD, CO 80023

CITY AND COUNTY OF BROOMFIELD
ONE DESCOMBES DR.
BROOMFIELD, CO 80020

SOHOCKI NATHAN AND JULIE
16689 BUCKSKIN WAY
BROOMFIELD, CO 80023

JACK STANLEY K AND CORENE M
16703 BUCKSKIN WAY
BROOMFIELD, CO 80023

POPE MARK S AND PAMELA R
16717 BUCKSKIN WAY
BROOMFIELD, CO 80023

FIGUEROA FRANK EDWARD
16729 BUCKSKIN WAY
BROOMFIELD, CO 80023

MORGAN KEVIN
3630 VESTAL LOOP
BROOMFIELD, CO 800234657

MARKARIAN JEVON S AND JENNIE M
3654 VESTAL LOOP
BROOMFIELD, CO 80023

LUKENS DANIEL E T
3660 VESTAL LOOP
BROOMFIELD, CO 800234657

ZADOROZNY RICHARD AND JILL
3670 VESTAL LOOP
BROOMFIELD, CO 80023

BENSON JEFFREY R AND EMILIE R
16656 PLATEAU LN
BROOMFIELD, CO 80023

4000 CENTENNIAL DRIVE LLC
PO BOX 18383
BOULDER, CO 80308

SCHNICKER HEIDI
4020 CENTENNIAL DR.
BROOMFIELD, CO 80023

HAYES NANCY R.
4038 CENTENNIAL DR.
BROOMFIELD, CO 80023

WOLNY KAREN
4124 CENTENNIAL DR.
BROOMFIELD, CO 80023

4132 CENTENNIAL LLC
6375 EAGLE CT.
LONGMONT, CO 80503

BYRNE RICHARD J AND ANN L
4144 CENTENNIAL DR
BROOMFIELD, CO 80023

GEMELLI CAROL J
4152 CENTENNIAL DR.
BROOMFIELD, CO 80023

SMITH SHAYN AND LAURINDA LIVING TRUST
4170 CENTENNIAL DR.
BROOMFIELD, CO 80023

KLEIN MARTIN & SAUNDRA FAMILY TRUST
4186 CENTENNIAL DR.
BROOMFIELD, CO 80023

JACKSON SANDRA L. FAMILY TRUST
4194 CENTENNIAL DR.
BROOMFIELD, CO 80023

SUMNER LIVING TRUST
16700 LA BRISAS DR.
BROOMFIELD, CO 80023

GRUMMON FAMILY TRUST
16696 LAS BRISAS DR.
BROOMFIELD, CO 80023

KEZOLIE CLEGG REVOCABLE TRUST
16680 LAS BRISAS DR.
BROOMFIELD, CO 80023

SETZKE FAMILY LIVING TRUST
16662 LAS BRISAS DR.
BROOMFIELD, CO 80023

MEYERS LIVING TRUST
16652 LAS RISAS DR.
BROOMFIELD, CO 80023

MOHLING ROBERT A
16659 LAS BRISAS DR.
BROOMFIELD, CO 80023

YODER TRUST
16671 LAS BRISAS DR.
BROOMFIELD, CO 80023

BARKER JOHN
16685 LAS BRISAS DR.
BROOMFIELD, CO 80023

PLUNKETT STEPHEN R. TRUST
16699 LAS BRISAS DR.
BROOMFIELD, CO 80023

KRAMER ANDREW T
4252 CORTE BELLA DR.
BROOMFIELD, CO 80023

WILLIAMS JOHN PATRICK
4274 CORTE BELLA DR.
BROOMFIELD, CO 80023

ROARTY JOSEPH P AND CHRISTINE D LIVING TRUST
4297 CORTE BELLA DR
BROOMFIELD, CO 80023

SCHWARTZBURG BONNIE C. REVOCABLE TRUST
4285 CORTE BELLA DR.
BROOMFIELD, CO 80023

MOSBERG JAMES FRANCIS SR
14100 MYAKKA AVE. LOT 98
PORT CHARLOTTE, FL 33953

HARRISON KAREN L.
4241 CORTE BELLA CIR.
BROOMFIELD, CO 80023

BURTON SANDRA BAKER
4211 CORTE BELLA DR.
BROOMFIELD, CO 80023

HOUSER FAMILY TRUST
4199 CORTE BELLA DR.
BROOMFIELD, CO 80023

KIRSNER BERNARD M
4185 CORTE BELLA DR.
BROOMFIELD, CO 80023

DUKES CHARLES D.
4163 CORTE BELLA DR.
BROOMFIELD, CO 800238062

HAIN ROBERT C AND MARY ANN LIVING TRUST
4149 CORTE BELLA DR.
BROOMFIELD, CO 80023

CONFETTI FRED O AND SANDRA G FAMILY TRUST
4131 CORTE BELLA DR.
BROOMFIELD, CO 80023

HALGREN JOANN S
4119 CORTE BELLA DR.
BROOMFIELD, CO 80023

HEPP NICHOLAS JOHN
4101 CORTE BELLA DR.
BROOMFIELD, CO 800238062

COSTA LOUISE A
4091 CORTE BELLA DR.
BROOMFIELD, CO 80023

WILLIAMS NANCY B
4073 CORTE BELLA DR
BROOMFIELD, CO 80023

LAMBERTSEN KAREN E.
4065 CORTE BELLA DR.
BROOMFIELD, CO 80023

SHOTTON MICHAEL
4082 CORTE BELLA DR.
BROOMFIELD, CO 80023

DAIGNAULT LINDA L'ESPERANCE
4098 CORTE BELLA DR
BROOMFIELD, CO 80023

KENNEDY ANITA MARIE
4112 CORTE BELLA DR.
BROOMFIELD, CO 80023

FERGUSON RONDELL A
4171 CENTENNIAL DR.
BROOMFIELD, CO 80023

BRANDT FAMILY TRUST
4169 CENTENNIAL DR.
BROOMFIELD, CO 80023

KENT RONNIE
4147 CENTENNIAL DR.
BROOMFIELD, CO 80023

SCOTT PETER G
4125 CENTENNIAL DR.
BROOMFIELD, CO 80023

RAWLINGS WILLIAM H. TRUST
4115 CENTENNIAL DR.
BROOMFIELD, CO 80023

STILTNER BARBARA TRUST
4091 CENTENNIAL DR.
BROOMFIELD, CO 80023

FRENGER RICHARD K
4077 CENTENNIAL DR.
BROOMFIELD, CO 80023

NEVE TERRY
4059 CENTENNIAL DR.
BROOMFIELD, CO 80023

CARY CAROLYN M.
4041 CENTENNIAL DR.
BROOMFIELD, CO 80023

MCGLEW DALE M
4027 CENTENNIAL DR.
BROOMFIELD, CO 80023

RASMUSSEN FAMILY TRUST
4017 CENTENNIAL DR.
BROOMFIELD, CO 80023

HARNER CAROLYN K TRUST
4003 CENTENNIAL DR.
BROOMFIELD, CO 80023

ANTHEM RANCH COMMUNITY ASSOCIATION
16151 LOWELL BLVD.
BROOMFIELD, CO 80023

MORIUCHI AMANDA
3675 VESTAL LOOP
BROOMFIELD, CO 80023

HORVATH MIKLOS AND HEATHER E
3669 VESTAL LOOP
BROOMFIELD, CO 80023

CARMICHAEL JASON
3663 VESTAL LOOP
BROOMFIELD, CO 80023

DONNELLY KATHRYN G AND SHAWN P
3657 VESTAL LOOP
BROOMFIELD, CO 80023

EGGERS JAMES G
3649 VESTAL LOOP
BROOMFIELD, CO 80023

MACK RYAN AND DANIELE
3645 VESTAL LOOP
BROOMFIELD, CO 80023

RODGERS DAVID J
3641 VESTAL LOOP
BROOMFIELD, CO 80023

PALOMINO LEONCIO AND OFELIA
8333 NORTHEAST 121ST PL
KIRKLAND, WA 98034

CARR SARAH E
3629 VESTAL LOOP
BROOMFIELD, CO 80023

SU YARI
3605 VESTAL LOOP
BROOMFIELD, CO 80023

EPSTEIN BRETT M.
3611 VESTAL LOOP
BROOMFIELD, CO 80023

MARTINEZ RICHARD J TRUST
3623 VESTAL LOOP
BROOMFIELD, CO 80023

BUFFALO FORTRESS CO LLC
650 S. LASHLEY LANE
BOULDER, CO 80305

NORTHERN COLORADO WATER
CONSERVANCY DISTRICT ETC
220 WATER AVE
BERTHOUD, CO 80513

SPROLE SUSAN I
16661 EOLUS WAY
BROOMFIELD, CO 800238309

BRESLIN ELAINE
16659 ANTERO ST.
BROOMFIELD, CO 80023

CORNELL FAMILY TRUST
16662 EOLUS WAY
BROOMFIELD, CO 80023

KOEHN HERMAN JR. FAMILY TRUST
16713 ANTERO ST.
BROOMFIELD, CO 80023

ZYGAJ GREGORY P
16707 ANTERO ST.
BROOMFIELD, CO 80023

CIMATO MARIA REVOCABLE TRUST
4926 EOLUS PL.
BROOMFIELD, CO 80023

KLINE RICHARD S
16695 ANTERO ST.
BROOMFIELD, CO 80023

HELDMAN SALLY BAIRD
16689 ANTERO ST.
BROOMFIELD, CO 80023

FRANCESCONI DEBRA H. REVOCABLE
LIVING TRUST
16683 ANTERO ST.
BROOMFIELD, CO 800238093

NELSON THOMAS C TRUST
16677 ANTERO ST.
BROOMFIELD, CO 800238093

YOUNGREN DAVID
16671 ANTERO ST.
BROOMFIELD, CO 80023

KOCH LORETTA
16670 EOLUS WAY
BROOMFIELD, CO 80023

KNUTSON SUSAN M.
16676 EOLUS WAY
BROOMFIELD, CO 80023

KUHN ALAN K. AND KATHY M. TRUST
16682 EOLUS WAY
BROOMFIELD, CO 80023

KELLENBERGER JAMES B.
16688 EOLUS WAY
BROOMFIELD, CO 80023

POOLE LOIS F
16694 EOLUS WAY
BROOMFIELD, CO 80023

JOYCE E. PENNER REVOCABLE TRUST
16700 EOLUS WAY
BROOMFIELD, CO 80023

ROUGHTON JUDITH A TRUST
16706 EOLUS WAY
BROOMFIELD, CO 80023

WORTH ROBERT JAMES
16712 EOLUS WAY
BROOMFIELD, CO 80023

PERSHING LARRY D
4907 EOLUS PL
BROOMFIELD, CO 80023

JOHNSON ANN CATHERINE
4916 EOLUS PL.
BROOMFIELD, CO 80023

KALKMAN GARY
4906 EOLUS PL.
BROOMFIELD, CO 80023

LANDUYT PENNY
5054 BIERSTADT LOOP
BROOMFIELD, CO 80023

SCHOLTEN ROBERT DALE REVOCABLE TRUST
5044 BIERSTADT LOOP
BROOMFIELD, CO 80023

STERN-MURAHATA JOAN W. TRUST
4884 BIERSTADT LOOP
BROOMFIELD, CO 80023

ZEMAN MICHELLE YVONNE
4875 BIERSTADT LOOP
BROOMFIELD, CO 80023

DEREMER CAROL R. AND RICHARD L. LIVING TRUST
4865 BIERSTADT LOOP
BROOMFIELD, CO 80023

NICCORE MADELINE D.
4855 BIERSTADT LOOP
BROOMFIELD, CO 80023

MILLIGAN MARY R
4835 BIERSTADT LOOP
BROOMFIELD, CO 80023

CORKUM DAVID
4825 BIERSTADT LOOP
BROOMFIELD, CO 80023

KLEIN RICHARD
4815 BIERSTADT LOOP
BROOMFIELD, CO 80023

AITKEN REVOCABLE TRUST
4805 BIERSTADT LOOP
BROOMFIELD, CO 80023

COOK RONALD T. SR. TRUST
4795 BIERSTADT LOOP
BROOMFIELD, CO 80023

CHAMBERLAIN GRACE
4794 BIERSTADT LOOP
BROOMFIELD, CO 80023

COREY JOSEPH
4804 BIERSTADT LOOP
BROOMFIELD, CO 80023

GOOD GERALD
16708 ANTERO ST.
BROOMFIELD, CO 80023

LAUREN JACK G
16702 ANTERO ST.
BROOMFIELD, CO 80023

BROWN SUSAN N
16696 ANTERO ST.
BROOMFIELD, CO 80023

LITTLE DONALD B
16690 ANTERO ST.
BROOMFIELD, CO 80023

MILLER THOMAS F.
16684 ANTERO ST.
BROOMFIELD, CO 80023

LICATA JOSEPHINE C
16678 ANTERO ST.
BROOMFIELD, CO 80023

BRUCKERT FAMILY TRUST
16666 ANTERO ST.
BROOMFIELD, CO 80023

YOST GARY F
16660 ANTERO ST.
BROOMFIELD, CO 80023

Chris LaRue

From: Ted Harberg <tharberg@broomfield.org>
Sent: Wednesday, March 11, 2026 10:53 AM
To: Kelly Driscoll
Cc: Jesse Ascunce; Chris LaRue
Subject: Re: 3rd Referral Review - ZON2025-00005 Sierra Vista Rezoning & SUB2025-00006 Sierra Vista Minor Subdivision

External Email: Do not click links or open attachments unless you recognize the sender and know the content is safe.

Thank you Kelly,

If I understand correctly, Erie's code would still allow aeronautical structures within the part of the applicant's western edge that is affected by the RPZ. It is also our understanding that aeronautical structures would also be permitted on the portion of the property proposed to be zoned AP that is not affected by the RPZ.

Broomfield would not object to any non-aeronautical structures, but has cited a concern about the potential future addition of aeronautical structures at the Sierra Vista property (we specifically cited the heliport, helistop, or related airport uses categories from Erie's code). This property is located adjacent to the Erie Airport, so we understand that any future development proposals including aeronautical structures also have the potential to create connections to the Erie Airport runway and taxiways and could make use of those facilities for takeoffs and landings.

Based on this discussion, my understanding is that *aeronautical structures* could still ultimately be permitted at any part of the Sierra Vista Subdivision rezoned to AP. Given this information, I do not think the two additional documents provided by the applicant impacts Broomfield's previous comments.

Thank you again the clarification about my questions.

Ted Harberg
Senior Planner, AICP
City and County of Broomfield
Direct: 303-438-6362
Planning Division web page

Please visit the Broomfield Community Development Department *web page or Broomfield.org/FindMyService to view ways to access all Broomfield City and County services.*

On Wed, Mar 11, 2026 at 10:31 AM Kelly Driscoll <kdriscoll@erieco.gov> wrote:

Ted,