



Date: September 5th, 2023

To: Erik Gates

From: Garrett Graham
PCS Group Inc.
P.O. Box 18287
Denver, CO 80218

This document is a response to the Jamaso (DA-2243-00) Second Technical Submission (5th Overall Review) comments received on June 6th, 2023 by the Office of Development Assistance. Responses are below in **RED**:

Second Technical Submission Review

SUMMARY OF KEY COMMENTS FROM ALL DEPARTMENTS

- The access road (as labeled on the PIP) needs to be a private road. The section does not meet COA standards nor does it provide additional connectivity. [Public Works Civil Engineering]
- A turnaround in the interim condition is not only for fire/life safety but for the general public. Provide a turnaround. [Public Works Civil Engineering]

PLANNING DEPARTMENT COMMENTS

1. General Planning (Erik Gates/ egates@auroragov.org / 303-739-7132 / Comments in dark teal)

[Tab 13 Page 4]

1A. If a turnaround is to be required/provided at the end of 12th, please clearly note this is a temporary condition. Perhaps as a separate sheet or detail.

LJA Response: Turnaround details will be added at the Site Plan process as needed for the Planning Areas to be developed.

REFERRAL COMMENTS FROM OTHER DEPARTMENTS AND AGENCIES

2. Civil Engineering / Julie Bingham / jbingham@auroragov.org / 303-739-7403 / comments in green)

[Tab 8 Page 1]

2A. Remove the reference to a raised median. (typical all tabs that show this).

PCS Response: Acknowledged, raised median reference has been removed the Land Use Map.

[Tab 9 Page 1]

2B. Check the location of the arrows.

PCS Response: Acknowledged, arrows on bike lane leaders have been updated for the N-to-S collector road.



2C. As noted on the PIP, this road should be private. The alternative two-lane collector may only be used when there is no access for a minimum of 1000 ft measured from intersection flow lines.

LJA Response: Per coordination with Public Works, this roadway section is local type 3 public road.

2D. Please clarify, there are 14' walk/bike lanes on Powhaton.

PCS Response: Acknowledged, this label has been updated to show a 14ft wide walk/bike lane per Aurora's updated cross section for major arterials.

[Tab 13 Page 2]

2E. The full section of the N-S collector is required. The section is entirely within this master plan and only open space exists on the east side.

Response: Per discussions with Cindy Colip on 8/14/23, the City is supportive of a deferral of a portion of 12th Ave past the access point of the proposed self-storage planning area PA-5 and the north-south collector on the east side of PA-5. This deferral should be processed as part of a Site Plan submittal for the proposed self-storage planning area and not included in the proposed Public Improvement Plan in the Master Plan submittal.

2F. Add: "and from N. Powhaton Road to the eastern site boundary." The full length of the collector is required to access this planning area.

Response: Per discussions with Cindy Colip on 8/14/23, the City is supportive of a deferral of a portion of 12th Ave past the access point of the proposed self-storage planning area PA-5 and the north-south collector on the east side of PA-5. This deferral should be processed as part of a Site Plan submittal for the proposed self-storage planning area and not included in the proposed Public Improvement Plan in the Master Plan submittal.

2G. These improvement sections are left over from the previous submittal. Please revise.

LJA Response: As discussed with engineering staff, the roadway sections were modified to include a Local Type 3 for the access road into the Raw Water Plant instead of an alternative two-lane collector. The roadway typical section that was on the Half-Section Line has been renamed to Road A to prevent confusion with the word "half". The typical section still remains as a two-lane collector.

[Tab 13 Page 4]

2H. Repeat: This needs to remain a private road. The section does not meet COA standards nor does it provide additional connectivity. In order to be considered a public road within ROW, it shall meet COA standards. The alternative two-lane collector may only be used when there is no access for a minimum of 1000 ft measured from intersection flow lines.

LJA Response: Per coordination with Public Works, this roadway section is local type 3 public road.

2I. A turnaround in the interim condition is not only for fire/life safety but for the general public. Provide a turnaround. There is currently no application that would provide a turnaround for this on the south or east sides.

LJA Response: Turnaround details will be added at the Site Plan process as needed for the Planning Areas to be developed. Specific locations are not anticipated during this process.

2J. Label as E. 12th Avenue.



LJA Response: The road name has been added.

2K. Is this half-section still applicable? Would this section apply to the N-S road on the east side of the site?

LJA Response: The roadway typical section that was on the Half-Section Line has been renamed to Road A to prevent confusion with the word "half". The typical section still remains as a two-lane collector.

3. Aurora Water (Nina Khanzadeh / rkhanzad@auroragov.org / 303-303-883-2060 / comments in red)
[Tab 13 Page 4]

3A. Remove "public" callouts- Typical. [3 comments]

LJA Response: The callouts have been edited to removed "public" from the utilities.

4. Public Art (Roberta Bloom / rbloom@auroragov.org / 303-739-6747)

4A. There were no more Public Art comments on this review.

PCS Response: Acknowledged – thank you.



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Westminster, CO 80234
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No.	Rev. Date	Revision Type
1		
2		
3		
4		
5		
6		

Date: March 17, 2022
 Horiz. Scale: 1" = 100'
 Vert. Scale: N/A

Designed By: ACS
 Prepared By: CWS
 Approved By: TRH

Sheet: 1 of 3
 Job No.: 1022-02

Jamaso Subdivision Filing No. 1
 City of Aurora, Colorado
 Master Drainage
 Historic Drainage Plan

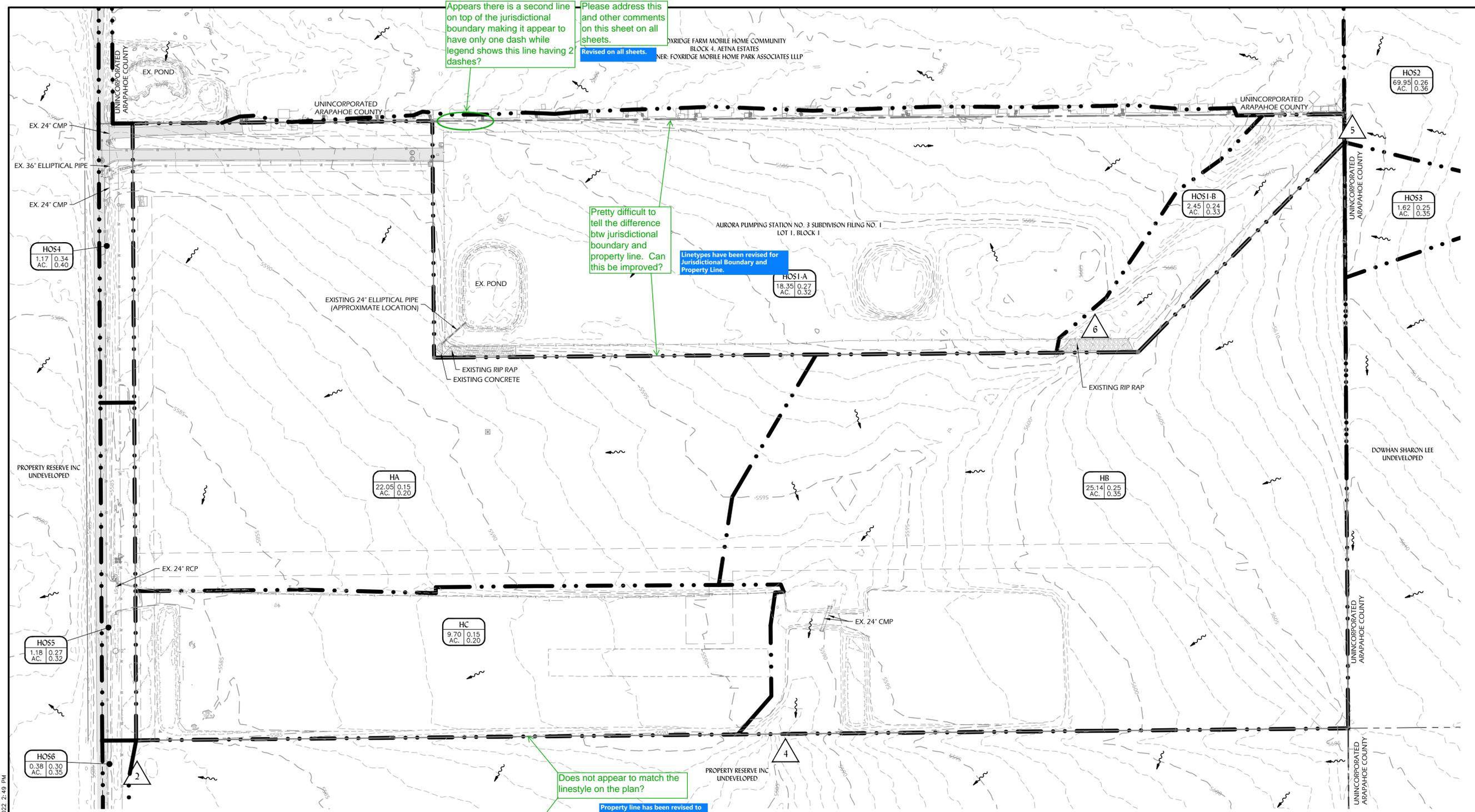
Project Name:
 Location:
 Plan Set:
 Sheet Name:

NOT FOR CONSTRUCTION



Know what's below. Call before you dig.

Sheet: |



Appears there is a second line on top of the jurisdictional boundary making it appear to have only one dash while legend shows this line having 2 dashes?

Please address this and other comments on this sheet on all sheets. Revised on all sheets.

Pretty difficult to tell the difference btw jurisdictional boundary and property line. Can this be improved?

Linetypes have been revised for Jurisdictional Boundary and Property Line.

Does not appear to match the linestyle on the plan?

Property line has been revised to match Legend.

LEGEND

- Property Line
- Right of Way Line
- Centerline
- Major Basin Boundary
- Jurisdictional Boundary
- Ex. Easement Line
- Ex. Water Line
- Ex. Storm Sewer Line
- Ex. Gas
- Ex. Underground Electric
- Ex. Overhead Electric
- Ex. Fence
- Existing Major Contour
- Existing Minor Contour
- Flow Direction Arrow
- Drainage Basin ID
- Existing Asphalt Pavement

Basin ID	Design Point	Total Area (Ac.)	Imperv. (%)	Tc (min)	Peak Flow (cfs)	
					Q ₂	Q ₁₀₀
HOS1-A	2	18.35	18%	19.0	9.82	32.05
HOS1-B	4	2.45	5%	13.2	1.39	5.26
HOS2	5	69.95	6%	25.7	30.78	115.74
HOS3	4	1.62	5%	12.9	0.98	3.72
HOS4	2	1.17	28%	11.3	1.03	3.22
HOS5	2	1.18	18%	11.1	0.82	2.65
HOS6	2	0.38	22%	10.8	0.30	0.95
HA	2	22.05	2%	18.7	6.67	24.15
HB	4	25.14	5%	18.9	12.61	47.98
HC	2	9.70	2%	14.6	3.31	11.99
	2				21.18	72.44
	4				42.73	161.23
	5				30.78	115.74
	6				32.46	122.12

NOTE: REFER TO SHEET 2 FOR HISTORIC OFFSITE DRAINAGE PLAN.

EASEMENT ABBREVIATIONS

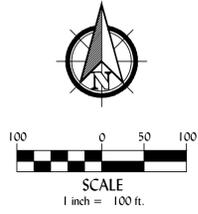
A.U.E. ACCESS & UTILITY EASEMENT
 EMER.A.E. DRAINAGE & UTILITY EASEMENT
 TEMP.E. TEMPORARY EASEMENT
 U.E. UTILITY EASEMENT

CITY OF AURORA PLAN REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH CITY OF AURORA DESIGN CRITERIA AND THE CITY CODE. THE CITY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, OF DIMENSIONS AND ELEVATIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE. THE CITY OF AURORA, THROUGH THE APPROVAL OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY FOR THE COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

Approved For One Year From This Date

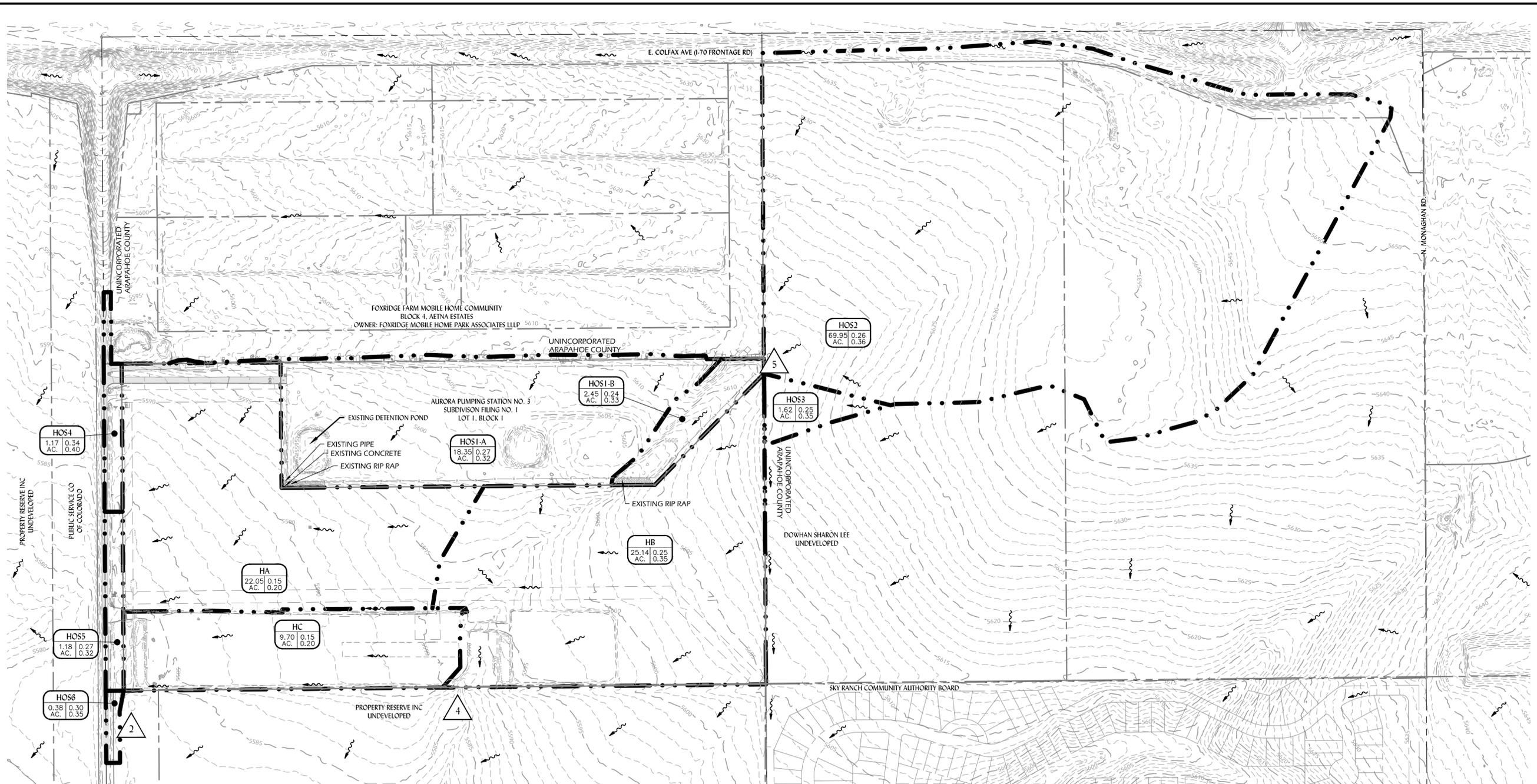
City Engineer	Date
Water Department	Date

PROJECT BENCHMARK:
 CITY OF AURORA BENCHMARK #356520NW001. FOUND SOUTH OF BARBED WIRE FENCE APPROXIMATELY 49.8 FEET SOUTH-SOUTHEAST OF THE SECTION CORNER FOR SECTIONS 17, 18, 19 AND 20, T 3 S, R 65 W. STAMPED "CITY OF AURORA, BM, 21-000, 2004".
 NAVD88 = 5545.81'



VICINITY MAP
NTS

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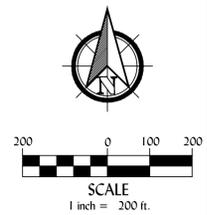
Calculated Historic Runoff Rates						
Basin ID	Design Point	Total Area (Ac.)	Imperv. (%)	Tc (min)	Peak Flow (cfs)	
					Q ₂	Q ₁₀₀
HOS1-A	2	18.35	18%	19.0	9.82	32.05
HOS1-B	4	2.45	5%	13.2	1.39	5.26
HOS2	5	69.95	6%	25.7	30.78	115.74
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	6				32.46	122.12

LEGEND

- Property Line
- Right of Way Line
- Centerline
- Major Basin Boundary
- Jurisdictional Boundary
- - - Ex. Easement Line
- - - Ex. Water Line
- - - Ex. Storm Sewer Line
- - - Ex. Gas
- - - Ex. Underground Electric
- - - Ex. Overhead Electric
- - - Ex. Fence
- - - Existing Major Contour
- - - Existing Minor Contour
- Flow Direction Arrow
- ⬡ Drainage Basin ID
- Existing Asphalt Pavement
- Existing Concrete Pavement
- △ Design Point

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 NAVD88 = 5545.81'





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No.	Rev. Date	Revision Type
1		
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Designed By: ACS
 Prepared By: CWS
 Approved By: TRH

Date: March 17, 2022
 Horiz. Scale: 1" = 200'
 Vert. Scale: N/A

Sheet: 2 of 3
 Job No.: 1022-02

Jamaso Subdivision Filing No. 1
 City of Aurora, Colorado
 Master Drainage
 Historic Offsite Drainage Plan

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

Sheet: **2**

No.	Rev. Date	Revision Type
1		
2		
3		
4		
5		
6		

Designed By: ACS
Prepared By: CWS
Approved By: TRH

Date: March 17, 2022
Sheet: 3 of 3
Job No.: 1022-02

Horizontal Scale: 1" = 100'
Vertical Scale: N/A

Jamaso Subdivision Filing No. 1
City of Aurora, Colorado
Master Drainage
Master Drainage Plan

Prop. Name:
Location:
Plan Sec:
Sheet Name:

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Know what's below.
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Sheet: 3

This pipe appears to collect OS4 flows and direct them south offsite without going to Pond A as described in report text. Det/EURV/WQ should be provided for all new roadways.

Roadway design has been revised since this rendition. Basin A1 will route runoff flow via curb and gutter and inlets to Pond A as part of the onsite drainage facilities. Report text has been revised, accordingly.

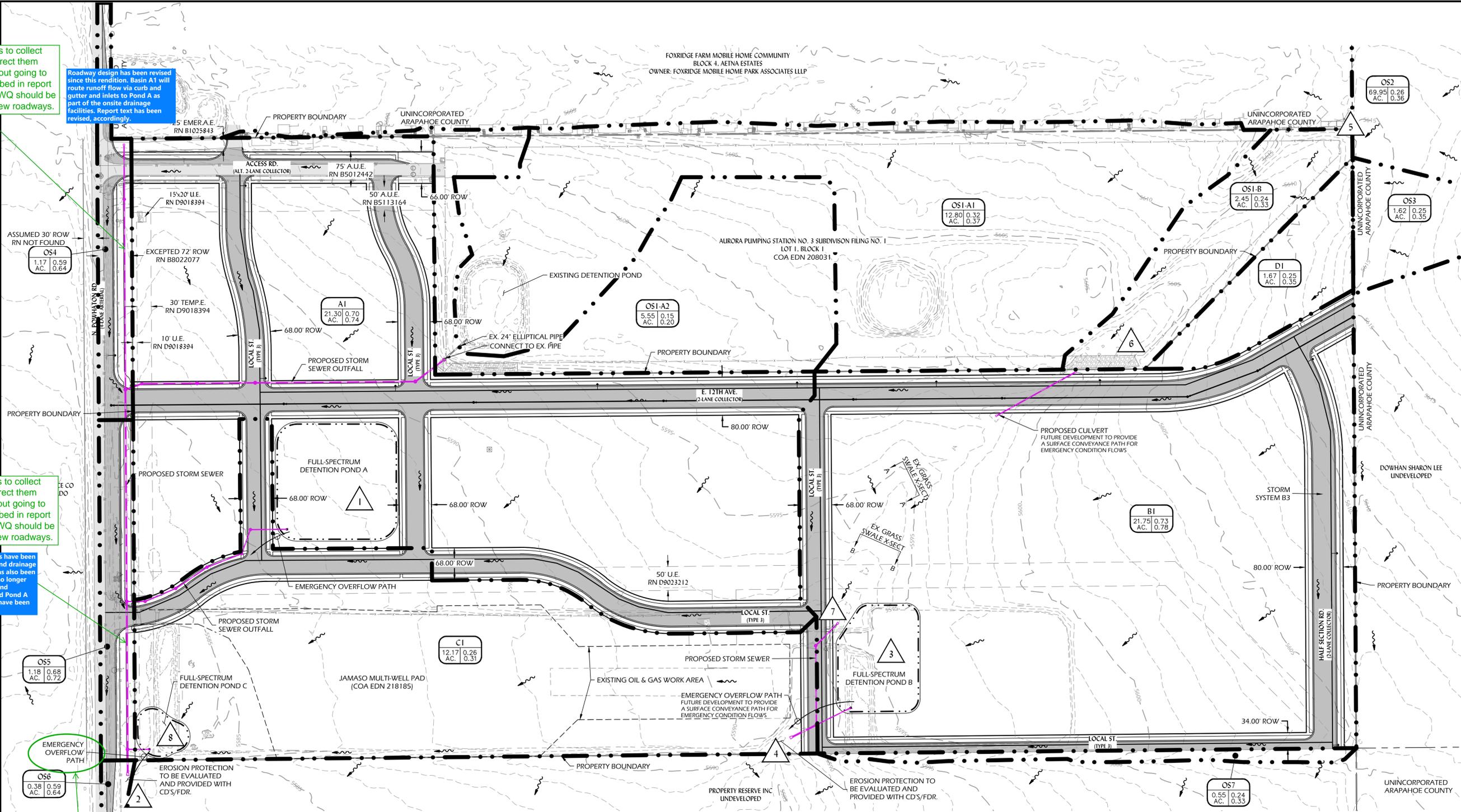
This pipe appears to collect OS5 flows and direct them south offsite without going to Pond C as described in report text. Det/EURV/WQ should be provided for all new roadways.

Several proposed roads have been omitted from design and drainage review. Pond design has also been revised since Pond C no longer exists and the design and discussion for proposed Pond A and proposed Pond B have been revised, accordingly.

Emergency overflow arrow has been revised for better clarity.

Please clarify the emergency overflow arrow (partly hidden under basin boundary). Important because emergency overflows here will go to private prop and at time of PDR will require written acceptance from owner to the south. See note requested to the right on this sheet.

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VICINITY MAP
NTS

Calculated Proposed Runoff Rates					
Basin ID	Design Point	Total Area (Ac.)	Imperv. (%)	Tc (min)	Peak Flow (cfs) Q2 Q100
A1	1	21.30	75%	12.6	36.18 104.30
B1	3	21.75	77%	10.0	42.61 123.07
C1	8	12.17	15%	14.6	7.14 23.47
D1	3	1.67	5%	11.2	1.07 4.07
OS1-A1	2	12.80	24%	19.0	8.15 26.02
OS1-A2	2	5.55	2%	12.9	2.00 7.25
OS1-B	6	2.45	5%	13.2	1.39 5.26
OS2	5	69.95	6%	25.7	30.78 115.74
OS3	3	1.62	5%	12.9	0.98 3.72
OS4	1	1.17	65%	7.9	2.02 5.94
OS5	8	1.18	76%	6.4	2.50 7.26
OS6	2	0.38	65%	8.0	0.65 1.92
OS7	1	-	-	-	39.89 116.56
	2	-	-	-	19.14 65.47
	3	-	-	-	40.37 118.43
	4	-	-	-	41.27 155.72
	5	-	-	-	30.78 115.74
	6	-	-	-	32.46 122.12
	7	-	-	-	32.16 121.01
	8	-	-	-	8.96 28.76

Basin OS7 missing from table.
Basin OS7 has been added to the table.

Conceptual Basin Detention									
Description	Impervious (%)	Area (ac)	WQCV (ac-ft)	EURV (ac-ft)	100-year V = KA (ac-ft)	Required Volume* (ac-ft)	Historic 100-yr Rate (cfs)	Aurora Release Rate (cfs)	Allowable Release Rate (cfs)
Pond A	60	28.0	0.55	2.16	2.81	3.89	30.7	14.0	14.0
Pond B	67	25.0	0.55	1.64	2.97	3.79	47.8	25.0	25.0
Pond C	20	13.4	0.13	0.24	0.31	0.43	16.5	6.7	6.7

*Required Volume is half EURV plus the 100-year V = KA volume.

- NOTES:
- THE STORM SEWER SYSTEM, INCLUDING BOTH STORM SEWER AND WITHIN STREETS ALLOWABLE CAPACITY, WILL BE DESIGNED TO CONVEY THE 100-YEAR STORM THROUGH THE SITE.
 - DRAINAGE FLOW ARROWS REPRESENT CONCEPTUAL FLOW PATTERNS.
 - ALL STORM SEWER IS PUBLIC UNLESS OTHERWISE NOTED.
 - PONDS SHOWN HEREON ARE SCHEMATIC ONLY. ACTUAL SIZE, SHAPE AND LOCATION WILL VARY AS SITE DESIGN PROGRESSES. ALL PONDS WILL BE PRIVATE PONDS.
 - EMERGENCY WEIR CREST WILL BE 1' MIN. ABOVE 100 YR + 1/2 EURV AND TOP OF EMBANKMENT WILL BE 1' MIN. ABOVE 100 YR WSEL OVER WEIR.
 - THE LOCAL STREET ALIGNMENT SHOWN HEREON IS NOT APPROVED BY THIS PLAN.
 - THIS MASTER DRAINAGE PLAN HAS BEEN PREPARED BASED UPON THE BEST AVAILABLE INFORMATION PROVIDED AT THE TIME. CONCEPTS, DRAINAGE PATTERNS, AND OFFSITE FACILITIES PRESENTED ON THIS PLAN SHALL BE CONFIRMED IN THE SUBSEQUENT PRELIMINARY AND FINAL DRAINAGE PLANS FOR

Please show legend.

Legend has been added.

PROJECT BENCHMARK:
CITY OF AURORA BENCHMARK #356520NW001. FOUND SOUTH OF BARBED WIRE FENCE APPROXIMATELY 49.8 FEET SOUTH-SOUTHEAST OF THE SECTION CORNER FOR SECTIONS 17, 18, 19 AND 20, T 3 S, R 65 W. STAMPED "CITY OF AURORA, BM, 21-000, 2004".
NAVD88 = 5545.81'

Add general note that where emergency overflows are directed to adjacent private property, written acceptance of emergency overflows from the adjacent owner will be required for approval of PDR.

Appears this would apply to Ponds B and C.

General note regarding emergency overflows has been added to general notes.

1207
We
www.
Signature set is requested but please do not submit until all comments from City and outside agencies are received and addressed. No comments have yet been received from MHFD - please reach out to them.

Signature blocks have been provided. Comments have been received from MHFD. There are no additional comments from MHFD.



Master Drainage Report

Jamaso Subdivision Filing No. 1 Aurora, Colorado

Project No. 1022-02

Submittal: 1st: April 23, 2021
 2nd: September 8, 2021
 3rd: March 17, 2022

Approved For One Year From This Date	
City Engineer	Date
Water Department	Date

Prepared For:
 Westside Investment Partners, Inc.
 4100 E. Mississippi Avenue, Suite 500
 Denver, CO 80246
 (303) 984-9800

Prepared By:
 Innovative Land Consultants, Inc.
 12071 Tejon Street, Suite 470
 Westminster, CO 80234
 (303) 421-4224

TABLE OF CONTENTS

- A. Introduction 3
 - 1. Location..... 3
 - 2. Proposed Development..... 3
- B. Historic Drainage 4
 - 1. Overall Basin Description..... 4
 - 2. Drainage Patterns Through Property 5
 - 3. Outfalls Downstream from Property..... 5
- C. Design Criteria 5
 - 1. List of References..... 5
 - 2. Hydrologic Criteria..... 5
 - 3. Hydraulic Criteria 6
- D. Drainage Plan..... 7
 - 1. General Concept 7
 - 2. Specific Details 8
- E. Conclusions..... 12
 - 1. Compliance with Standards..... 12
 - 2. Summary of Concept 12
- F. List of References..... 13

APPENDICES

- A. Hydrologic Computations.....14
- B. Detention Pond Capacity & Hydraulic Computations.....23
- C. Referenced Information.....33

A. Introduction

1. Location

- a. Adjacent Streets, Subdivision Name, Lot and Block, Site Plan Name
Jamaso Subdivision Filing No. 1 is located in the northwest quarter of Section 4, Township 4 South, Range 65 West of the 6th Principal Meridian, City of Aurora, County of Arapahoe, State of Colorado. The site is bounded by N. Powhatan Road to the west. See Exhibit A, below, for a vicinity map of the area.

- b. Vicinity Map

Exhibit A – Vicinity Map



- c. Surrounding Developments

The site is approximately 56.7 acres of land which is bounded by N. Powhatan Road to the west, Foxridge Farm mobile home community, Sable Altura Fire Station #1, and Aurora Water Pumping Station No. 3 to the north, Sky Ranch Subdivision to the southeast and undeveloped land to the east and south.

2. Proposed Development

- a. Property description

The site slopes to the southwest and is predominantly covered by native vegetation. The southern portion of the site has been partially developed for the Jamaso Oil and Gas Well Pad. An existing

developed open channel was constructed along the east side of Aurora Pumping Station No. 3 Subdivision No. 1 and flows southwest, through the Jamaso Well Pad, into the Riverwood Tributary and on to First Creek.

According to the NRCS soil survey map, approximately the west half of soils on-site are Truckton loamy sand, 1 to 5 percent slopes (map unit symbol TrC); these soils fall into Hydrologic Soil Group A. Approximately a quarter of on-site soils are Adena-Colby silt loams, 1 to 5 percent slopes (map unit symbol AdC) which are characterized as Hydrologic Soil Group C. To a lesser extent, in the southeast corner of the site, the on-site soils are Weld-Deertrail silt loams, 0 to 3 percent slopes (map unit symbol WrB); these soils fall into Hydrologic Soil Group C. Refer to the NRCS Hydrologic Soil Report located in Appendix C of this report.

b. Type of Development

The proposed site is being master planned for commercial land uses while retaining the existing oil & gas work area. Currently, the majority of the project site is zoned for Mixed Use – Corridor (MU-C) and will be rezoned to Mixed Use – Airport (MU-A) concurrently. 14.4 acres on the southwest are zoned R-2 (Medium-Density Residential) which is not allowed to be developed as such this close to oil and gas and will be rezoned to MU-A concurrently. Development of the site results in a composite site imperviousness of 61%.

c. Requested Variances

No variances are requested at this time.

B. Historic Drainage

1. Overall Basin Description

a. Off-site Basins

The site is located within the First Creek Basin. Historically, drainage from the site traveled overland to either a naturally occurring swale near the center of the site or the roadside ditch along N. Powhatan Road. According to FEMA FIRM 08005C0206L (see Appendix C), dated February 17, 2017, the site and contributory off-site areas are outside the regulated floodplain of First Creek. See Appendix C for the map of Historic Off-site (HOS) basins.

b. Major Drainageways

There are no major drainageways located on or adjacent to the site. The Riverwood Tributary of First Creek extends from just south of the site to First Creek. The project site is not within a FEMA-regulated floodplain. It is located within unshaded Zone X as shown on the FEMA FIRM 08005C0206L, dated February 17, 2017 and located in Appendix C.

2. Drainage Patterns Through Property

The proposed site is north of First Creek. There is a naturally occurring swale that forms near the center of the property and flows south of the property into the Riverwood Tributary to First Creek. The eastern half of the property sheet flows generally southwest to this swale at an approximate 1.8% overall slope. The western half of the proposed site sheet flows generally southwest to N. Powhatan Road at an approximate 1.0% overall slope. There is an existing minor swale on the north side of the existing Oil and Gas Pad that routes some runoff from the western portion of the site to N. Powhatan Road.

3. Outfalls Downstream from Property

The majority of the site drains to either N. Powhatan Road or the existing natural swale near the middle of the site. Both N. Powhatan Road and the Riverwood Tributary to the south of the property drain southerly into First Creek.

C. Design Criteria

1. List of References

- ◆ *City of Aurora Storm Drainage Design and Technical Criteria*, City of Aurora, October 11, 2010
- ◆ *Urban Drainage and Flood Control District (UDFCD) Urban Storm Drainage Criteria Manual (USDCM)*, Volumes 1, 2, & 3, current version¹
- ◆ *National Resources Conservation Service (NRCS) Web Soil Survey*, United States Department of Agriculture, site visited May 7, 2020
- ◆ *Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM)*, Community-Panel Number 08005C0206L, revised February 17, 2017
- ◆ *First Creek Tributaries (Upstream of I-70) Master Drainageway Plan, Conceptual Design Report*, prepared by Merrick & Associates Engineering and dated February 2021 (revisions were expected prior to approval)
- ◆ *Flood Hazard Area Delineation First Creek (Upstream of Buckley Road)*, prepared by Moser & Associates Engineering and dated October 2011
- ◆ *First Creek (Upstream of Buckley Road) Major Drainageway Plan Conceptual Design Report*, prepared by Moser & Associates Engineering and dated August 2010
- ◆ *First Creek and DFA 0055 Outfall Systems Masterplan Preliminary Design Report*, prepared by Wright Water Engineers, Inc. and dated February 9, 1990

2. Hydrologic Criteria

a. Rainfall Source

For the Rational Method, the Storm Drainage Design & Technical Criteria uses Figures RA-1 through RA-6 in USDCM, Volume 1 for P_1 as

¹ Urban Drainage and Flood Control District is now known as Mile High Flood District; *UDFCD Urban Storm Drainage Criteria Manual* has not yet been updated to reflect this change.

follows (see Appendix A for site-specific figures). The minor storm is the 2-year event; the major storm is the 100-year event.

2-Year $P_1 = 0.99$ in

100-Year $P_1 = 2.69$ in

b. Calculation Method

The Rational Method was utilized to calculate peak runoff values for drainage basins. Impervious coefficients were determined for each basin based on land use. The time of concentration was calculated by combining the initial time or overland flow time with the travel time in the swale, gutter, and storm sewer. The one-hour rainfall and time of concentration were used to calculate rainfall intensities. Preliminary runoff calculations for each basin are in Appendix A of this report.

c. Detention Volume Computation Method

Detention is provided by the proposed full-spectrum detention pond. The required water quality capture & excess urban runoff volumes and release times for the pond were calculated using the MHFD-Detention spreadsheet and the City of Aurora method of $V = KA$ for 100-year runoff volume. The required 100-year volume was added to one half of the required volume for the excess urban runoff volume (EURV) to obtain the total required volume. Approximately one-half of the site contains Type A with the remaining being Type C soils, the City detention release rates were weighted based on the soils percentages from the NRCS soil survey.

d. Design Frequencies

Runoff was calculated for the minor and major storm events, the 2-year and 100-year storms, respectively.

3. Hydraulic Criteria

a. References

The *City of Aurora Storm Drainage Design and Technical Criteria* dated October 11, 2010 was used as a reference.

b. Design Storm Frequencies

Calculations will be performed for both the 2-year and 100-year storm events. Per *City of Aurora Storm Drainage Design and Technical Criteria*, sizing of pipes and inlets is not required until the final drainage report.

c. Water surface profile method

Water surface profiles will be calculated using StormCAD, developed by Bentley Systems, in the Final Drainage Report. The headloss coefficients in the storm sewer model will be calculated using the technical paper *Modeling Hydraulic and Energy Gradients in Storm Sewers: A Comparison of Computation Methods*, prepared by AMEC Earth & Environmental, Inc. for UDFCD. The paper supplies

suggested coefficients to use with StormCAD to replicate HGL results from UD-Sewer. Storm system hydraulic grade lines will be included in the Final Drainage Report.

d. Major Drainageways

As previously discussed, there are no major drainageways located on or adjacent to the project site.

D. Drainage Plan

1. General Concept

a. Conveyance of Off-site Drainage; Proposed Downstream Outfall

There are three basins tributary to the proposed site. Basin OS1 consists of Aurora Water Pumping Station No. 3. The improved portion, Basin OS1-A, is routed to an existing pond in the southwest corner of the Aurora Water Pumping Station No. 3 site. The existing pond discharges to the Jamaso site via a level spreader. It is proposed to collect these pond releases in a new storm sewer system and route the stormwater in this manner to N. Powhatan Road. The unimproved portion, Basin OS1-B, is routed in the same manner as the adjacent proposed streets through a proposed full-spectrum pond and onto N. Powhatan Road. Basin OS1-B consists of the eastern portion of Aurora Water Pumping Station No. 3 and contains a developed open channel that routes flows to the northern boundary of the project site at Design Point (DP) 6.

Basin OS2 is undeveloped; runoff from this basin flows to an existing low point at the northeast corner of Aurora Water Pumping Station No. 3 where this stormwater combines with flows from Basin OS1-B and continues to DP 6. Flows from DP6 will be conveyed under E. 12th Avenue to DP7 which in turn will be conveyed under the midblock north-south street to DP4. DP4 outfalls south of the site to the start of the Riverwood Tributary that outfalls directly to First Creek. Further details will be provided in successive drainage reports, including pipe connectivity, alignment and outlet erosion protection.

Basin OS3 is undeveloped; runoff from this basin sheet flows to the project site on the eastern boundary, combines with flows from Basin D1, and flows to DP6. Basin D1 will remain undeveloped within an open space landscape buffer.

Should Basins OS2 and OS3 be developed, the discharge onto the site will remain at historic levels, or City of Aurora criteria allowable release rates, whichever is less.

b. Coordination with Surrounding Developments

There are no developments downstream of the project site. The proposed drainage design releases flows in accordance with City of Aurora and MHFD criteria.

- c. Detention Ponding/ Water Quality & Maintenance Responsibilities
Detention, EURV and Water Quality are provided in the proposed onsite full-spectrum detention ponds located onsite. The proposed ponds will be owned and maintained by the district.

2. Specific Details

a. Basin Discussion

The proposed site consists of three major on-site basins: Basins A1, B1, and C1.

Basin A1 consists of all on-site drainage area tributary to the proposed water quality and detention Pond A. Runoff from self-storage, commercial, and open space areas will be routed to the detention pond via curb & gutter to proposed inlets. The proposed Pond A has been sized to accept developed flows from Basin A1 and outlet to DP2 after treatment in the full-spectrum detention pond.

Basin B1 consists of all on-site drainage area tributary to the proposed water quality and detention Pond B. Runoff from self-storage, and open space areas will be routed to the detention pond via curb & gutter to proposed inlets. The proposed Pond B has been sized to accept developed flows from Basin B1 and outlet at DP4 after treatment in the full-spectrum detention pond. The existing drainageway will continue to drain south of the property as the Riverwood Tributary of First Creek.

Basin C1 consists of all on-site drainage area tributary to proposed water quality and detention Pond C. Runoff from the commercial, and open space areas will be routed to the detention pond via curb & gutter to proposed inlets. This basin will continue to drain south within the existing N. Powhaton Road ditch. The existing oil & gas work area will not be affected by development.

Basin OS1 consists of the existing Aurora Water Pumping Station No. 3, aka Prairie Waters Treatment Facility, as well as a small portion of the existing Foxridge Farm mobile home community that drains thereon. Runoff for this area will continue to flow as in the existing condition.

Basin OS1 consists of the existing Aurora Water Pumping Station No. 3, aka Prairie Waters Treatment Facility, as well as a small portion of the existing Foxridge Farm mobile home community that drains thereon. Runoff for this area will continue to flow as in the existing condition. **Text has been subdivided into basins OS1-A1, OS1-A2 and OS1-B described below." (Suggest this text be added and additionally a paragraph below describing Basin OS1-B)** Basin OS1-A1 consists of the existing Aurora Water Pumping Station No. 3, aka Prairie Waters Treatment Facility, as well as a small portion of the existing Foxridge Farm mobile home community that drains thereon. Runoff for this area will continue to flow as in the existing condition. **Text has been added for clarity. A paragraph describing Basin OS1-B has been included in the narrative.** Basin OS1-A2 consists of the undeveloped portion of the Prairie Waters Treatment Facility. Basin OS1-A2 will continue to sheet flow onto the site. The adjacent proposed streets will convey the surface flow within the proposed streets thereto.

Basin OS1-A2 consists of the undeveloped portion of the Prairie Waters Treatment Facility. Basin OS1-A2 will continue to sheet flow onto the site. The adjacent proposed streets will convey the surface flow within the proposed streets thereto.

stormwater to proposed inlets. This offsite stormwater routes to Pond A where it will be treated for water quality and continue to N. Powhatan Road.

Basin OS2 consists of undeveloped land to the northeast of the project site. Runoff from this area will flow to an existing low point at the northeast corner of Aurora Water Pumping Station No. 3 and combine with flows from Basin OS1-B. These flows continue on to DP7 and then on to the Riverwood Tributary south of the site.

Basin OS3 consists of undeveloped land to the east of the project site. Runoff from Basin OS2 will sheet flow to the developed open channel on the east side of Aurora Water Pumping Station No. 3, combine with the historic conditions, and flow to DP 6 as in the proposed design. The system outfalls into the detention pond, DP 7A. The detention pond, DP 7A, is sized to provide water quality for these offsite flows.

Several proposed roads have been omitted from design and drainage review. The discussion has been revised accordingly to address runoff.

The storm sewer system shown on plan appears to collect these flows and discharge then offsite to the south without going to Pond A? Det/EURV/WQ should be provided for all new roadways. See related comment on plan.

Basin OS4 consists of the east side of the north-bound lane and transition to the existing pavement. Runoff from this area will be conveyed to the detention pond via curb & gutter, and a storm sewer system. The detention pond, Pond A, is sized to provide water quality for these offsite flows.

Basin OS5 consists of the east side of N. Powhatan Road. Public improvements on the north-bound lane from this area will be conveyed to the detention pond via curb & gutter, and a storm sewer system. The detention pond, Pond C, is sized to provide water quality for these on-site flows.

For basin OS5, the storm sewer system shown on plan appears to collect these flows and discharge then offsite to the south without going to Pond C? Det/EURV/WQ should be provided for all new roadways. See related comment on plan.

Several proposed roads have been omitted from design and drainage review. Pond design has also been revised since, Pond C no longer exists and the design and discussion for proposed Pond A and proposed Pond B have been revised, accordingly.

Basin OS6 consists of the areas of N. Powhatan Road that may not be required for water quality until the adjacent property is developed therefor. As the existing north-bound lane is developed, the storm sewer system shown on plan will be required to provide water quality for the flows. The detention pond, Pond C, is sized to provide water quality for these on-site flows.

For Basin OS6, discuss that interim WQ will be provided by the existing roadside swale along the east side of Powhatan south of the site.

Text has been provided to discuss the interim water quality being provided.

Basin OS7 consists of an approximately 20' wide strip adjacent to the south boundary east of the north/south bisecting local road. Basin OS7 will discharge east of DP4 until such time as the property to the south develops and constructs the south half of the southern local road.

The proposed storm sewer system will be sized to capture and convey the 2-year storm event. The overall storm conveyance system will be sized for the 100-year storm event. Total basin runoff is shown in the following table.

Basin Runoff Calculations - Direct Runoff												
											Project No.:	1022-02
											17-Mar-22	
Basin ID	Design Point	Total Area (Ac.)	Imp (%)	Tc (min)	Runoff Coeff.							
					C ₂	C ₅	C ₁₀₀	I ₂	I ₅	I ₁₀₀	Q ₂	Q ₁₀₀
Developed												
A1	1	21.30	75%	12.6	0.70	0.70	0.74	2.43	3.39	6.60	36.18	104.30
B1	3	21.75	77%	10.0	0.73	0.74	0.78	2.68	3.73	7.27	42.61	123.07
C1	8	12.17	15%	14.6	0.26	0.27	0.31	2.28	3.17	6.18	7.14	23.47
D1	3	1.67	5%	11.2	0.25	0.27	0.35	2.56	3.57	6.96	1.07	4.07
OS1-A1	2	12.80	24%	19.0	0.32	0.33	0.37	2.00	2.79	5.43	8.15	26.02
OS1-A2	2	5.55	2%	12.9	0.15	0.16	0.20	2.40	3.35	6.53	2.00	7.25
OS1-B	6	2.45	5%	13.2	0.24	0.26	0.33	2.38	3.32	6.48	1.39	5.26
OS2	5	69.95	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	30.78	115.74
OS3	3	1.62	5%	12.9	0.25	0.27	0.35	2.41	3.36	6.55	0.98	3.72
OS4	1	1.17	65%	7.9	0.59	0.60	0.64	2.92	4.07	7.94	2.02	5.94
OS5	8	1.18	76%	6.4	0.68	0.68	0.72	3.13	4.36	8.50	2.50	7.26
OS6	2	0.38	65%	8.0	0.59	0.60	0.64	2.91	4.06	7.92	0.65	1.92
OS7	4	0.55	5%	5.0	0.25	0.27	0.35	3.36	4.68	9.12	0.46	1.76
	1	28.02	60%	12.6	0.59	0.59	0.63	2.43	3.39	6.60	39.89	116.56
	2	54.55	8%	24.0	0.20	0.21	0.25	1.76	2.46	4.79	19.14	65.47
	3	25.04	67%	12.9	0.67	0.68	0.72	2.41	3.36	6.55	40.37	118.43
	4	96.32	6%	26.1	0.25	0.27	0.35	1.68	2.35	4.58	41.28	155.75
	5	69.95	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	30.78	115.74
	6	74.02	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	32.46	122.12
	7	74.02	6%	26.1	0.26	0.28	0.36	1.68	2.35	4.58	32.16	121.01
	8	13.35	20%	14.61	0.30	0.31	0.35	2.28	3.17	6.18	8.96	28.76
Existing												
HOS1-A	2	18.35	18%	19.0	0.27	0.28	0.32	2.00	2.79	5.43	9.82	32.05
HOS1-B	4	2.45	5%	13.2	0.24	0.26	0.33	2.38	3.32	6.48	1.39	5.26
HOS2	5	69.95	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	30.78	115.74
HOS3	4	1.62	5%	12.9	0.25	0.27	0.35	2.41	3.36	6.55	0.98	3.72
HOS4	2	1.17	28%	11.3	0.34	0.35	0.40	2.55	3.56	6.93	1.03	3.22
HOS5	2	1.18	18%	11.1	0.27	0.28	0.32	2.57	3.58	6.97	0.82	2.65
HOS6	2	0.38	22%	10.8	0.30	0.31	0.35	2.60	3.63	7.07	0.30	0.95
HOS7	4	0.55	5%	5.0	0.25	0.27	0.35	3.36	4.68	9.12	0.46	1.76
HA	2	22.05	2%	18.7	0.15	0.16	0.20	2.02	2.81	5.48	6.67	24.15
HB	4	25.14	5%	18.9	0.25	0.27	0.35	2.01	2.80	5.45	12.61	47.98
HC	2	9.70	2%	14.6	0.15	0.16	0.20	2.28	3.17	6.18	3.31	11.99
	1	28.02	2%	18.7	0.15	0.16	0.20	2.02	2.81	5.48	8.47	30.69
	2	52.83	8%	18.7	0.20	0.21	0.25	2.02	2.81	5.48	21.18	72.44
	3	25.04	5%	18.9	0.25	0.27	0.35	2.01	2.80	5.45	12.56	47.79
	4	99.71	6%	26.1	0.25	0.27	0.35	1.68	2.35	4.58	42.73	161.23
	5	69.95	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	30.78	115.74
	6	74.02	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	32.46	122.12
	7	74.02	0.06	26.1	0.26	0.28	0.36	1.68	2.35	4.58	32.16	121.01
	8	13.35	2%	14.61	0.15	0.16	0.20	2.28	3.17	6.18	4.56	16.51
Emergency Overflow Contributing Flows												
Pond A inflow	1	28.02	60%	12.6	0.59	0.59	0.63	2.43	3.39	6.60	39.89	116.56
Pond B inflow	3	25.04	67%	12.9	0.67	0.68	0.72	2.41	3.36	6.55	40.37	118.43
Pond C inflow	8	13.35	20%	14.6	0.30	0.31	0.35	2.28	3.17	6.18	8.96	28.76
Intensity = $\frac{28.5 * P_1}{(10 + T_c)^{0.786}}$										2 Year P ₁ =	0.99	inches
										5 Year P ₁ =	1.38	inches
										100 Year P ₁ =	2.69	inches

Note: In the above calculations, Basins A1, OS1-A2 and OS4 are tributary to Pond A, Basins B1, D1 and OS3 are tributary to Pond B, and Basins C1 and OS5 are tributary to Pond C.

Routed stormwater flows and the pond outfall structures will be analyzed and presented in the Final Drainage Report.

b. TOD / Urban Center Development Interception of Downstream Runoff

Not applicable.

c. Detention Pond Location and Outfall

Detention for this project is provided by the proposed on-site full-spectrum detention ponds located at the west end, south-central area, and southwest corner of the project site. Pond A outlets to DP2 within N. Powhatan Road ROW via proposed storm pipe. The N. Powhatan Road east ditch then flows into First Creek (refer to the First Creek Tributaries (Upstream of I-70) Master Drainageway Plan). Pond B outlets to DP4 within the existing swale via proposed storm pipe. Pond C outlets to DP2 within N. Powhatan Road ROW via proposed storm pipe. Erosion protection is to be evaluated and provided with CD's/FDR. The ultimate outfall for the proposed project is First Creek.

Conceptual Basin Detention									
Description	Impervious (%)	Area (ac)	WQCV (ac-ft)	EURV (ac-ft)	100-year V = KA (ac-ft)	Required Volume* (ac-ft)	Historic 100-yr Rate (cfs)	Aurora Release Rate (cfs)	Allowable Release Rate (cfs)
Pond A	60	28.0	0.55	2.16	2.81	3.89	30.7	14.0	14.0
Pond B	67	25.0	0.55	1.64	2.97	3.79	47.8	25.0	25.0
Pond C	20	13.4	0.13	0.24	0.31	0.43	16.5	6.7	6.7

*Required Volume is half EURV plus the 100-year V = KA volume.

The City's calculated allowable release rate for detention ponds was compared to the historic release rate at the same design point. The City's calculated allowable release rate for detention ponds as reflected on the pond sheets in Appendix B was the lesser of the two (see above table). A comparison of historic flows routed to N. Powhatan Road ROW to proposed was also evaluated. The proposed flows were calculated to remain at or below the historic rate. The table in section D.2.a. above shows the basin runoff calculations.

d. Emergency Overflow Paths

The emergency overflow path for the on-site detention Pond A is southwest to N. Powhatan Road ROW at DP2. The emergency overflow path for the on-site detention Pond B is southwest to the existing swale at DP4 then to the Riverwood Tributary to First Creek. The emergency overflow path for the on-site detention Pond C is southwest to N. Powhatan Road ROW at DP2.

e. Solutions to Problems Encountered

Not applicable.

f. Proposed Permanent BMPs

The proposed on-site ponds, located on the west end, south-central area, and southwest corner of the site, will provide permanent water quality treatment as an extended detention basin (EDB) with a target WQCV 40-hour drain time.

g. Phasing of Construction and Provisions for Drainage

The proposed improvements will all be constructed in one phase.

h. Open Channel Concepts

There is an existing swale on-site which conveys flows from respective tributary basins. Development occurring onsite may size a grass swale to convey the 100-year flows from the respective tributary basins.

i. Stabilization Requirements for Roadside Ditches

Not applicable.

j. Compliance with Approved Outfall Systems Plan

No improvements are shown on or adjacent to the project site according to the Outfall Systems Plan for First Creek. The project is in compliance with the approved Outfall Systems Plan and Major Drainageway Plan.

k. Additional Information

Not applicable.

E. Conclusions

1. Compliance with Standards

This Preliminary Drainage Report is in conformance with *City of Aurora Storm Drainage Design and Technical Criteria*, and *Urban Storm Drainage Criteria Manuals*.

2. Summary of Concept

a. Degree of Protection to Existing Site

This site is designed to emulate historic conditions. Runoff from the eastern portion of the site generally sheet flows to the existing minor drainageway. Runoff from the northern and western portions of the site generally sheet flow to swales and/or curb & gutter before being conveyed to the proposed inlets. The proposed detention ponds will be sized to capture developed runoff from the entire site and release at historic rates, or allowable release rates per City of Aurora criteria, whichever is less.

b. Measures Taken to Provide Adequate On-site Drainage and Water Quality

All on-site developed basins will be routed to the ponds for water quality treatment and detention to historic rates. The proposed

ponds are sized to accept runoff from all onsite basins to allow for further development of the site.

c. Effect of Proposed Development

The proposed site drainage patterns are in conformance with the existing topography and surrounding developments. There is no expected negative impact to the surrounding developments or existing streets.

F. List of References

- ◆ *City of Aurora Storm Drainage Design and Technical Criteria*, City of Aurora, October 11, 2010
- ◆ *Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual*, Volumes 1,2, & 3, current version¹
- ◆ *National Resources Conservation Service Web Soil Survey*, United States Department of Agriculture, site visited May 7, 2020
- ◆ *Federal Emergency Management Agency Flood Insurance Rate Map*, Community-Panel Number 08005C0206L, revised February 17, 2017
- ◆ *First Creek Tributaries (Upstream of I-70) Master Drainageway Plan, Conceptual Design Report*, prepared by Merrick & Associates Engineering and dated February 2021 (revisions were expected prior to approval)
- ◆ *Flood Hazard Area Delineation First Creek (Upstream of Buckley Road)*, prepared by Moser & Associates Engineering and dated October 2011
- ◆ *First Creek (Upstream of Buckley Road) Major Drainageway Plan Conceptual Design Report*, prepared by Moser & Associates Engineering and dated August 2010
- ◆ *First Creek and DFA 0055 Outfall Systems Masterplan Preliminary Design Report*, prepared by Wright Water Engineers, Inc. and dated February 9, 1990
- ◆ *Alternative Report for Planning of First Creek, Irondale Gulch and DFA 0055 Outfall Systems* prepared by Wright Water Engineers, Inc. and dated December 15, 1988
- ◆ *Final Drainage Study, Aurora Pumping Station No. 3, Subdivision Filing No. 1* (COA EDN 208031) prepared by MWH, dated February 11, 2008 and approved March 13, 2008
- ◆ *Final Drainage Report, Jamaso Well Pad, Aurora, Colorado* (COA EDN 218185) prepared by Lamp Rynearson & Associates, dated October 2018 and approved November 13, 2018

¹ Urban Drainage and Flood Control District is now known as Mile High Flood District; *UDFCD Urban Storm Drainage Criteria Manual* has not yet been updated to reflect this change.

APPENDIX A

Hydrologic Computations

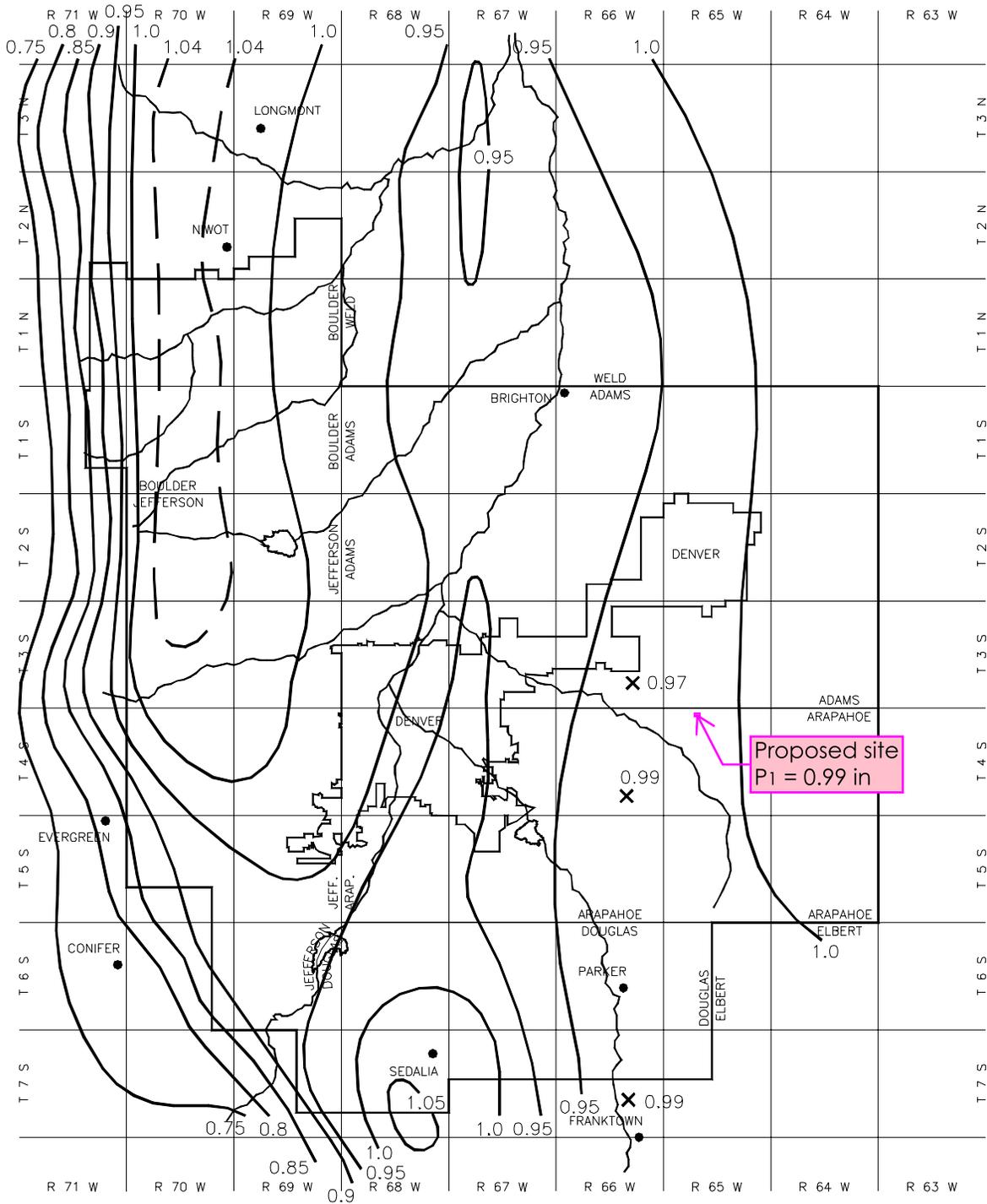


Figure RA-1—Rainfall Depth-Duration-Frequency: 2-Year, 1-Hour Rainfall

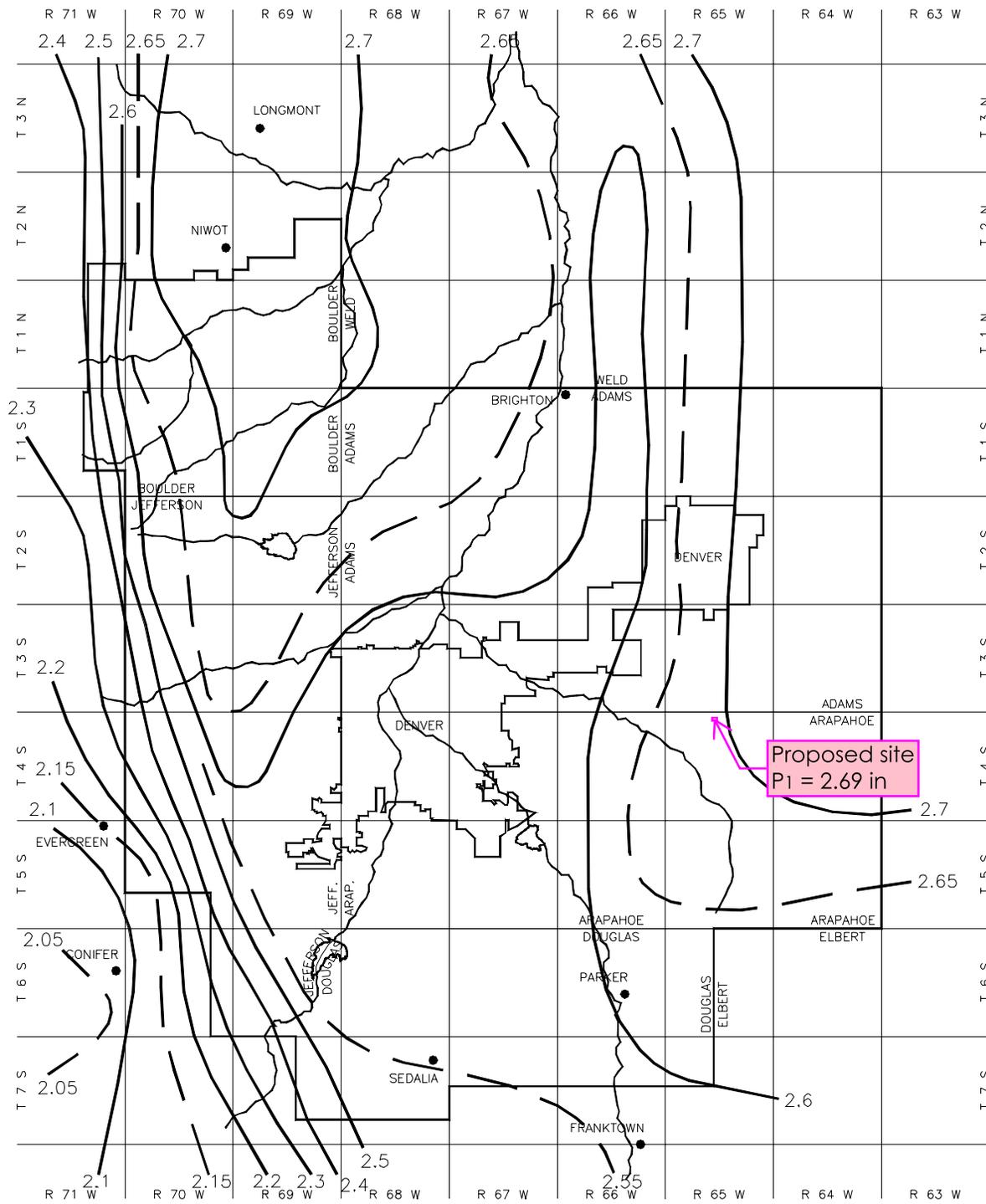


Figure RA-6—Rainfall Depth-Duration-Frequency: 100-Year, 1-Hour Rainfall

TABLE 1
RUNOFF COEFFICIENTS AND PERCENTS IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	FREQUENCY			
		2	5	10	100
<u>Business:</u>					
Commercial Areas	95	.87	.87	.88	.89
Neighborhood Areas	85	.60	.65	.70	.80
<u>Residential:</u>					
Single-Family (**)	(*)	.40	.45	.50	.60
Multi-Unit (detached)	60	.45	.50	.60	.70
Multi-Unit (attached)	75	.60	.65	.70	.80
1/2 Acre Lot or Larger	(*)	.30	.35	.40	.60
Apartments	80	.65	.70	.70	.80
<u>Industrial:</u>					
Light Areas	80	.71	.72	.76	.82
Heavy Areas	90	.80	.80	.85	.90
<u>Parks, Cemeteries</u>	5	.10	.10	.35	.60
<u>Playgrounds</u>	10	.15	.25	.35	.65
<u>Schools</u>	50	.45	.50	.60	.70
<u>Railroad Yard Areas</u>	15	.40	.45	.50	.60
<u>Undeveloped Areas:</u>					
Historic Flow Analysis, Greenbelts, Agricultural	2	(See "Lawns")			
Off-Site Flow Analysis (when land use not defined)	45	.43	.47	.55	.65

TABLE 1 (continued)

RUNOFF COEFFICIENTS AND PERCENTS IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	FREQUENCY			
		2	5	10	100
<u>Streets:</u>					
Paved	100	.87	.88	.90	.93
Gravel	40	.15	.25	.35	.65
<u>Concrete Drive and Walks</u>	96	.87	.87	.88	.89
<u>Roofs</u>	90	.80	.85	.90	.90
<u>Lawns, Sandy Soil (A and B Soils):</u>	2				
2% Slope		.05	.06	.08	.10
2-7% Slope		.10	.11	.13	.15
>7% Slope		.15	.16	.18	.20
<u>Lawns, Clay Soil (C and D Soils):</u>	5				
2% Slope		.13	.14	.15	.17
2-7% Slope		.18	.19	.20	.22
>7% Slope		.25	.27	.30	.35

NOTE: These Rational Formula coefficients may not be valid for large basins

(*)See Figures RO-3 through RO-5 of USDCM Volume 1 for percent impervious.

(**)Up to 5 units per acre. Single-family with more than 5 units per acre, use values for multi-unit/detached

Right-of-Way (ROW) Impervious Calculation						
Local Type 3					1022-02	
17-Mar-22						
Total ROW width (ft):		68				
Surface	Width (ft)	Runoff Coefficients				Impervious (%)
		C ₂	C ₅	C ₁₀	C ₁₀₀	
Group C/D Soil Lawn 2% Slope	17.00	0.13	0.14	0.15	0.17	5%
Concrete Drive/Walk	11.00	0.87	0.87	0.88	0.89	96%
Paved Street	41.00	0.87	0.88	0.90	0.93	100%
Composite Site Values:		0.70	0.71	0.72	0.75	77.1%
Composite % Impervious Used:						77

Right-of-Way (ROW) Impervious Calculation						
Collector					1022-02	
17-Mar-22						
Total ROW width (ft):		80				
Surface	Width (ft)	Runoff Coefficients				Impervious (%)
		C ₂	C ₅	C ₁₀	C ₁₀₀	
Group C/D Soil Lawn 2% Slope	17.00	0.13	0.14	0.15	0.17	5%
Concrete Drive/Walk	12.00	0.87	0.87	0.88	0.89	96%
Paved Street	51.00	0.87	0.88	0.90	0.93	100%
Composite Site Values:		0.71	0.72	0.74	0.76	79.2%
Composite % Impervious Used:						79

Right-of-Way (ROW) Impervious Calculation						
Arterial East Half					1022-02	
17-Mar-22						
Total ROW width (ft):		72				
Surface	Width (ft)	Runoff Coefficients				Impervious (%)
		C ₂	C ₅	C ₁₀	C ₁₀₀	
Group A Soil Lawn 2% Slope	24.50	0.05	0.06	0.08	0.10	2%
Concrete Drive/Walk	14.00	0.87	0.87	0.88	0.89	96%
Paved Street	33.50	0.87	0.88	0.90	0.93	100%
Composite Site Values:		0.59	0.60	0.62	0.64	65.0%
Composite % Impervious Used:						65

Right-of-Way (ROW) Impervious Calculation						
Arterial East Half with Accel/decel/turn Lane					1022-02	
17-Mar-22						
Total ROW width (ft):		72				
Surface	Width (ft)	Runoff Coefficients				Impervious (%)
		C ₂	C ₅	C ₁₀	C ₁₀₀	
Group A Soil Lawn 2% Slope	12.50	0.05	0.06	0.08	0.08	2%
Concrete Drive/Walk	14.00	0.87	0.87	0.88	0.89	96%
Paved Street	45.50	0.87	0.88	0.90	0.93	100%
Composite Site Values:		0.73	0.74	0.75	0.77	82.0%
Composite % Impervious Used:						82

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Basin Weighted Runoff Coefficient Calculations

Land Use Is Comprised of the Following Surface Characteristics:						
NRCS Soil Group A & C		Imperviousness	C ₂	C ₅	C ₁₀	C ₁₀₀
A	Landscape (A Soils) >7% Slope	2%	0.15	0.16	0.18	0.20
B	Landscape (C/D Soils) >7% Slope	5%	0.25	0.27	0.30	0.35
C	Asphalt Surface / Impervious / Pond Area	100%	0.87	0.88	0.90	0.93
D	Concrete Drives/ Walks	96%	0.87	0.87	0.88	0.89
E	Commercial Area	95%	0.87	0.87	0.88	0.89
F	Local Type 3 ROW	77%	0.70	0.71	0.72	0.75
G	Collector ROW	79%	0.71	0.72	0.74	0.79
H	Arterial ROW (4-lane w/painted median)	65%	0.59	0.60	0.62	0.64
I	Arterial ROW (4-lane w/painted median and accel/decel/turn lar	82%	0.73	0.74	0.77	0.77

Project No.: 1022-02
Date: 3/17/2022

Basin ID	Total Area (Ac.)	A Area (Ac.)	B Area (Ac.)	C Area (Ac.)	D Area (Ac.)	E Area (Ac.)	F Area (Ac.)	G Area (Ac.)	H Area (Ac.)	I Area (Ac.)	Weighted Imp. I (%)	Weighted Runoff Coefficients			
												C ₂	C ₅	C ₁₀	C ₁₀₀
Developed															
A1	21.30	3.47	0.00	1.36	0.00	9.54	3.02	3.91	0.00	0.00	75%	0.70	0.70	0.72	0.74
B1	21.75	0.11	3.33	0.81	0.00	12.18	1.65	3.67	0.00	0.00	77%	0.73	0.74	0.75	0.78
C1	12.17	8.82	1.77	0.18	0.00	1.40	0.00	0.00	0.00	0.00	15%	0.26	0.27	0.29	0.31
D1	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5%	0.25	0.27	0.30	0.35
OS1-A1	12.80	9.06	0.86	2.88	0.00	0.00	0.00	0.00	0.00	0.00	24%	0.32	0.33	0.35	0.37
OS1-A2	5.55	5.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2%	0.15	0.16	0.18	0.20
OS1-B	2.45	0.30	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5%	0.24	0.26	0.29	0.33
OS2	69.95	0.00	68.95	1.00	0.00	0.00	0.00	0.00	0.00	0.00	6%	0.26	0.28	0.31	0.36
OS3	1.62	0.00	1.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5%	0.25	0.27	0.30	0.35
OS4	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	65%	0.59	0.60	0.62	0.64
OS5	1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.74	76%	0.68	0.68	0.72	0.72
OS6	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	65%	0.59	0.60	0.62	0.64
OS7	0.55	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5%	0.25	0.27	0.30	0.35
Developed Site Imp.	56.89	12.40	6.77	2.35	0.00	23.12	4.67	7.58	0.00	0.00	61%	0.60	0.61	0.63	0.65
Historic/Existing															
HOS1-A	18.35	14.61	0.86	2.88	0.00	0.00	0.00	0.00	0.00	0.00	18%	0.27	0.28	0.30	0.32
HOS1-B	2.45	0.30	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5%	0.24	0.26	0.29	0.33
HOS2	69.95	0.00	68.95	1.00	0.00	0.00	0.00	0.00	0.00	0.00	6%	0.26	0.28	0.31	0.36
HOS3	1.62	0.00	1.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5%	0.25	0.27	0.30	0.35
HOS4	1.17	0.85	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	28%	0.34	0.35	0.37	0.40
HOS5	1.18	0.98	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	18%	0.27	0.28	0.30	0.32
HOS6	0.38	0.30	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	22%	0.30	0.31	0.33	0.35
HOS7	0.55	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5%	0.25	0.27	0.30	0.35
HA	22.05	22.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2%	0.15	0.16	0.18	0.20
HB	25.14	0.00	25.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5%	0.25	0.27	0.30	0.35
HC	9.70	9.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2%	0.15	0.16	0.18	0.20
Existing Site Imp.	56.89	31.75	25.14	0.00	3%	0.19	0.21	0.23	0.27						

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Time of Concentration

Project No.: 1022-02
3/17/22

Basin ID	C ₅	Initial Flow Time T _i			Travel Time T _t						T _c	T _c Check		Final T _c (min)
		Length (ft)	Slope (%)	T _i (min)	Length (ft)	Slope (%)	Convey. Element	Convey. Coefficient	Vel. (fps)	T _t (min)	Final T _c (min)	Length (ft)	T _c =(L/180)+10 (min)	
Developed														
A1	0.70	50	1.02	5.0	925	1.02	Street	20	2.0	7.6	12.6	975	15.4	12.6
B1	0.74	50	1.41	4.1	880	1.41	Street	21	2.5	5.9	10.0	930	15.2	10.0
C1	0.27	300	0.57	31.3	530	0.57	Bare Ground	10	0.8	11.7	43.0	830	14.6	14.6
D1	0.27	212	2.60	15.9	0	1.00	Grass	7	0.7	0.0	15.9	212	11.2	11.2
OS1-A1	0.33	300	1.33	21.9	1,325	1.33	Grass	7	0.8	27.4	49.3	1,625	19.0	19.0
OS1-A2	0.16	300	1.60	25.2	229	1.60	Grass	7	0.9	4.3	29.5	529	12.9	12.9
OS1-B	0.26	100	6.75	8.1	578	1.60	Grassed Waterway	15	1.9	5.1	13.2	678	13.8	13.2
OS2	0.28	300	1.38	23.1	2,521	1.38	Bare Ground	10	1.2	35.8	58.9	2,821	25.7	25.7
OS3	0.27	300	1.90	21.0	214	1.90	Bare Ground	10	1.4	2.6	23.6	514	12.9	12.9
OS4	0.60	45	2.00	4.8	407	1.22	Street	20	2.2	3.1	7.9	452	12.5	7.9
OS5	0.68	45	2.00	4.0	205	0.50	Street	20	1.4	2.4	6.4	250	11.4	6.4
OS6	0.60	45	2.00	4.8	200	0.50	Grassed Waterway	15	1.1	3.1	8.0	245	11.4	8.0
Historic														
HOS1-A	0.28	500	1.33	30.2	1,125	1.33	Bare Ground	10	1.2	16.3	46.5	1,625	19.0	19.0
HOS1-B	0.26	100	6.75	8.1	578	1.60	Grassed Waterway	15	1.9	5.1	13.2	678	13.8	13.2
HOS2	0.28	500	1.38	29.8	2,321	1.38	Bare Ground	10	1.2	32.9	62.7	2,821	25.7	25.7
HOS3	0.27	500	1.90	27.1	14	1.90	Bare Ground	10	1.4	0.2	27.3	514	12.9	12.9
HOS4	0.35	45	2.00	7.2	407	1.22	Grassed Waterway	15	1.7	4.1	11.3	452	12.5	11.3
HOS5	0.28	45	2.00	7.9	205	0.50	Grassed Waterway	15	1.1	3.2	11.1	250	11.4	11.1
HOS6	0.31	45	2.00	7.6	200	0.50	Grassed Waterway	15	1.1	3.1	10.8	245	11.4	10.8
HA	0.16	300	1.26	27.2	1,270	0.86	Bare Ground	10	0.9	22.8	50.1	1,570	18.7	18.7
HB	0.27	300	1.61	22.2	1,297	1.61	Bare Ground	10	1.3	17.0	39.2	1,597	18.9	18.9
HC	0.16	300	0.57	35.4	530	0.57	Bare Ground	10	0.8	11.7	47.1	830	14.6	14.6

Basin Runoff Calculations - Direct Runoff

Project No.: 1022-02
17-Mar-22

Basin ID	Design Point	Total Area (Ac.)	Imp (%)	Tc (min)	Runoff Coeff.						Q ₂	Q ₁₀₀
					C ₂	C ₅	C ₁₀₀	I ₂	I ₅	I ₁₀₀		
Developed												
A1	1	21.30	75%	12.6	0.70	0.70	0.74	2.43	3.39	6.60	36.18	104.30
B1	3	21.75	77%	10.0	0.73	0.74	0.78	2.68	3.73	7.27	42.61	123.07
C1	8	12.17	15%	14.6	0.26	0.27	0.31	2.28	3.17	6.18	7.14	23.47
D1	3	1.67	5%	11.2	0.25	0.27	0.35	2.56	3.57	6.96	1.07	4.07
OS1-A1	2	12.80	24%	19.0	0.32	0.33	0.37	2.00	2.79	5.43	8.15	26.02
OS1-A2	2	5.55	2%	12.9	0.15	0.16	0.20	2.40	3.35	6.53	2.00	7.25
OS1-B	6	2.45	5%	13.2	0.24	0.26	0.33	2.38	3.32	6.48	1.39	5.26
OS2	5	69.95	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	30.78	115.74
OS3	3	1.62	5%	12.9	0.25	0.27	0.35	2.41	3.36	6.55	0.98	3.72
OS4	1	1.17	65%	7.9	0.59	0.60	0.64	2.92	4.07	7.94	2.02	5.94
OS5	8	1.18	76%	6.4	0.68	0.68	0.72	3.13	4.36	8.50	2.50	7.26
OS6	2	0.38	65%	8.0	0.59	0.60	0.64	2.91	4.06	7.92	0.65	1.92
OS7	4	0.55	5%	5.0	0.25	0.27	0.35	3.36	4.68	9.12	0.46	1.76
	1	28.02	60%	12.6	0.59	0.59	0.63	2.43	3.39	6.60	39.89	116.56
	2	54.55	8%	24.0	0.20	0.21	0.25	1.76	2.46	4.79	19.14	65.47
	3	25.04	67%	12.9	0.67	0.68	0.72	2.41	3.36	6.55	40.37	118.43
	4	96.32	6%	26.1	0.25	0.27	0.35	1.68	2.35	4.58	41.28	155.75
	5	69.95	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	30.78	115.74
	6	74.02	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	32.46	122.12
	7	74.02	6%	26.1	0.26	0.28	0.36	1.68	2.35	4.58	32.16	121.01
	8	13.35	20%	14.61	0.30	0.31	0.35	2.28	3.17	6.18	8.96	28.76
Existing												
HOS1-A	2	18.35	18%	19.0	0.27	0.28	0.32	2.00	2.79	5.43	9.82	32.05
HOS1-B	4	2.45	5%	13.2	0.24	0.26	0.33	2.38	3.32	6.48	1.39	5.26
HOS2	5	69.95	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	30.78	115.74
HOS3	4	1.62	5%	12.9	0.25	0.27	0.35	2.41	3.36	6.55	0.98	3.72
HOS4	2	1.17	28%	11.3	0.34	0.35	0.40	2.55	3.56	6.93	1.03	3.22
HOS5	2	1.18	18%	11.1	0.27	0.28	0.32	2.57	3.58	6.97	0.82	2.65
HOS6	2	0.38	22%	10.8	0.30	0.31	0.35	2.60	3.63	7.07	0.30	0.95
HOS7	4	0.55	5%	5.0	0.25	0.27	0.35	3.36	4.68	9.12	0.46	1.76
HA	2	22.05	2%	18.7	0.15	0.16	0.20	2.02	2.81	5.48	6.67	24.15
HB	4	25.14	5%	18.9	0.25	0.27	0.35	2.01	2.80	5.45	12.61	47.98
HC	2	9.70	2%	14.6	0.15	0.16	0.20	2.28	3.17	6.18	3.31	11.99
	1	28.02	2%	18.7	0.15	0.16	0.20	2.02	2.81	5.48	8.47	30.69
	2	52.83	8%	18.7	0.20	0.21	0.25	2.02	2.81	5.48	21.18	72.44
	3	25.04	5%	18.9	0.25	0.27	0.35	2.01	2.80	5.45	12.56	47.79
	4	99.71	6%	26.1	0.25	0.27	0.35	1.68	2.35	4.58	42.73	161.23
	5	69.95	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	30.78	115.74
	6	74.02	6%	25.7	0.26	0.28	0.36	1.70	2.37	4.62	32.46	122.12
	7	74.02	0.06	26.1	0.26	0.28	0.36	1.68	2.35	4.58	32.16	121.01
	8	13.35	2%	14.61	0.15	0.16	0.20	2.28	3.17	6.18	4.56	16.51
Emergency Overflow Contributing Flows												
Pond A inflow	1	28.02	60%	12.6	0.59	0.59	0.63	2.43	3.39	6.60	39.89	116.56
Pond B inflow	3	25.04	67%	12.9	0.67	0.68	0.72	2.41	3.36	6.55	40.37	118.43
Pond C inflow	8	13.35	20%	14.6	0.30	0.31	0.35	2.28	3.17	6.18	8.96	28.76
Intensity : $28.5 * P_1$ $(10 + T_c)^{0.786}$											2 Year P ₁ = 0.99 inches	
											5 Year P ₁ = 1.38 inches	
											100 Year P ₁ = 2.69 inches	

Note: In the above calculations, Basins A1, OS1-A2 and OS4 are tributary to Pond A, Basins B1, D1 and OS3 are tributary to Pond B, and Basins C1 and OS5 are tributary to Pond C.

Shouldn't Pond B also include basin OS7?

Basin OS7 is undeveloped and will continue west via historic drainage patterns until the property to the south develops and constructs the south half of the southern local road.

APPENDIX B

Detention Pond Capacity
Hydraulic Computations

Comments on this Pond A apply to other ponds also.

Noted.

EURV should be provided for basin OS4 since it is ROW you are constructing.

You can exclude offsite areas under other ownership (OS1-A2) from EURV.

Appears the EURV calc below may include entire trib area?

Pond A has been redesigned.

Storage Volume Calculations (Type A soils)

Project: JAMASO
 Note: Pond A

Site Information:
 Off-site Area: 6.72 acre
 Percent Impervious: 13 %
 On-site Area: 21.3 acre
 Percent Impervious: 75 %
 Total Contributing Area: 28.02 acre
 Percent Impervious: 60 %

Basin OS1-A2	Basin OS4 (ROW)	
5.55 acre	1.17 acre	(for WQCV only)
2 %	65 %	
Basin A1		

10-Yr Release Rate: 0.13 cfs/ac
 100-Yr Release Rate: 0.50 cfs/ac
 Q_{10A} : 3.64 cfs

Allowable release rates for detention ponds - CFS/ACRE

Storm Frequency	SCS Hydrologic Soil Group		
	A	B	C&D
10-year	0.13	0.23	0.30
100-year	0.50	0.85	1.00

Q_{100A} : 14.01 cfs

Water Quality: $WQCV = a (0.91i^3 - 1.19i^2 + .78i)$

a: 1 (based on drain time)

Total Cont. Area I: 0.60 Impervious

WQCV: 0.24 watershed in.
 WQCV: 0.55 ac-ft
 WQCV: 24,020 cf

Table 3-2. Drain Time Coefficients for WQCV Calculations

Drain Time (hours)	Coefficient, a
12 hours (filtration BMPs and retention ponds)	0.8
24 hours (constructed wetland ponds)	0.9
40 hours (extended detention)	1.0
No attenuation (e.g., grass buffer or swale)	1.0

EURV:
 $EURV_A = 1.68I^{1.28}$
 $EURV_B = 1.36I^{1.08}$
 $EURV_{C/D} = 1.20I^{1.08}$

0.75?

Revised according to new design.

I: 0.74 Impervious (on-site and adjacent ROW)
 EURV: 1.15 watershed in.
 EURV: 2.16 ac-ft
 EURV: 93,978 cf

100 Year Detention: $V_{100} = K_{100}A$

$$K_{100} = (1.78I - 0.002I^2 - 3.56) / 900$$

I: 75
 K_{100} : 0.132

V_{100} : 2.81 ac-ft
 V_{100} : 122,360 cf
 $V_{100} + 1/2 EURV$: 3.89 ac-ft
 $V_{100} + 1/2 EURV$: 169,349 cf

Noted.

No objection to 100yr vol calc but note that you can exclude offsite trib areas under other ownership such as OS1-A2 from the 100yr vol calc and simply pass through your pond the exist 100yr flow from these areas. Not sure if changing this will have any significant impact on the volume since the trib area will go down but the wt'd % imperv will go up.

Similarly the allowable release rate can be the COA allowable for your site + trib offsite ROW + pass through of existing trib offsite areas under other ownership.

Again no objection if you want to keep the calcs simple and just compute V100 and allowable 100yr release based on total trib area.

Storage Volume Calculations (Type C & D soils)

Project: JAMASO
 Note: Pond B

Date: 3/17/2022
 By: ACS

Site Information:

Off-site Area: 1.62 acre **Basin OS3** (for WQCV only)
 Percent Impervious: 5 %
 On-site Area: 23.42 acre Basins B1 and D1
 Percent Impervious: 72 %
 Total Contributing Area: 25.04 acre
 Percent Impervious: 67 %

Allowable release rates for detention ponds - CFS/ACRE

10-Yr Release Rate: 0.30 cfs/ac
 100-Yr Release Rate: 1.00 cfs/ac
 Q_{10A}: 7.51 cfs

Storm Frequency	SCS Hydrologic Soil Group		
	A	B	C&D
10-year	0.13	0.23	0.30
100-year	0.50	0.85	1.00

Q_{100A}: 25.04 cfs

Water Quality: WQCV = a (0.91i³ - 1.19i² + .78i)

a: 1 (based on drain time)
 Total Cont. Area I: 0.67 Impervious

Table 3-2. Drain Time Coefficients for WQCV Calculations

Drain Time (hours)	Coefficient, a
12 hours (filtration BMPs and retention ponds)	0.8
24 hours (constructed wetland ponds)	0.9
40 hours (extended detention)	1.0
No attenuation (e.g., grass buffer or swale)	1.0

WQCV: 0.26 watershed in.
 WQCV: 0.55 ac-ft
 WQCV: 23,824 cf

EURV: EURV_A = 1.68I^{1.28}
 EURV_B = 1.36I^{1.08}
 EURV_{C/D} = 1.20I^{1.08}

I: 0.72 Impervious
 EURV: 0.84 watershed in.
 EURV: 1.64 ac-ft
 EURV: 71,547 cf

100 Year Detention: V₁₀₀ = K₁₀₀A

$$K_{100} = (1.78I - 0.002I^2 - 3.56) / 900$$

I: 72
 K₁₀₀: 0.127

V₁₀₀: 2.97 ac-ft
 V₁₀₀: 129,485 cf
 V₁₀₀ + 1/2 EURV: 3.79 ac-ft
 V₁₀₀ + 1/2 EURV: 165,259 cf

Storage Volume Calculations (Type A soils)

Project: JAMASO
 Note: Pond C

Date: 3/17/2022
 By: ACS

Site Information:

Off-site Area: 1.18 acre
 Percent Impervious: 76 %
 On-site Area: 12.17 acre
 Percent Impervious: 15 %
 Total Contributing Area: 13.35 acre
 Percent Impervious: 20 %

Basin OS5 (ROW) (for WQCV only)
 Basin C1

Allowable release rates for detention ponds - CFS/ACRE

10-Yr Release Rate: 0.13 cfs/ac
 100-Yr Release Rate: 0.50 cfs/ac
 Q_{10A}: 1.74 cfs

Storm Frequency	SCS Hydrologic Soil Group		
	A	B	C&D
10-year	0.13	0.23	0.30
100-year	0.50	0.85	1.00

Q_{100A}: 6.68 cfs

Water Quality: WQCV = a (0.91i³ - 1.19i² + .78i)

a: 1 (based on drain time)

Total Cont. Area I: 0.20 Impervious

WQCV: 0.12 watershed in.
 WQCV: 0.13 ac-ft
 WQCV: 5,684 cf

Table 3-2. Drain Time Coefficients for WQCV Calculations

Drain Time (hours)	Coefficient, a
12 hours (filtration BMPs and retention ponds)	0.8
24 hours (constructed wetland ponds)	0.9
40 hours (extended detention)	1.0
No attenuation (e.g., grass buffer or swale)	1.0

EURV: EURV_A = 1.68I^{1.28}
 EURV_B = 1.36I^{1.08}
 EURV_{C/D} = 1.20I^{1.08}

I: 0.20 Impervious (on-site and adjacent ROW)
 EURV: 0.22 watershed in.
 EURV: 0.24 ac-ft
 EURV: 10,637 cf

100 Year Detention: V₁₀₀ = K₁₀₀A

$$K_{100} = (1.78I - 0.002I^2 - 3.56) / 900$$

I: 15
 K₁₀₀: 0.025

V₁₀₀: 0.31 ac-ft
 V₁₀₀: 13,365 cf
 V₁₀₀ + 1/2 EURV: 0.43 ac-ft
 V₁₀₀ + 1/2 EURV: 18,683 cf

Conceptual Basin Detention									
Description	Impervious (%)	Area (ac)	WQCV (ac-ft)	EURV (ac-ft)	100-year V = KA (ac-ft)	Required Volume* (ac-ft)	Historic 100-yr Rate (cfs)	Aurora Release Rate (cfs)	Allowable Release Rate (cfs)
Pond A	60	28.0	0.55	2.16	2.81	3.89	30.7	14.0	14.0
Pond B	67	25.0	0.55	1.64	2.97	3.79	47.8	25.0	25.0
Pond C	20	13.4	0.13	0.24	0.31	0.43	16.5	6.7	6.7

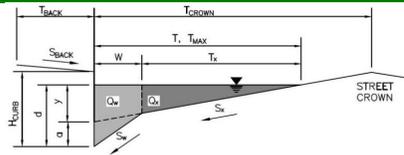
*Required Volume is half EURV plus the 100-year V = KA volume.

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Jamaso

Inlet ID: E. 12th Avenue



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

T_{BACK}	=	14.5	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

H_{CURB}	=	6.00	inches
T_{CROWN}	=	25.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_0	=	0.005	ft/ft
n_{STREET}	=	0.016	

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

		Minor Storm	Major Storm	
T_{MAX}	=	25.0	25.0	ft
d_{MAX}	=	6.0	12.0	inches
		<input type="checkbox"/>	<input checked="" type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Depth Criterion
 MAJOR STORM Allowable Capacity is based on Depth Criterion

		Minor Storm	Major Storm	
Q_{allow}	=	9.7	92.8	cfs

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'

Existing Grass Swale X-Sect A-A

Worksheet for CrossSection - Max Slope DP6 Q

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.018 ft/ft
Discharge	121.01 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+68	5,596.00
-0+16	5,595.00
0+00	5,594.29
0+22	5,595.00
0+45	5,595.27
0+81	5,596.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+68, 5,596.00)	(0+81, 5,596.00)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	12.4 in
Roughness Coefficient	0.030
Elevation	5,595.32 ft
Elevation Range	5,594.3 to 5,596.0 ft
Flow Area	33.2 ft ²
Wetted Perimeter	80.1 ft
Hydraulic Radius	5.0 in
Top Width	80.09 ft
Normal Depth	12.4 in
Critical Depth	12.4 in
Critical Slope	0.018 ft/ft
Velocity	3.65 ft/s
Velocity Head	0.21 ft
Specific Energy	1.24 ft
Froude Number	1.000

Existing Grass Swale X-Sect A-A

Worksheet for CrossSection - Max Slope DP6 Q

Results	
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	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	12.4 in
Critical Depth	12.4 in
Channel Slope	0.018 ft/ft
Critical Slope	0.018 ft/ft

Existing Grass Swale X-Sect B-B

Worksheet for CrossSection - Min Slope DP6 Q

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.006 ft/ft
Discharge	121.01 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+77	5,595.00
-0+47	5,594.00
0+00	5,593.17
0+36	5,594.00
0+66	5,595.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+77, 5,595.00)	(0+66, 5,595.00)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	11.9 in
Roughness Coefficient	0.030
Elevation	5,594.16 ft
Elevation Range	5,593.2 to 5,595.0 ft
Flow Area	48.5 ft ²
Wetted Perimeter	92.8 ft
Hydraulic Radius	6.3 in
Top Width	92.75 ft
Normal Depth	11.9 in
Critical Depth	9.8 in
Critical Slope	0.018 ft/ft
Velocity	2.49 ft/s
Velocity Head	0.10 ft
Specific Energy	1.08 ft
Froude Number	0.607
Flow Type	Subcritical

Existing Grass Swale X-Sect B-B

Worksheet for CrossSection - Min Slope DP6 Q

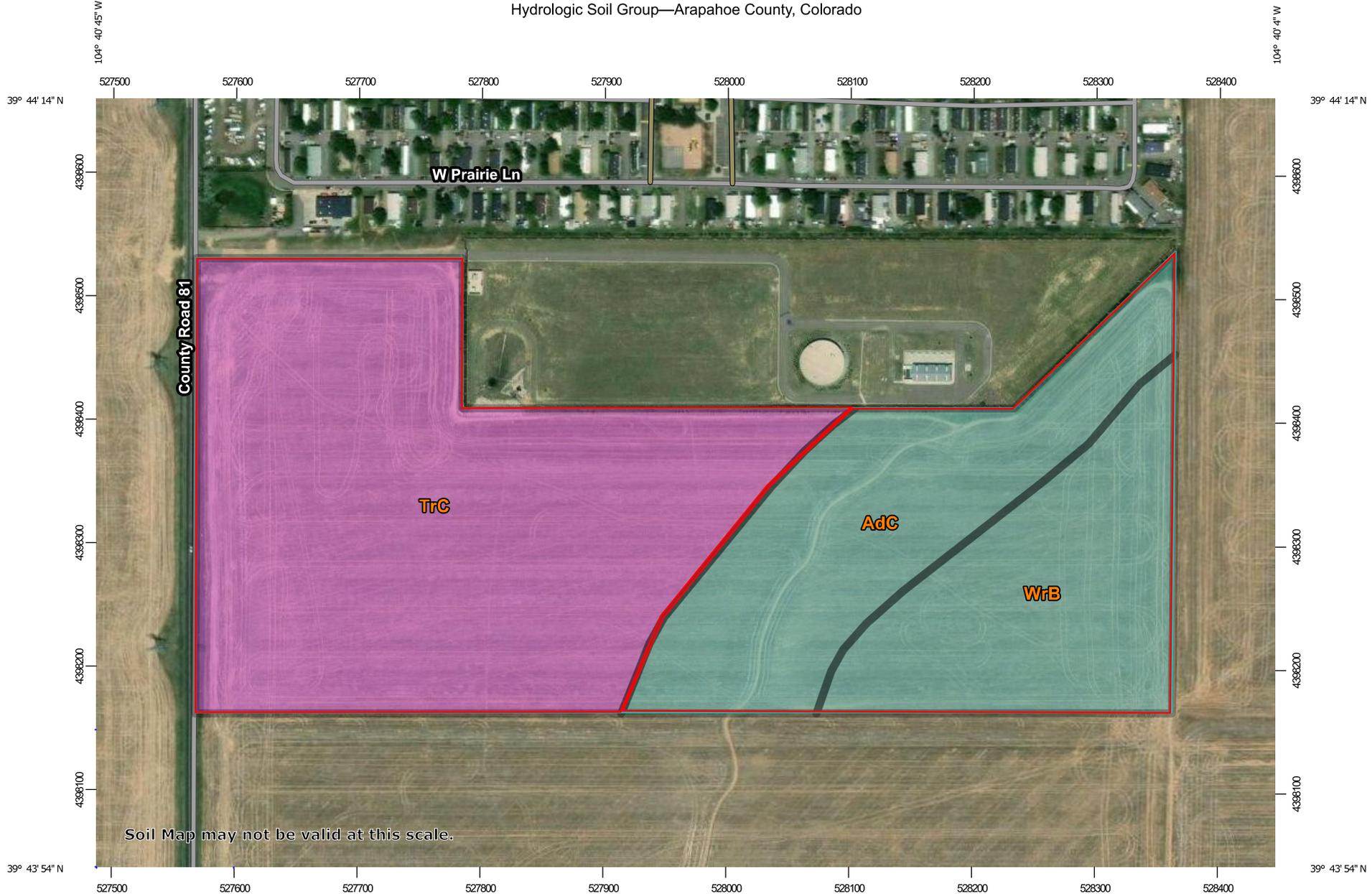
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	11.9 in
Critical Depth	9.8 in
Channel Slope	0.006 ft/ft
Critical Slope	0.018 ft/ft

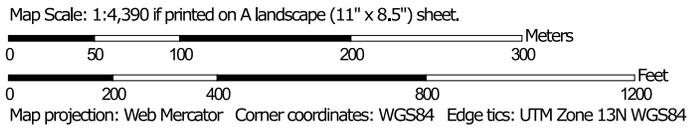
APPENDIX C

Referenced Information

Hydrologic Soil Group—Arapahoe County, Colorado



Soil Map may not be valid at this scale.



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 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Arapahoe County, Colorado
 Survey Area Data: Version 15, Sep 12, 2019

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

Date(s) aerial images were photographed: Jul 17, 2015—Oct 2, 2017

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AdC	Adena-Colby silt loams, 1 to 5 percent slopes	C	13.4	23.4%
TrC	Truckton loamy sand, 1 to 5 percent slopes	A	32.5	56.8%
WrB	Weld-Deertrail silt loams, 0 to 3 percent slopes	C	11.4	19.9%
Totals for Area of Interest			57.2	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.

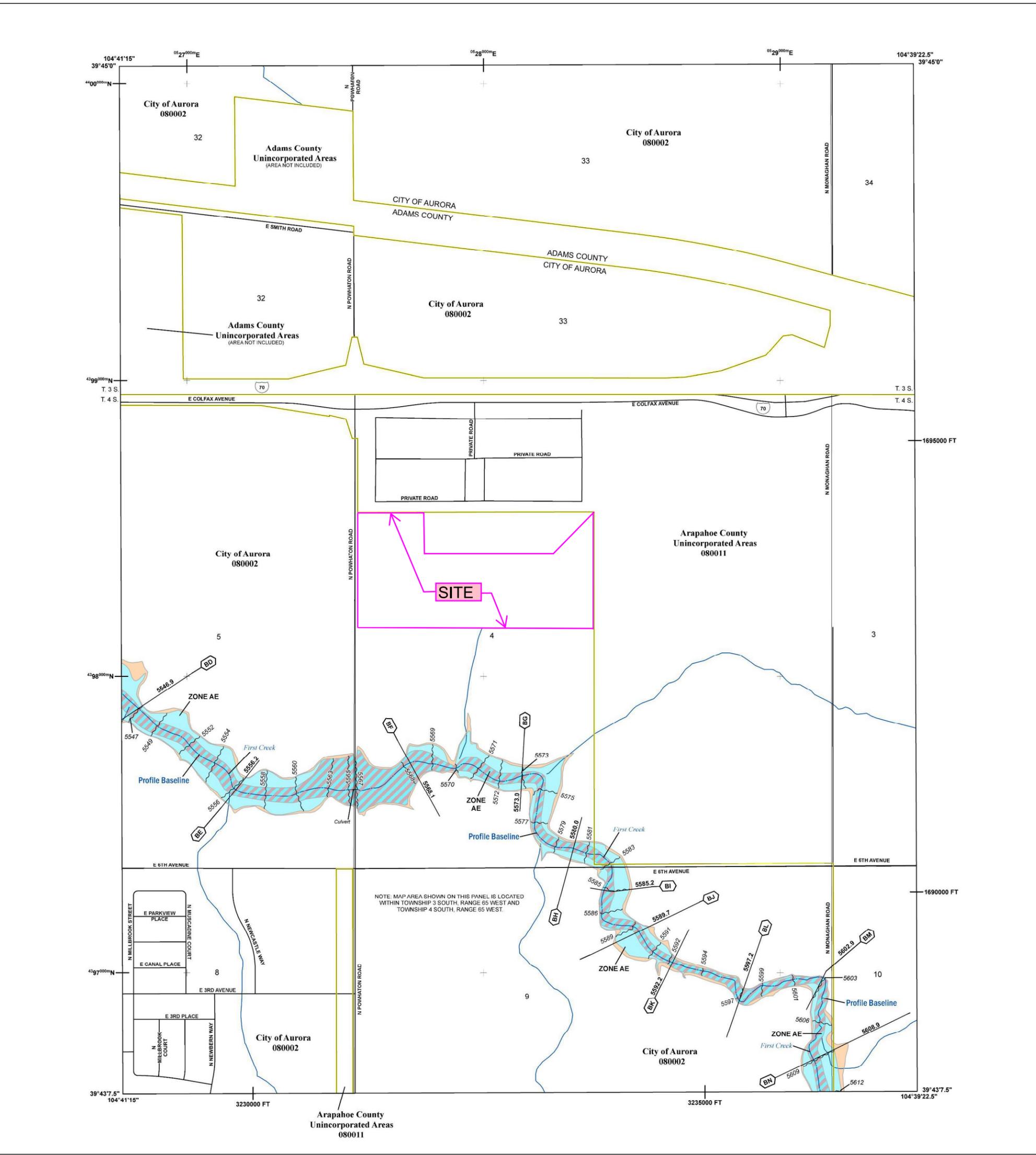
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP
 THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING
 DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT
[HTTP://MSC.FEMA.GOV](http://MSC.FEMA.GOV)

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A.V, A.99
		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
OTHER AREAS		NO SCREEN Areas of Minimal Flood Hazard Zone X
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer Accredited or Provisionally Accredited Levee, Dike, or Floodwall
		Non-accredited Levee, Dike, or Floodwall
OTHER FEATURES		Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
		Coastal Transect
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary

NOTES TO USERS

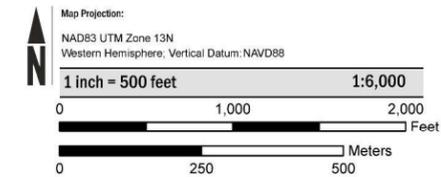
For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center 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 website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

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 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 the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was provided by the Arapahoe County and Cities of Aurora and Littleton GIS departments. The coordinate system used for production of the digital FIRM is Universal Transverse Mercator, Zone 13N, referenced to the North American Datum of 1983 and the GRS 1980 spheroid, Western Hemisphere.

SCALE



PANEL LOCATOR



**NATIONAL FLOOD INSURANCE PROGRAM
 FLOOD INSURANCE RATE MAP**

ARAPAHOE COUNTY, COLORADO
 And Incorporated Areas

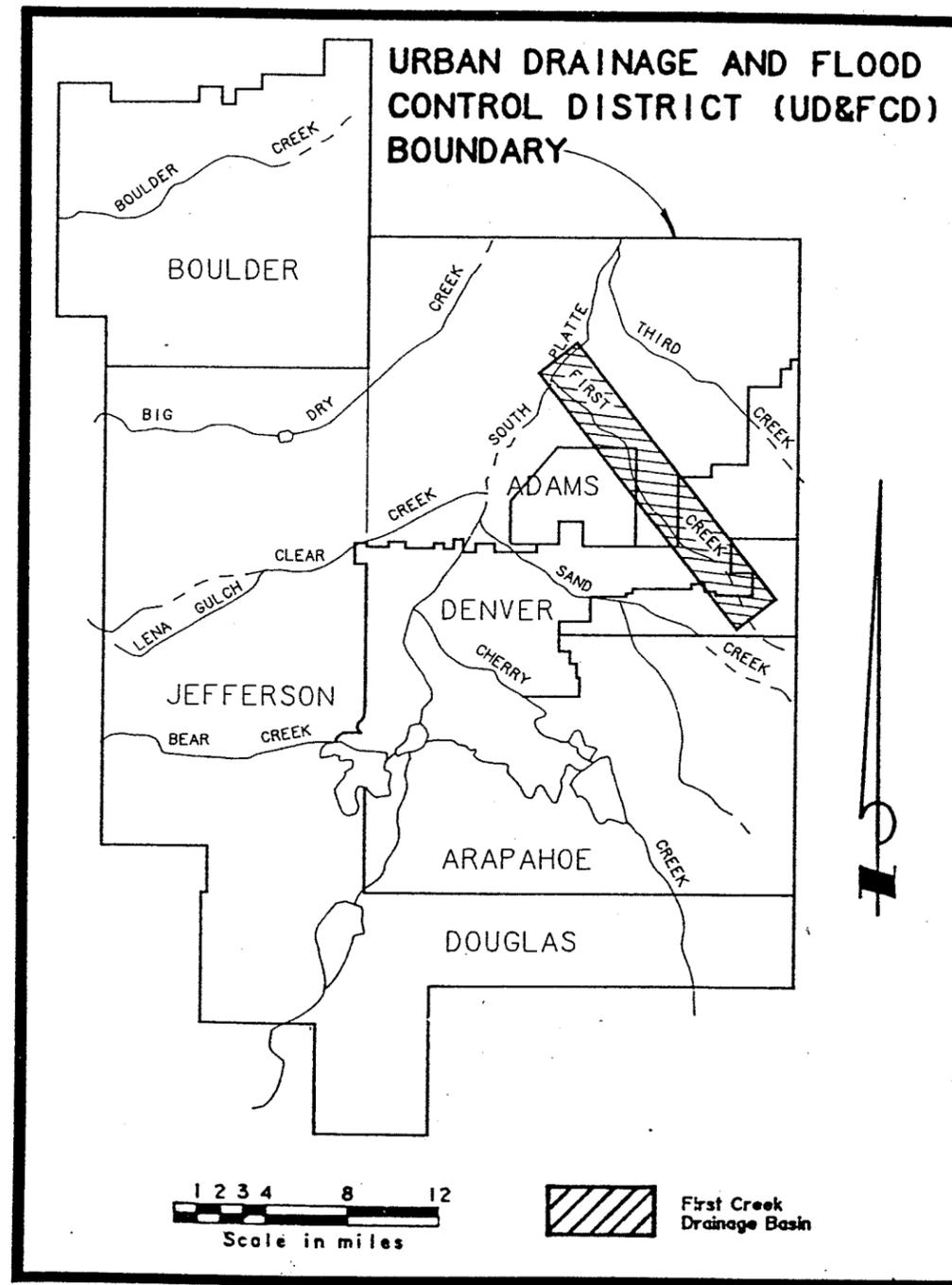
PANEL 206 OF 725

COMMUNITY	NUMBER	PANEL	SUFFIX
ARAPAHOE COUNTY	080011	0206	L
AURORA, CITY OF	080002	0206	L

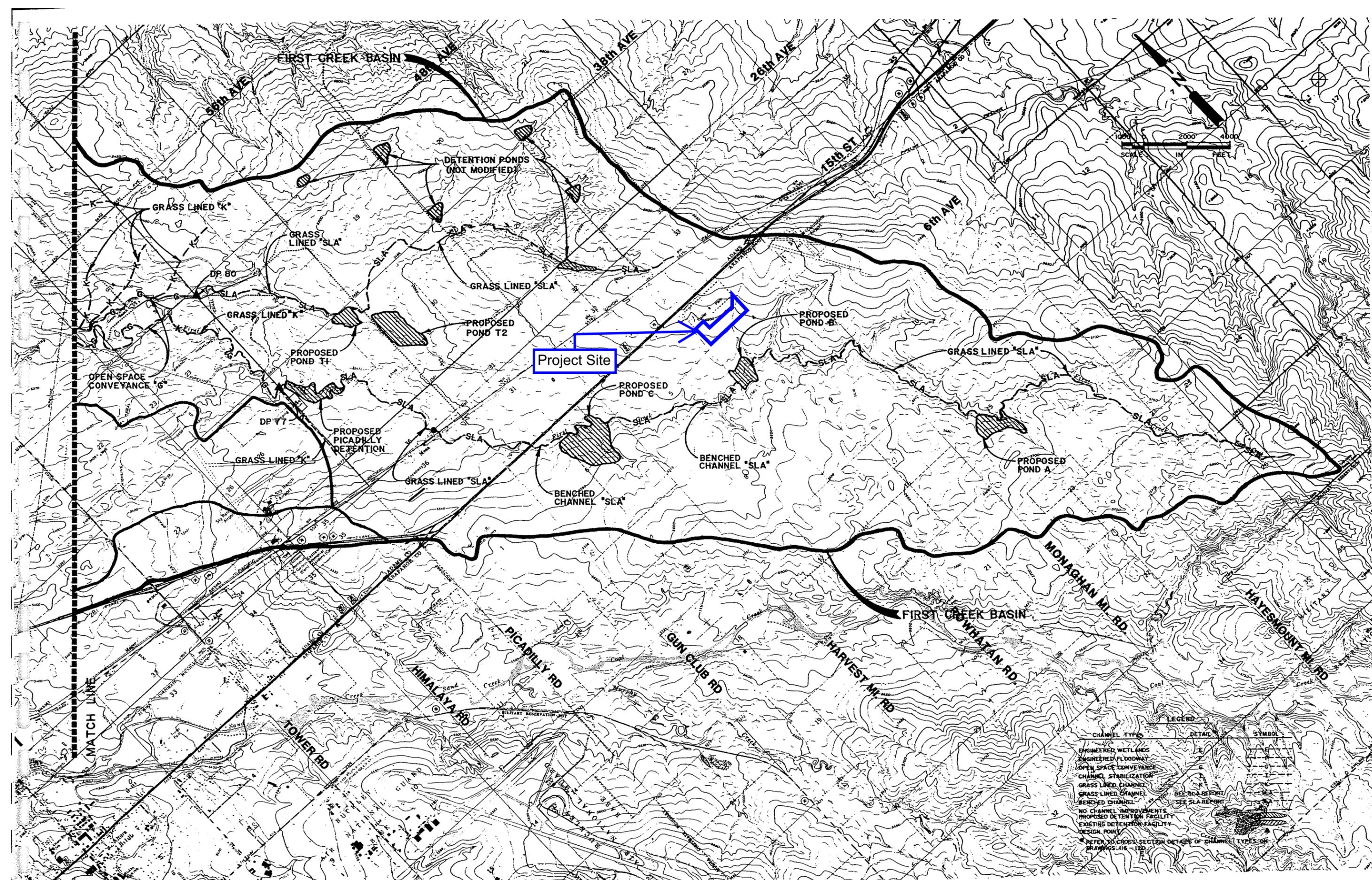
FIRST CREEK AND DFA 0055 OUTFALL SYSTEMS MASTERPLAN PRELIMINARY DESIGN REPORT

Prepared for
**URBAN DRAINAGE & FLOOD
CONTROL DISTRICT**
ADAMS COUNTY
CITY AND COUNTY OF DENVER
CITY OF AURORA
CITY OF COMMERCE CITY
CITY OF BRIGHTON

Prepared by
WRIGHT WATER ENGINEERS, INC.
2490 W. 26th AVENUE,
SUITE 100-A
DENVER, CO. 80211
Dec. 1990



1990



LEGEND

CHANNEL TYPE	DETAIL	SYMBOL
ENGINEERED WETLANDS		(Symbol)
ENGINEERED FLOODWAY		(Symbol)
OPEN SPACE CONVEYANCE		(Symbol)
CHANNEL STABILIZATION		(Symbol)
GRASS LINED CHANNEL		(Symbol)
GRASS LINED CHANNEL	SEE SLA REPORT	(Symbol)
BENCHED CHANNEL	SEE SLA REPORT	(Symbol)
NO CHANNEL IMPROVEMENTS		(Symbol)
PROPOSED DETENTION FACILITY		(Symbol)
EXISTING DETENTION FACILITY		(Symbol)
DESIGN POINT		(Symbol)

REFER TO CROSS SECTION DETAILS OF CHANNEL TYPES ON DRAWINGS 116 - 122

MAPS - U.S.G.S. QUADRANGLE SHEETS:
 BOX ELDER SCHOOL, BRIGHTON,
 AL CREEK, COMMERCE CITY, EASTLAKE,
 FITZSIMONS, SABLE, WATKINS

WRIGHT WATER ENGINEERS, INC.
 2490 WEST 26TH AVE. - SUITE 100A
 DENVER, COLORADO 80211
 FAX (303) 480-1020 (303) 480-1700

DESIGNED DATE
 DRAWN DATE 11/89
 CHECKED DATE
 REVISED DATE

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
 ADAMS COUNTY, CITY AND COUNTY OF DENVER,
 CITIES OF AURORA, BRIGHTON, AND COMMERCE CITY

OUTFALL SYSTEMS PLANNING
 FIRST CREEK AND DFA 0055

SELECTED OUTFALL SYSTEM
 PLAN SCHEMATIC

DRAWING
 8B OF 120



FIRST CREEK (UPSTREAM OF BUCKLEY ROAD)

MAJOR DRAINAGEWAY PLAN CONCEPTUAL DESIGN REPORT

Project Sponsors



URBAN DRAINAGE AND FLOOD CONTROL DISTRICT



CITY AND COUNTY OF DENVER

DENVER
THE MILE HIGH CITY



CITY OF AURORA

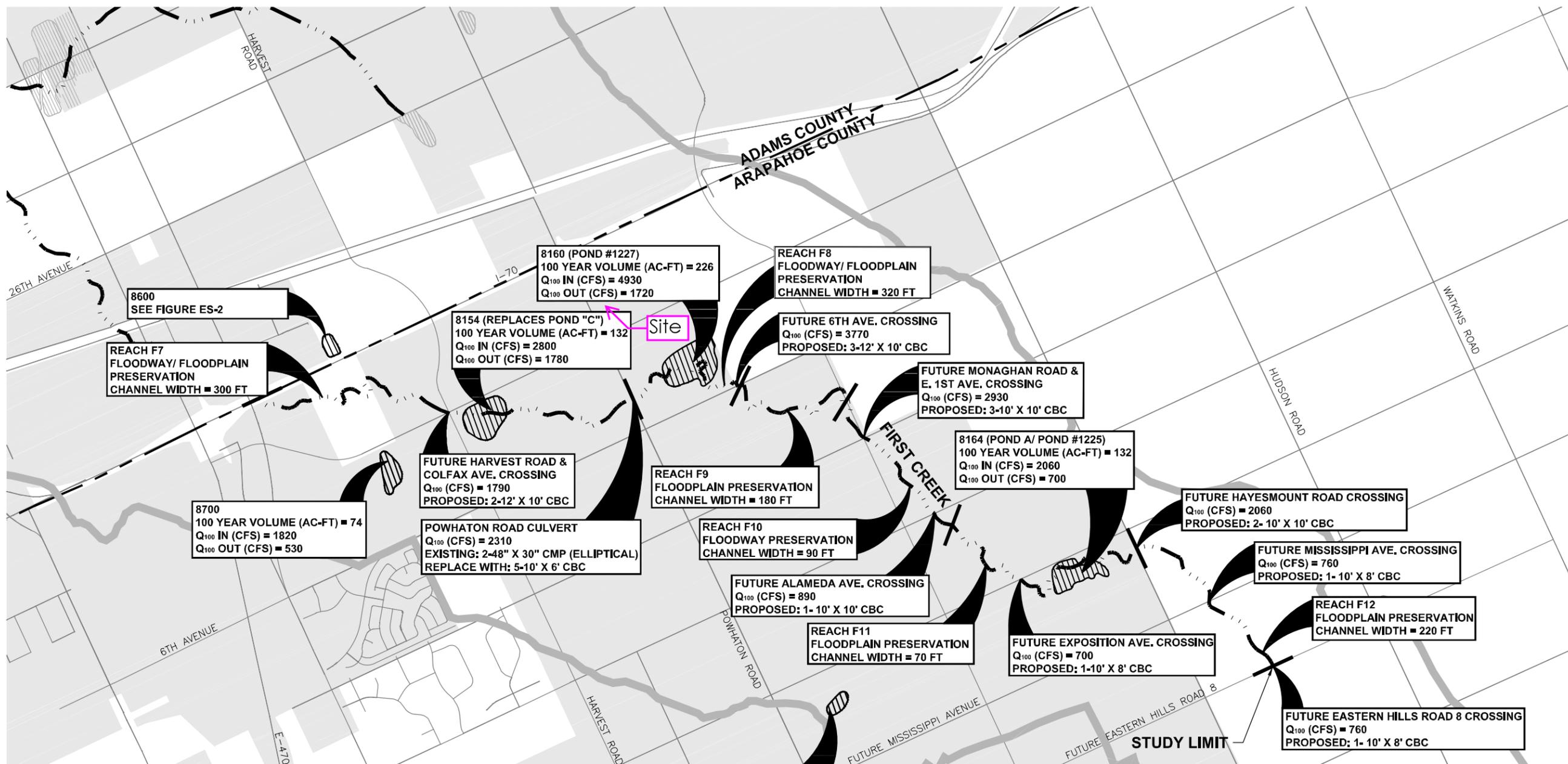
Prepared by:



720 South Colorado Boulevard
Suite 410 S
Denver, Colorado 80246
phone (303) 757-3655
fax (303) 300-1635

August 2010

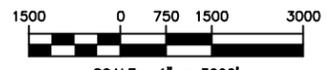
NAME: Z:\UDFCD PLANNING\Upper First Creek\CAD_UFC\DWG\Phase B\Fig ES-3 - Selected Plan_UFC.dwg
 PLOT DATE: Aug 06, 2010 11:23am



LEGEND

	DETENTION BASIN
	WATERSHED BOUNDARY
	REACH LIMIT
	STREAM CENTERLINE
	COUNTY BOUNDARIES
	CITY OF AURORA
	CITY AND COUNTY OF DENVER
	UNINCORPORATED COUNTY LAND

NOTE:
 EXISTING ROADWAY CROSSINGS WITH ADEQUATE CAPACITY ARE NOT SHOWN.



MOSER
 ENGINEERING
 720 S. COLORADO BLVD.
 SUITE 410 S
 DENVER, CO 80246
 PHONE: 303-757-3655
 FAX: 303-300-1635

DESIGNED AGC DATE 5/28/09
 DRAWN AGC DATE 5/28/09
 CHECKED TLP DATE 7/10/09
 REVISED _____ DATE _____

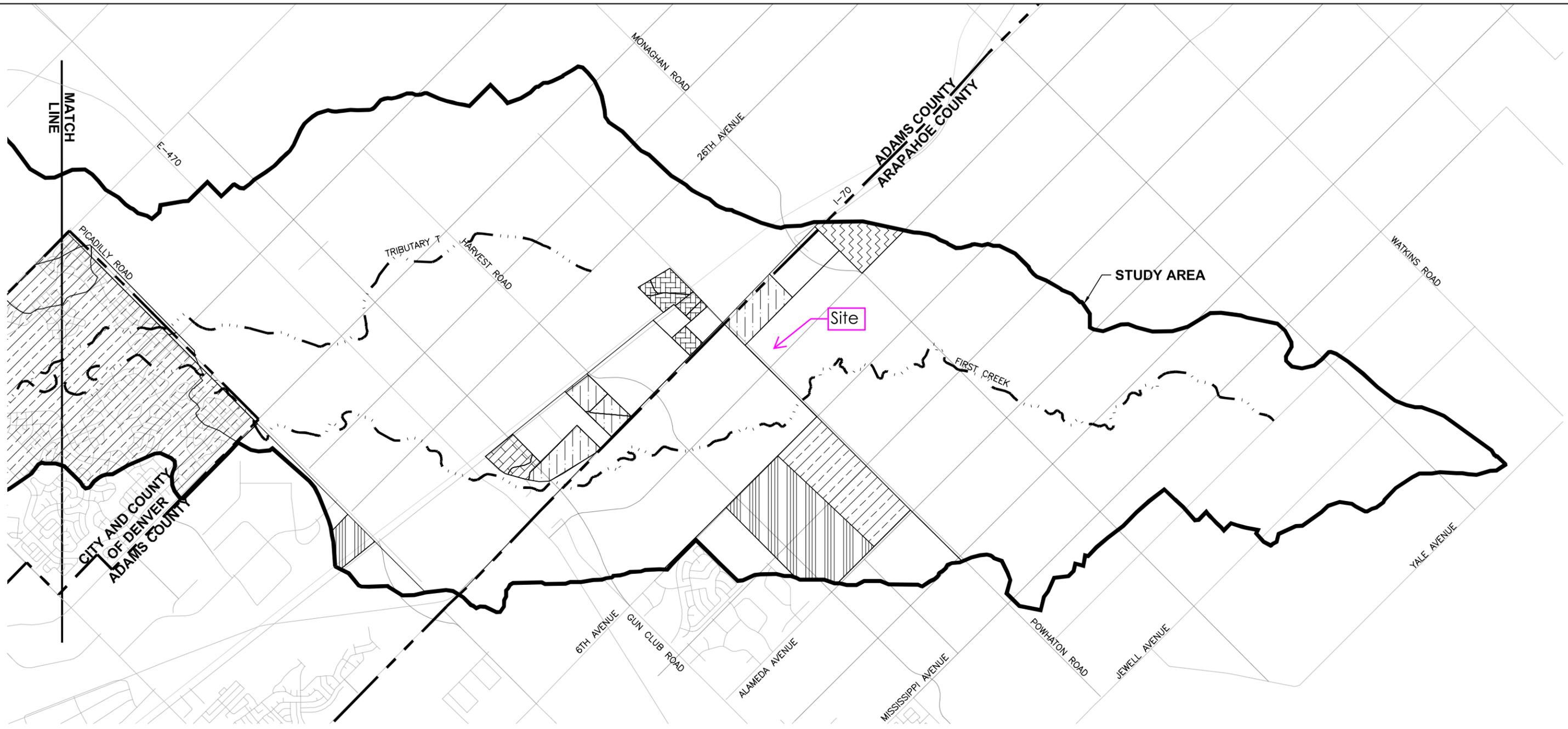
CITY AND COUNTY OF DENVER
 CITY OF AURORA
 URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

FIRST CREEK (UPPER)
 MAJOR DRAINAGEWAY
 PLANNING STUDY

CONCEPTUAL DESIGN
 FIRST CREEK
 SOUTH OF I-70

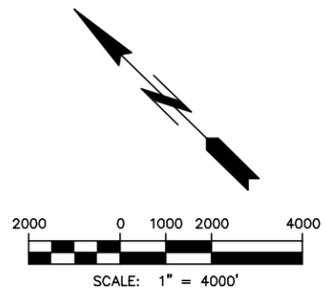
FIGURE ES-3

NAME: Z:\UDFCD PLANNING\Upper First Creek\UDFC\DWG\Alt Rpt\Fig 2-4 - Impervious Values - Existing Land Use.dwg
 PLOT DATE: Oct 05, 2009 3:38pm



IMPERVIOUS VALUES

	2%		55%		80%
	20%		60%		85%
	45%		65%		
	50%		70%		



MOSER
 & associates
 ENGINEERING

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 DENVER, CO 80246
 PHONE: 303-757-3655
 FAX: 303-300-1635

DESIGNED AGC DATE 5/28/09
 DRAWN AGC DATE 5/28/09
 CHECKED TLP DATE 7/10/09
 REVISED _____ DATE _____

**CITY AND COUNTY OF DENVER
 CITY OF AURORA
 URBAN DRAINAGE AND FLOOD CONTROL DISTRICT**

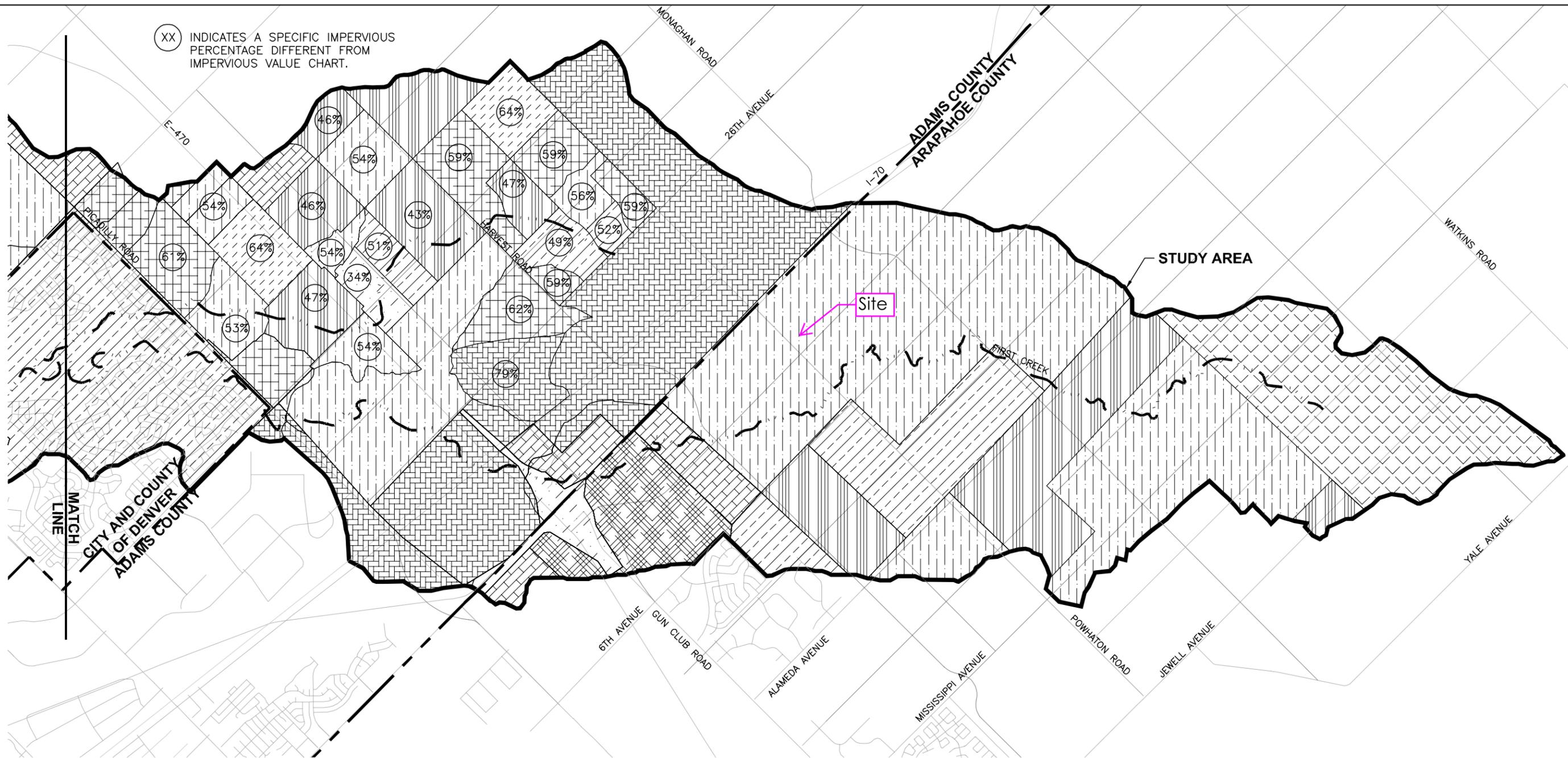
**FIRST CREEK (UPPER)
 MAJOR DRAINAGEWAY
 PLANNING STUDY**

**IMPERVIOUS VALUES -
 EXISTING LAND USE**

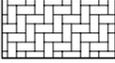
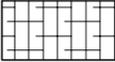
FIGURE 2-5

NAME: Z:\UDFCD PLANNING\Upper First Creek\CAD_UFC\DWG\Alt Rpt\Fig 2-6 - Impervious Values - Future Land Use.dwg
 PLOT DATE: Oct 05, 2009 3:44pm

XX INDICATES A SPECIFIC IMPERVIOUS PERCENTAGE DIFFERENT FROM IMPERVIOUS VALUE CHART.



IMPERVIOUS VALUES

	2%		50%		70%
	10%		55%		80%
	35%		60%		85%
	45%		65%		90%

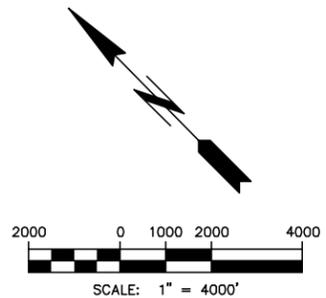


Table 3.3-2
CUHP Subwatershed Characteristics

Subwatershed	Area (sq. mi.)	Distance to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperviousness		Depression Storage		Horton's Infiltration Parameters		
					Existing	Future	Pervious (inches)	Impervious (inches)	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)
100	0.92	2.03	2.37	0.002	2.09	2.26	0.35	0.10	3.09	0.0007	0.60
101	0.45	0.76	1.89	0.005	32.35	57.30	0.35	0.10	4.59	0.0015	0.70
102	0.51	0.42	0.78	0.006	28.24	73.56	0.35	0.10	3.47	0.0018	0.54
103	0.41	0.53	0.89	0.009	21.21	24.01	0.35	0.10	3.65	0.0018	0.56
104	0.56	1.48	2.31	0.009	3.98	4.76	0.35	0.10	3.73	0.0018	0.54
110	1.16	2.12	2.80	0.008	2.00	2.00	0.35	0.10	3.78	0.0017	0.57
111	1.13	1.42	2.18	0.010	2.00	2.00	0.35	0.10	4.02	0.0017	0.59
112	0.22	0.59	1.17	0.010	2.00	2.00	0.35	0.10	3.76	0.0018	0.55
113	0.19	0.42	0.95	0.012	2.00	2.00	0.35	0.10	4.38	0.0018	0.59
114	0.41	0.89	1.59	0.010	2.00	2.00	0.35	0.10	4.37	0.0017	0.61
115	0.44	0.47	0.89	0.015	2.00	2.00	0.35	0.10	4.54	0.0016	0.66
116	0.53	1.23	2.18	0.007	2.00	2.00	0.35	0.10	4.36	0.0017	0.60
117	0.42	0.37	0.80	0.010	2.00	3.00	0.35	0.10	4.59	0.0016	0.67
118	0.26	0.35	0.91	0.010	2.00	4.00	0.35	0.10	4.62	0.0015	0.69
120	0.26	0.34	0.67	0.009	2.00	48.00	0.35	0.10	4.70	0.0014	0.76
121	0.16	0.14	0.22	0.018	2.00	67.28	0.35	0.10	4.50	0.0018	0.60
122	0.19	0.40	0.94	0.008	12.91	50.00	0.35	0.10	4.79	0.0012	0.83
123	0.37	0.57	1.03	0.015	2.96	50.00	0.35	0.10	4.53	0.0017	0.62
130	0.33	0.63	0.97	0.010	50.01	52.46	0.35	0.10	4.64	0.0015	0.71
131	0.25	0.44	0.81	0.008	49.99	69.05	0.35	0.10	4.50	0.0018	0.60
132	0.21	0.30	0.64	0.020	50.01	50.00	0.35	0.10	4.55	0.0017	0.64
133	0.15	0.57	0.95	0.015	49.96	50.00	0.35	0.10	4.57	0.0016	0.65
134	0.35	1.12	1.44	0.007	50.00	50.00	0.35	0.10	4.75	0.0013	0.80
135	0.18	0.23	0.57	0.011	46.29	50.00	0.35	0.10	4.61	0.0016	0.69
136	0.39	0.03	0.86	0.014	17.47	57.32	0.35	0.10	4.82	0.0011	0.86
140	0.38	0.83	1.73	0.010	10.26	76.14	0.35	0.10	3.26	0.0017	0.55
141	0.19	0.43	0.76	0.010	2.00	55.60	0.40	0.10	4.44	0.0013	0.75
142	0.52	0.80	1.27	0.008	2.00	55.00	0.40	0.10	3.82	0.0018	0.55
143	0.48	0.38	0.99	0.010	2.00	79.63	0.40	0.10	3.10	0.0018	0.51
144	0.21	0.47	0.87	0.010	2.00	76.35	0.40	0.10	4.09	0.0018	0.57
145	0.40	0.38	1.17	0.010	13.97	77.37	0.40	0.10	3.28	0.0018	0.52
146	0.34	0.47	1.04	0.007	31.23	72.99	0.40	0.10	3.20	0.0018	0.51
150	0.28	0.61	1.17	0.012	4.32	80.40	0.40	0.10	3.00	0.0018	0.50
151	0.31	0.51	1.52	0.013	5.21	89.80	0.40	0.10	3.39	0.0018	0.53
152	0.68	0.90	1.63	0.010	3.05	61.27	0.40	0.10	3.67	0.0018	0.54
153	0.31	0.61	1.40	0.012	17.46	55.00	0.40	0.10	3.83	0.0018	0.56
154	0.15	0.36	0.74	0.013	2.67	54.79	0.40	0.10	3.85	0.0018	0.56
155	0.42	0.54	1.12	0.012	4.43	54.14	0.40	0.10	3.67	0.0018	0.54
160	0.57	0.62	1.40	0.015	6.36	54.34	0.40	0.10	3.00	0.0018	0.50
161	0.63	0.76	1.72	0.012	2.00	54.29	0.40	0.10	3.39	0.0018	0.53
162	0.47	0.62	1.33	0.016	2.00	50.52	0.40	0.10	3.69	0.0018	0.55
163	0.34	0.28	0.83	0.020	2.00	50.32	0.40	0.10	3.45	0.0018	0.53
164	0.44	0.55	1.10	0.005	2.00	35.53	0.40	0.10	3.31	0.0018	0.52
165	1.66	1.16	2.61	0.013	2.00	9.90	0.40	0.10	3.63	0.0018	0.54
200	0.27	0.32	0.59	0.009	14.12	59.17	0.35	0.10	4.24	0.0016	0.65
210	0.19	0.46	0.85	0.007	58.10	72.50	0.35	0.10	3.86	0.0018	0.56
211	0.26	0.24	0.77	0.006	42.66	64.97	0.35	0.10	3.72	0.0018	0.55
220	0.38	0.68	1.21	0.003	56.85	89.68	0.35	0.10	4.37	0.0018	0.59
221	0.26	0.46	0.83	0.004	39.60	89.83	0.35	0.10	4.37	0.0018	0.59
230	0.30	0.53	0.81	0.005	62.41	90.00	0.35	0.10	3.47	0.0018	0.53

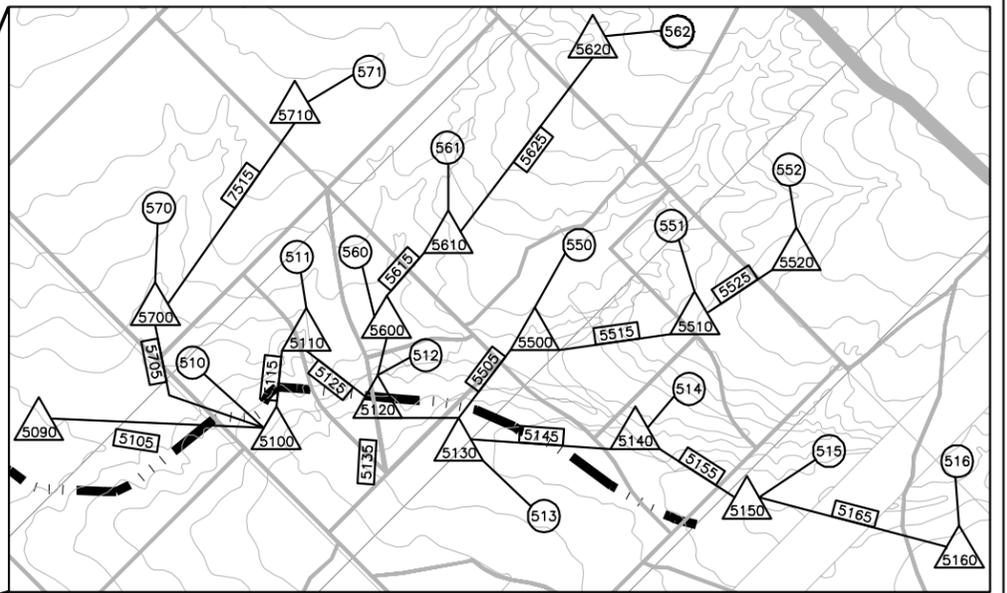
Table 3.3-2 (continued)
CUHP Subwatershed Characteristics

Subwatershed	Area (sq. mi.)	Distance to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperviousness		Depression Storage		Horton's Infiltration Parameters		
					Existing	Future	Pervious (inches)	Impervious (inches)	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)
511	0.22	0.40	0.80	0.022	5.00	76.96	0.40	0.10	3.41	0.0018	0.53
512	0.29	0.45	0.85	0.018	11.69	79.15	0.40	0.10	3.01	0.0018	0.50
513	0.16	0.42	0.80	0.014	2.00	78.77	0.40	0.10	3.00	0.0018	0.50
520	0.47	0.40	1.03	0.011	2.00	60.91	0.35	0.10	4.50	0.0018	0.60
521	0.18	0.37	0.77	0.020	2.00	77.76	0.35	0.10	4.49	0.0018	0.60
530	0.29	0.31	0.84	0.020	2.00	69.33	0.35	0.10	3.97	0.0018	0.56
531	0.27	0.20	0.66	0.020	2.00	84.57	0.35	0.10	3.86	0.0018	0.56
532	0.14	0.46	0.63	0.020	2.00	84.21	0.40	0.10	4.03	0.0018	0.57
533	0.38	0.24	0.65	0.017	2.00	49.89	0.37	0.10	3.27	0.0018	0.52
534	0.32	0.33	0.85	0.016	2.00	44.25	0.40	0.10	3.23	0.0018	0.52
540	0.39	0.55	1.10	0.015	2.00	54.13	0.40	0.10	3.19	0.0018	0.51
541	0.42	0.64	1.12	0.008	2.00	72.59	0.40	0.10	3.32	0.0018	0.52
542	0.22	0.24	0.50	0.011	17.11	80.00	0.40	0.10	3.01	0.0018	0.50
543	0.37	0.37	1.09	0.012	10.77	80.00	0.40	0.10	3.00	0.0018	0.50
550	0.30	0.62	1.14	0.015	2.00	58.74	0.40	0.10	3.07	0.0018	0.50
551	0.21	0.08	0.69	0.017	2.00	70.40	0.38	0.10	3.01	0.0018	0.50
560	0.25	0.41	0.70	0.020	2.00	59.95	0.35	0.10	3.00	0.0018	0.50
561	0.26	0.46	0.59	0.020	2.00	59.71	0.35	0.10	3.06	0.0018	0.50
570	0.21	0.36	0.72	0.020	2.00	50.09	0.35	0.10	3.71	0.0018	0.55
571	0.31	0.28	0.59	0.024	2.00	78.74	0.40	0.10	3.58	0.0018	0.54
580	0.23	0.28	0.72	0.020	2.00	53.97	0.35	0.10	3.73	0.0018	0.55
581	0.34	0.28	0.69	0.026	2.00	78.24	0.40	0.10	3.58	0.0018	0.54
600	0.27	0.69	1.30	0.012	17.19	79.86	0.40	0.10	3.00	0.0018	0.50
601	0.24	0.38	1.00	0.008	2.05	79.27	0.40	0.10	3.00	0.0018	0.50
610	0.34	0.27	0.83	0.011	2.00	66.02	0.40	0.10	3.09	0.0018	0.51
700	0.29	0.71	1.28	0.012	4.70	81.85	0.40	0.10	3.01	0.0018	0.50
701	0.14	0.38	0.64	0.012	14.30	53.80	0.40	0.10	3.32	0.0018	0.52
702	0.30	0.38	0.93	0.010	38.86	46.77	0.40	0.10	3.06	0.0018	0.50
703	0.26	0.30	0.80	0.012	38.42	47.25	0.40	0.10	3.15	0.0018	0.51
704	0.16	0.36	0.68	0.011	2.00	54.92	0.40	0.10	3.39	0.0018	0.53
710	0.17	0.32	0.64	0.015	41.28	49.27	0.40	0.10	3.58	0.0018	0.54
711	0.44	0.59	1.76	0.008	31.48	51.17	0.40	0.10	3.38	0.0018	0.53
712	0.22	0.34	0.91	0.008	3.39	52.87	0.40	0.10	3.54	0.0018	0.54
713	0.19	0.49	0.83	0.008	2.00	55.00	0.40	0.10	3.44	0.0018	0.53
714	0.24	0.64	1.00	0.010	2.00	54.92	0.40	0.10	3.90	0.0018	0.56
715	0.37	0.47	1.13	0.011	2.00	55.00	0.40	0.10	3.76	0.0018	0.55
716	0.32	0.64	1.47	0.012	2.00	55.00	0.40	0.10	3.33	0.0018	0.52
717	0.18	0.38	0.76	0.015	2.00	54.85	0.40	0.10	3.62	0.0018	0.54
720	0.20	0.31	0.87	0.017	5.36	55.00	0.40	0.10	3.40	0.0018	0.53
721	0.15	0.36	0.68	0.015	8.73	55.10	0.40	0.10	3.11	0.0018	0.51
730	0.19	0.71	1.28	0.012	2.00	51.63	0.40	0.10	3.63	0.0018	0.54
731	0.16	0.38	1.61	0.014	2.00	52.96	0.40	0.10	3.59	0.0018	0.54
740	0.18	0.42	0.85	0.018	2.00	54.50	0.40	0.10	3.00	0.0018	0.50
741	0.23	0.47	0.90	0.019	2.00	54.18	0.40	0.10	3.01	0.0018	0.50
742	0.22	0.34	0.57	0.021	2.00	52.72	0.40	0.10	3.00	0.0018	0.50
750	0.25	0.45	1.14	0.018	2.00	47.24	0.40	0.10	3.73	0.0018	0.55
751	0.39	0.57	1.23	0.019	2.00	47.70	0.40	0.10	3.69	0.0018	0.55
752	0.31	0.43	0.95	0.018	2.00	38.20	0.40	0.10	4.36	0.0018	0.59

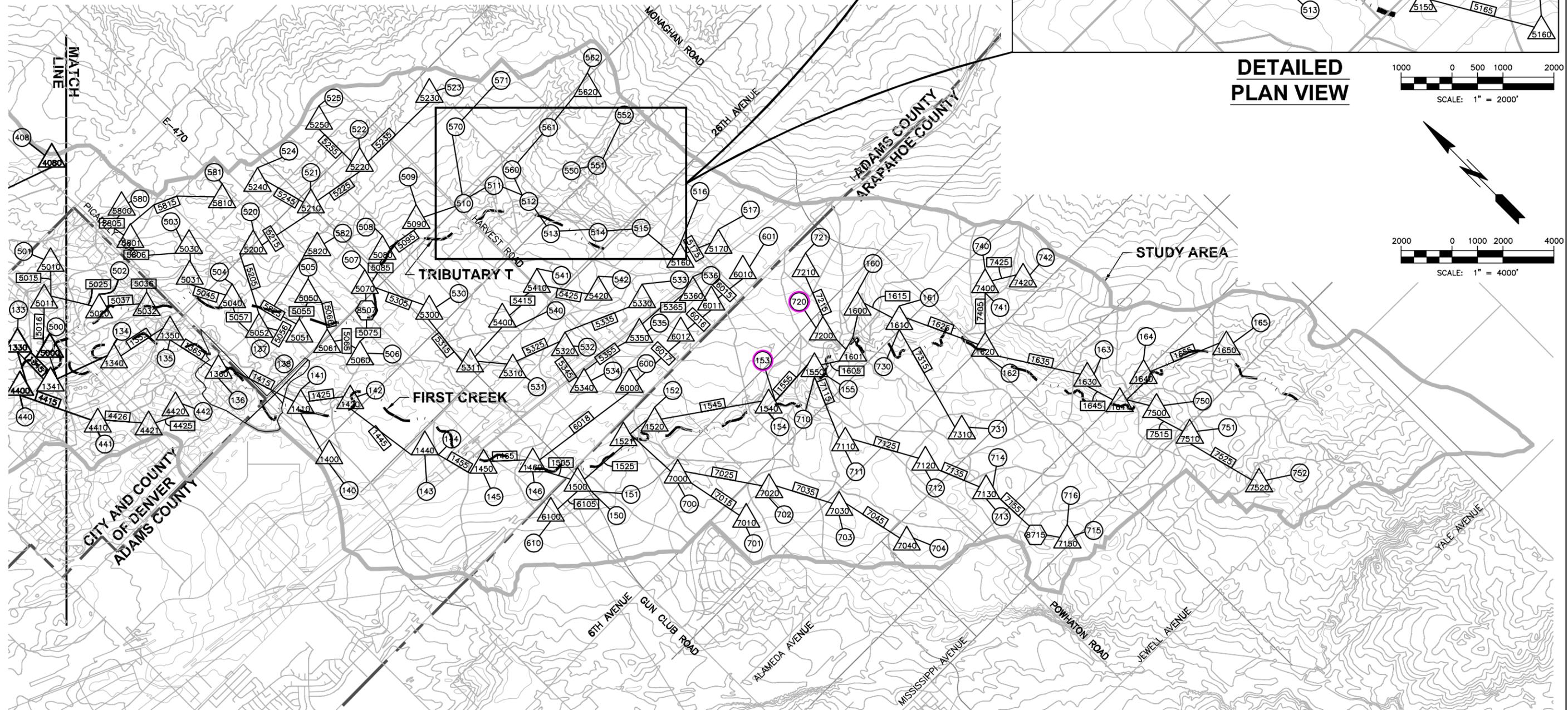
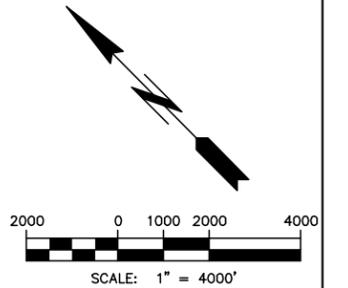
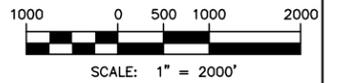
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LEGEND

	DETENTION ELEMENT
	CONVEYENCE ELEMENT
	DESIGN POINT
	SUB-WATERSHED ID
	WATERSHED BOUNDARY
	SUB-WATERSHED BOUNDARY
	STREAM CENTERLINE



**DETAILED
PLAN VIEW**



MOSER
 & associates
 ENGINEERING

720 S. COLORADO BLVD.
 SUITE 410 S
 DENVER, CO 80246
 PHONE: 303-757-3655
 FAX: 303-300-1635

DESIGNED	AGC	DATE	5/28/09
DRAWN	AGC	DATE	5/28/09
CHECKED	TLP	DATE	7/10/09
REVISED		DATE	

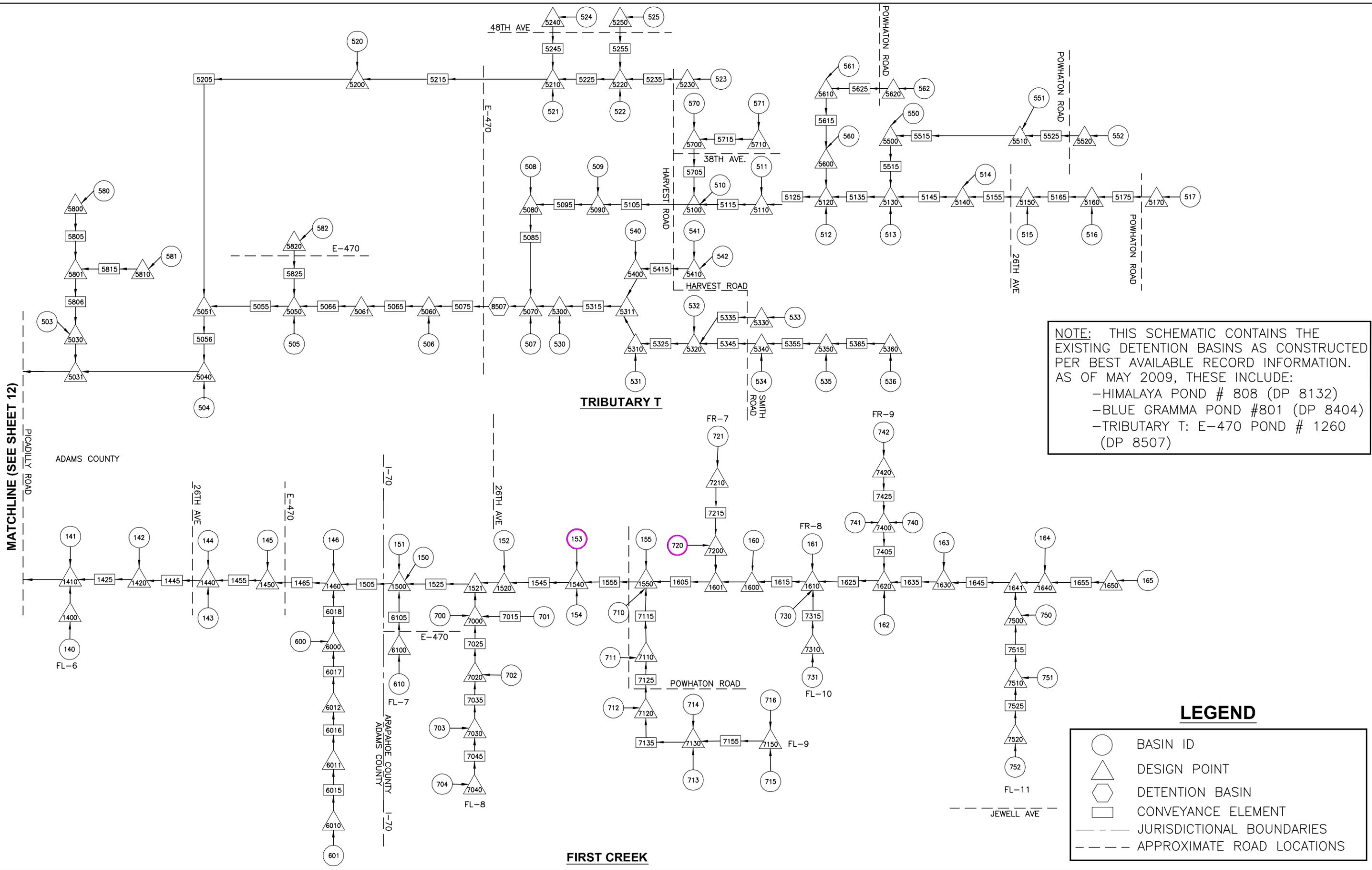
**CITY AND COUNTY OF DENVER
 CITY OF AURORA
 URBAN DRAINAGE AND FLOOD CONTROL DISTRICT**

**FIRST CREEK (UPPER)
 MAJOR DRAINAGEWAY
 PLANNING STUDY**

**BASELINE HYDROLOGY
 EPA SWMM ROUTING**

FIGURE 3-4

NAME: Z:\UDFCD PLANNING\Upper First Creek\CAD_UFC\DWG\Alt Rpt\Fig 12-14 - SWMM Schematic.dwg
 PLOT DATE: Apr 12, 2010 2:24pm



MATCHLINE (SEE SHEET 12)

ADAMS COUNTY

APARAHOE COUNTY
ADAMS COUNTY

TRIBUTARY T

FIRST CREEK

LEGEND

- BASIN ID
- DESIGN POINT
- DETENTION BASIN
- CONVEYANCE ELEMENT
- JURISDICTIONAL BOUNDARIES
- APPROXIMATE ROAD LOCATIONS



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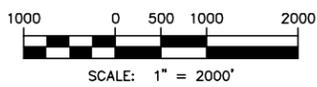
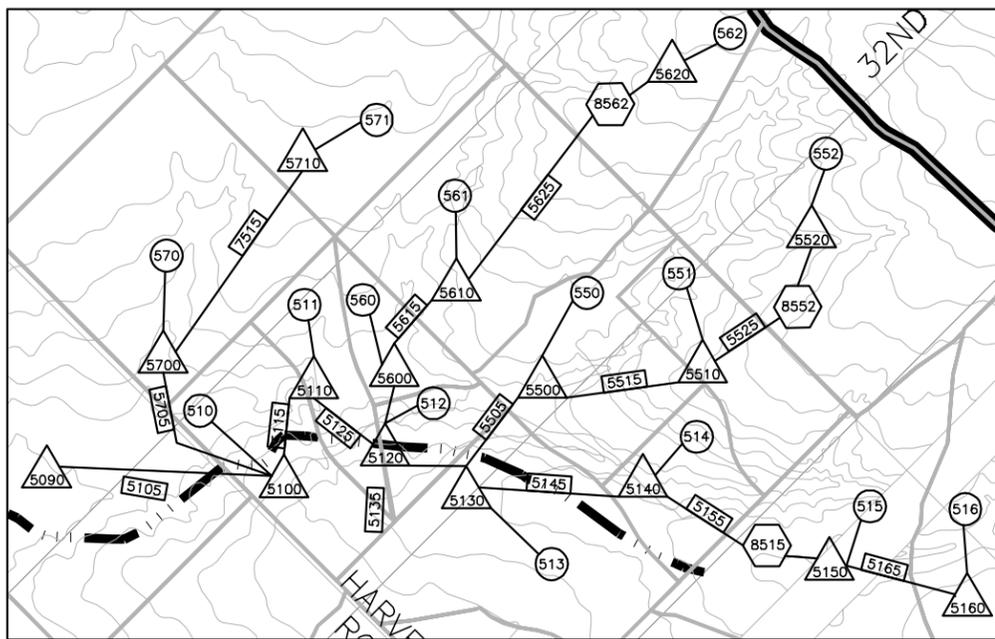
DESIGNED AGC DATE 5/28/09
 DRAWN AGC DATE 5/28/09
 CHECKED TLP DATE 7/10/09
 REVISED _____ DATE _____

**CITY AND COUNTY OF DENVER
 CITY OF AURORA
 URBAN DRAINAGE AND FLOOD CONTROL DISTRICT**

**FIRST CREEK (UPPER)
 MAJOR DRAINAGEWAY
 PLANNING STUDY**

EPA SWMM SCHEMATIC

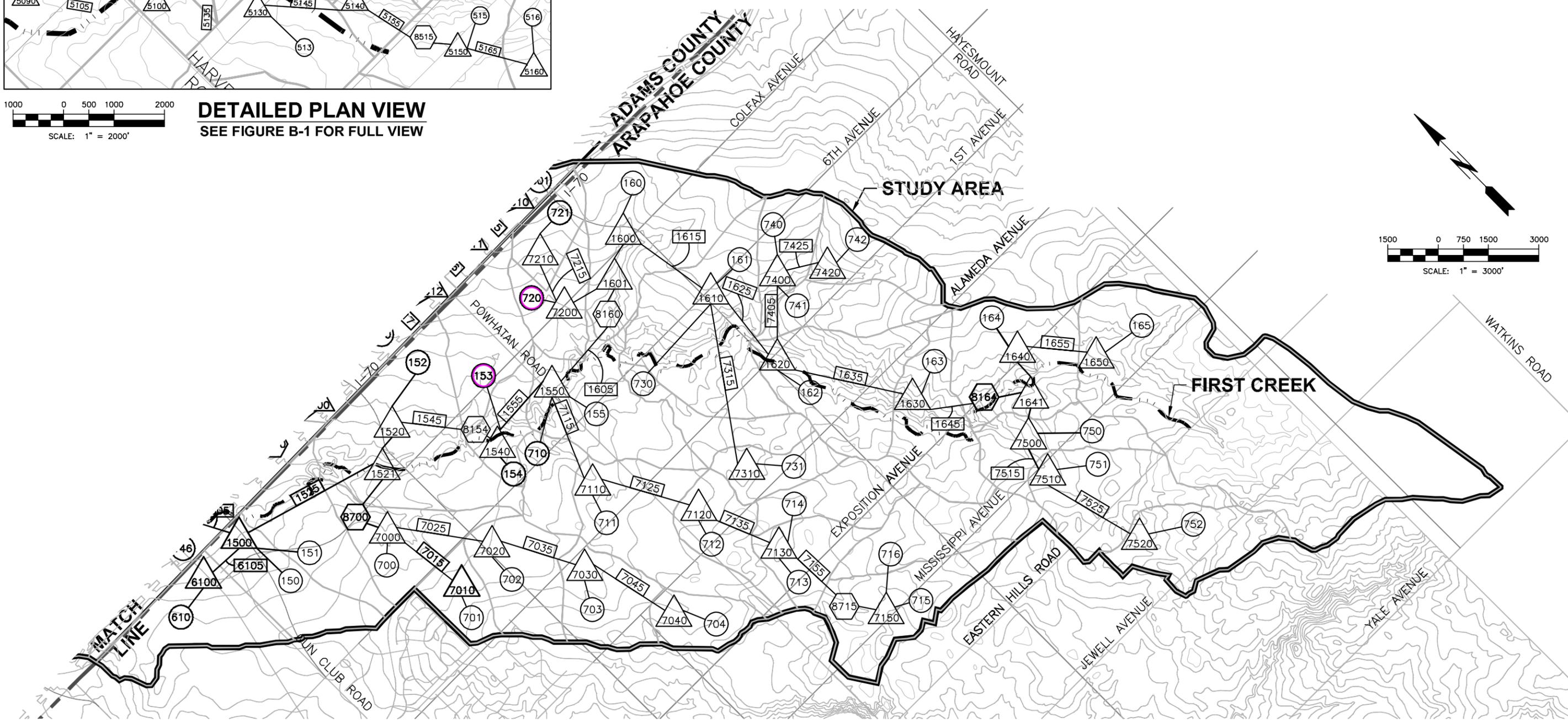
FIGURE 3-7



DETAILED PLAN VIEW
SEE FIGURE B-1 FOR FULL VIEW

LEGEND

- DETENTION ELEMENT
- CONVEYANCE ELEMENT
- DESIGN POINT
- SUB-WATERSHED ID
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- STREAM CENTERLINE



NAME: Z:\UDFCD PLANNING\Upper First Creek\CAD_UFC\DWG\Alt Rpt\Fig B-1 - EPA SWM Routing_RecPlan.dwg
PLOT DATE: Oct 05, 2009 11:47am



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FAX: 303-300-1635

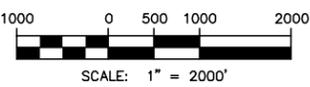
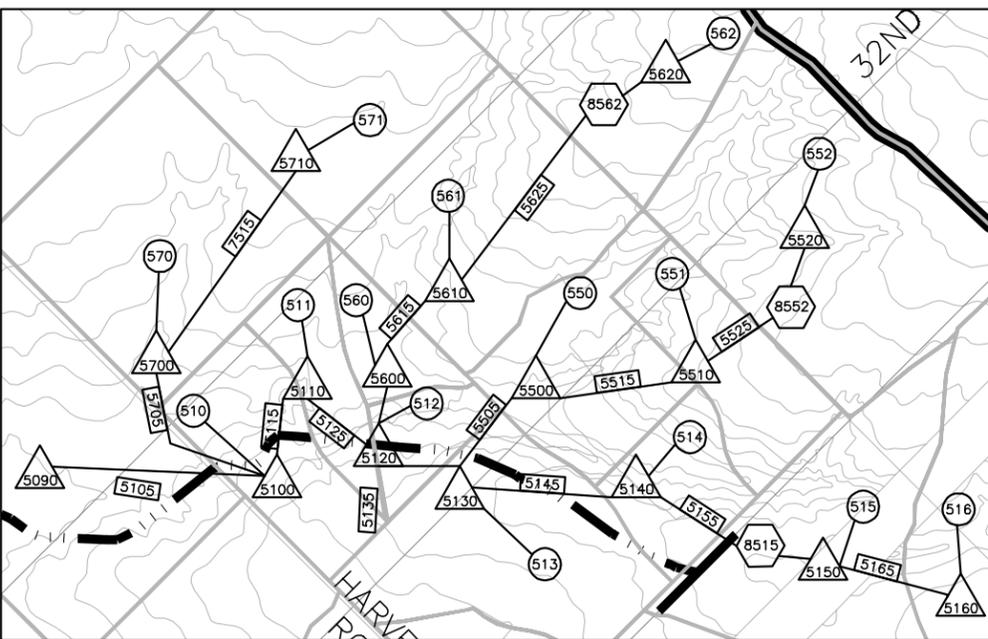
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DRAWN	AGC	DATE	5/28/09
CHECKED	TLP	DATE	7/10/09
REVISED		DATE	

CITY AND COUNTY OF DENVER
CITY OF AURORA
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

FIRST CREEK (UPPER)
MAJOR DRAINAGEWAY
PLANNING STUDY

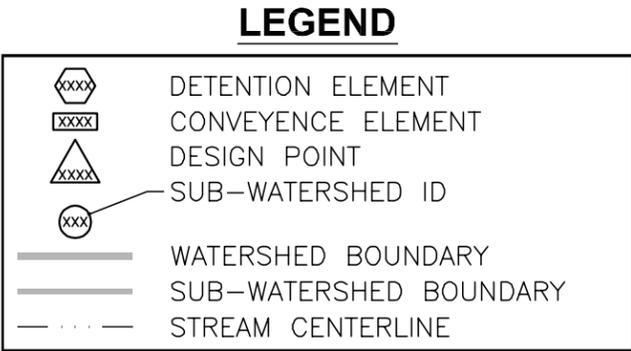
RECOMMENDED PLAN
EPA SWMM ROUTING

FIGURE B-2

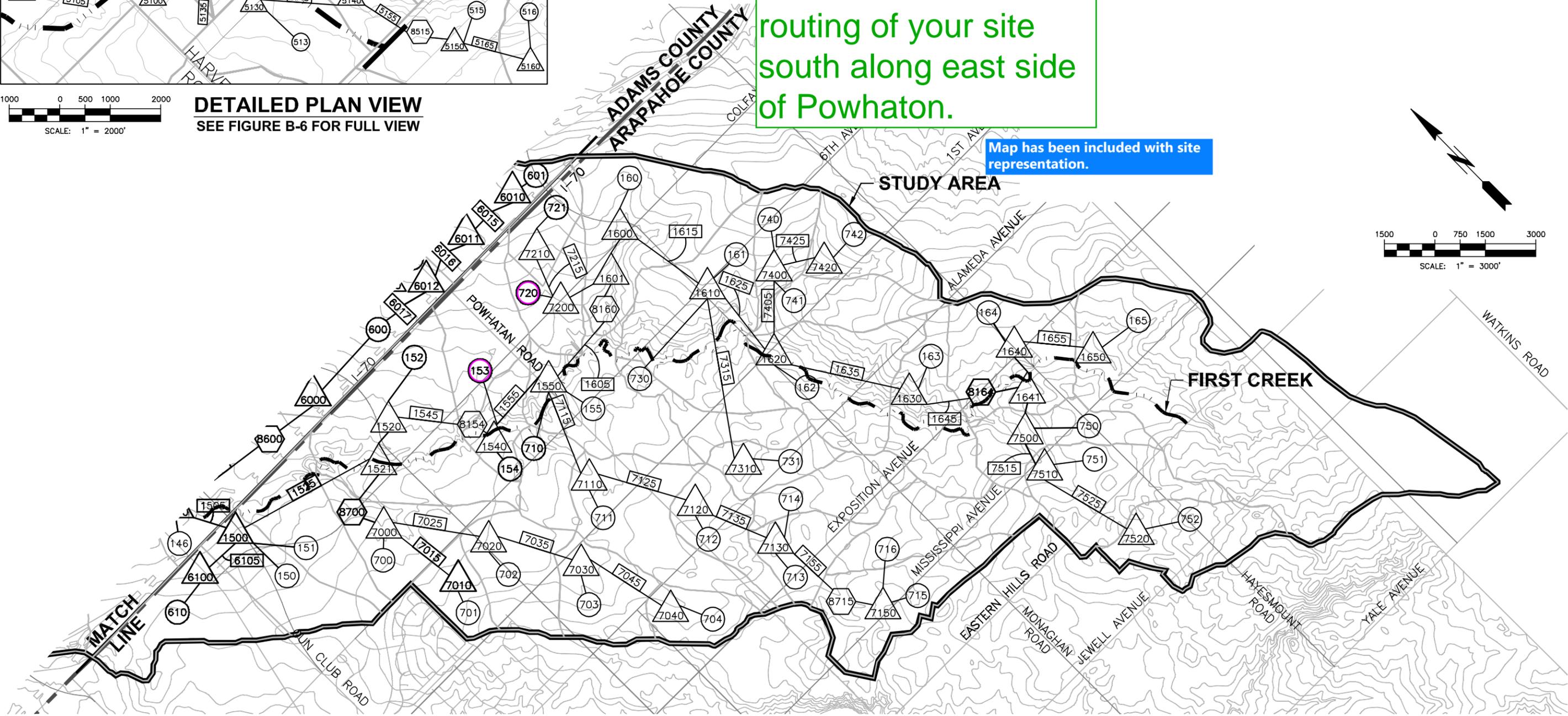
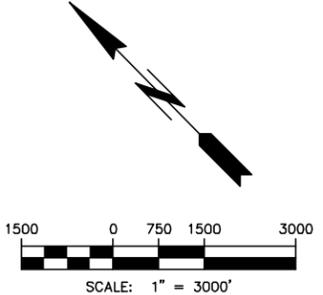


DETAILED PLAN VIEW
SEE FIGURE B-6 FOR FULL VIEW

Please include a hydrology map from the 2019 First Creek Tribs MDP by Merrick. The map included should show the routing of your site south along east side of Powhatan.



Map has been included with site representation.



NAME: Z:\UDFCD PLANNING\Upper First Creek\CAD_UFC\DWG\Phase B\Fig B-6-7 - EPA SWMM Routing_SelPlan.dwg
PLOT DATE: Aug 18, 2010 4:32pm



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DESIGNED	AGC	DATE	5/28/09
DRAWN	AGC	DATE	5/28/09
CHECKED	TLP	DATE	7/10/09
REVISED		DATE	

CITY AND COUNTY OF DENVER
CITY OF AURORA
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

FIRST CREEK (UPPER)
MAJOR DRAINAGEWAY
PLANNING STUDY

CONCEPTUAL DESIGN
EPA SWMM ROUTING

FIGURE B-7

Jamaso Public Improvements Plan Narrative
City of Aurora, Colorado
May 1, 2023



Vicinity Map
NTS

Jamaso Project Location & Description

The purpose of this Public Improvements Plan narrative is to discuss relevant issues regarding infrastructure planning for the Jamaso Development. More specifically this report will discuss each identified Planning Area and the required roadway, storm drainage, water and sanitary sewer infrastructure necessary to facilitate them as standalone developments.

The proposed Jamaso Development is approximately 60 acres of land with the land use designation of Mixed-Use Airport (MU-A). The site is located just south of Interstate 70 & east of E-470, bounded by Foxridge Farms Community / an existing COA Prairie Waters treatment facility to the north, vacant land to the south, vacant land / Sky Ranch Subdivision to the east and N. Powhatan Road / vacant land to the west. The property has an existing oil and gas operation on the southern portion and the remaining portion is undeveloped. The predominant land uses are expected to be indoor & outdoor self-storage facilities and commercial retail spaces.

A Master Traffic Impact Study (TIS) was prepared by LSC Transportation Consultants, Inc. for the proposed Jamaso Development. Future Traffic Signal Escrow responsibility for a future signalized intersection is expected at N. Powhatan Road

(4-lane arterial – painted median) and E. 12th Avenue (2-lane collector), according to the TIS. Additional offsite improvements for planning areas may be required based on traffic or life safety needs. The half section collector road extending north of E. 12th Avenue will have to be accommodated with the unincorporated property to the east of the site due to conflicts with the existing COA Prairie Waters treatment facility and Foxridge Farms mobile home community to the north.

Specific Development Improvements

Planning Area #1 – PA-1:

Planning Area #1 is approximately 1.0 acres in size and is located in the northwest portion of the Jamaso site. The land use is identified as open space / landscape buffer. Street trees, tree lawns, landscape buffers and other landscape elements required per the City of Aurora’s landscape standards shall be included as part of roadway development and construction. The existing access to the City of Aurora Prairie Waters Treatment Facility and the existing emergency access to Sable Altura Fire Station #1 must be maintained at all times. The storm sewer collection system includes routing to N. Powhatan Road. PA-1’s development will be triggered by the development of PA-2. The portions of PA-1 adjacent to PA-2 shall be installed at this time.

Planning Area #2 – PA-2:

Planning Area #2 is approximately 6.6 acres in size and is located in the northwest portion of the Jamaso site along N. Powhatan Road. The land use is identified as commercial retail and commercial indoor self-storage.

Roadway Improvements

Street improvements along N. Powhatan Road (4-lane arterial) adjacent to PA-2 from E. 12th Avenue to the existing access road will consist of an additional north-bound lane, the eastern half of a painted median, and detached walk/bike path. Required transition from the east section of N. Powhatan Road will begin at the property line (extended) and continues north to match the existing 2-lane road. Completion of the existing access road (to an alternative 2-lane collector) and the north half of E. 12th Avenue (2-lane minimum) along PA-2 will be required to access the lot. Transit stop improvements, including enhanced pavement depths, may be required in the future along north-bound N. Powhatan Road adjacent to PA-2 when and if RTD extends service to this area. Coordination efforts with the emergency access to the fire station would provide for a larger turn radius for fire trucks and a combined access to N. Powhatan Road. Street trees, tree lawns, landscape buffers and other landscape elements required per the City of Aurora’s landscape standards shall be included as part of roadway development and construction.

Storm Drainage Improvements

Storm sewer collection at E. 12th Avenue to PA-4 will be required for detention. The detention pond required for PA-2 will be constructed. The N. Powhatan Road existing ditch water collection into storm sewer near the northwest corner of the site will facilitate the required roadway transition from the full cross-section to existing.

Water Improvements

Waterline connection to the existing 16-in waterline within N. Powhatan Road will be extended between PA-2 and PA-3 along E. 12th Avenue. Waterline required for PA-2 is planned to be a 16-in waterline along E. 12th Avenue between PA-2 and PA-3. Fire hydrants adjacent to E. 12th Avenue will be provided for the nearby fire station to access in emergency situations.

Sanitary Improvements

Until such time as future sanitary sewer will be provided in E. 12th Avenue, a septic system may include a sanitary vault or septic tank with an associated leach bed, as a temporary measure under direction of the health department. Future sanitary sewer is expected to support onsite commercial areas and is planned to be 8-in sanitary sewer internal to the site. Future 12-in sanitary sewer is expected along E. 12th Avenue within the site extents.

Planning Area #3 – PA-3:

Planning Area #3 is approximately 5.0 acres in size and is located in the west portion of the Jamaso site. The land use is identified as commercial retail.

Roadway Improvements

Street improvements along N. Powhatan Road (4-lane arterial) adjacent to PA-3 include an additional north-bound travel lane, the eastern half of a painted median, bicycle lane, and turn lane at E. 12th Avenue. Completion of E. 12th Avenue (2-lane collector) along PA-3 will be required to access the lot. Street trees, tree lawns, landscape buffers and other landscape elements required per the City of Aurora’s landscape standards shall be included as part of roadway development and construction.

Storm Drainage Improvements

Storm sewer collection for PA-3 to the south will be required for detention. The detention pond required for PA-3 will be constructed.

Water Improvements

Waterline connection to the existing 16-in waterline within N. Powhatan Road will be extended as a 16-in water loop between PA-2 and PA-3 along E. 12th Avenue, between PA-3 and PA-5 and between PA-3 and PA-4 along the existing oil & gas access. Fire hydrants adjacent to E. 12th Avenue will be provided for the nearby fire station to access in emergency situations.

Sanitary Improvements

Until such time as future sanitary sewer will be provided in E. 12th Avenue, a septic system may include a sanitary vault or septic tank with an associated leach bed, as a temporary measure under direction of the health department.

Planning Area #4 – PA-4:

Planning Area #4 is approximately 2.2 acres in size and is located in the southwest portion of the Jamaso site along N. Powhatan Road. The land use is identified as detention.

Roadway Improvements

Street improvements along N. Powhatan Road (4-lane arterial) adjacent to PA-4 include transition of the north-bound lane for an additional travel lane, the eastern half of a painted median, bicycle lane, and turn lane at E. 12th Avenue. Maintenance access for the full-spectrum detention pond will be provided from the existing oil & gas road. Street trees, tree lawns, landscape buffers and other landscape elements required per the City of Aurora’s landscape standards shall be included as part of roadway development and construction.

Storm Drainage Improvements

Storm sewer collection for PA-4 to the full-spectrum detention pond will be required for detention. The following planning areas require the pond to be constructed: PA-2, PA-3, PA-4, and PA-5 (west of the other proposed detention pond).

The full section of the N-S collector is required. The section is entirely within this master plan and only open space exists on the east side.

The road name has been added as Road A. The road is on a 'half-section' line.

Planning Area #5 – PA-5:

Planning Area #5 is approximately 24.0 acres in size and is located in the east portion of the Jamaso site along proposed E. 12th Avenue. The land use is identified as commercial outdoor self-storage.

Roadway Improvements

Street improvements include E. 12th Avenue (2-lane collector) within the site extents. Street trees, tree lawns, landscape buffers and other landscape elements required per the City of Aurora’s landscape standards shall be included as part of roadway development and construction.

Storm Drainage Improvements

Storm sewer collection along E. 12th Avenue to Planning Areas #4 and #5 will be required for detention. The respective detention ponds required for PA-5 will be constructed. Storm sewer collection along the half section collector and along the southern boundary to the full-spectrum detention pond will be required for detention of the east portion of PA-5. Storm sewer collection for PA-5 to the full-spectrum detention pond in PA-4 will be required for detention west of the detention pond in PA-5 past the ridgeline. The existing COA Prairie Waters treatment facility developed conveyance along the east edge of that

facility will be conveyed under E. 12th Avenue in storm sewer to the existing swale through PA-5. The existing swale onsite will be conveyed to the south boundary.

Water Improvements

Waterline looping for the collector roads’ required fire hydrants will occur within E. 12th Avenue and the half section road. The waterline within the half section road is being completed by others as 30-in waterline. A waterline will be required along the southern boundary within PA-8 as a 12-in waterline, between PA-5 and PA-7 as a 12-in waterline, between PA-3 and PA-5 as a 16-in waterline and within E. 12th Avenue as a 12-in waterline to provide waterline looping.

Sanitary Improvements

Until such time as future sanitary sewer will be provided in E. 12th Avenue, a septic system may include a sanitary vault or septic tank with an associated leach bed, as a temporary measure under direction of the health department. A sanitary vault will be required for future sanitary sewer is expected along E. 12th Avenue within the site extents.

Add: "and from N. Powhatan Road to the eastern site boundary." The full length of the collector is required to access this planning area.

Per our conversations with Planning Staff, we will not add deferment language in the PIP document and this will be addresses during Planning Area Site Plan development.

Planning Area #6 – PA-6:

Planning Area #6 is approximately 2.7 acres in size and is located in the northeast portion of the Jamaso site along E. 12th Avenue. The land use is identified as commercial retail.

Roadway Improvements

Street improvements include E. 12th Avenue (2-lane collector) within the site extents. Street trees, tree lawns, landscape buffers and other landscape elements required per the City of Aurora’s landscape standards shall be included as part of roadway development and construction.

Storm Drainage Improvements

Storm sewer collection from PA-6, crossing E. 12th Avenue to the full-spectrum detention pond will be required for detention.

Water Improvements

Waterline connection to the existing 16-in waterline within N. Powhatan Road will be extended between Planning Areas #5 and #6 as a 12-in waterline to the 30-in waterline by others along the east side of PA-6.

Sanitary Improvements

Until such time as future sanitary sewer will be provided in E. 12th Avenue, a septic system may include a sanitary vault or septic tank with an associated leach bed, as a temporary measure under direction of the health department.

Planning Area #7 – PA-7:

Planning Area #7 is approximately 8.7 acres in size and is located in the northeast portion of the Jamaso site. This portion of the property is currently being used as an operational oil & gas site. The site shall be maintained at all times.

This is leftover from the previous submittal. Please revise.

Planning Area #8 – PA-8:

Planning Area #8 is approximately 2.7 acres in size and is located along the eastern boundary of the Jamaso site. The land use is identified as open space / landscape buffer. Specifically, this buffer area shall be maintained and bermed to provide screen views of outdoor self-storage in PA-5 from adjacent Sky Ranch development. The development will be triggered by the development of PA-5.

This section has been revised.

Storm Drainage Improvements

Storm sewer collection for the half section collector road will continue along the north portion of PA-8 to the full-spectrum detention pond in PA-5. The existing swale through PA-5 will be conveyed to the south and combine with the full-spectrum detention pond outfall which outlets prior to the south boundary of the site.

Roadway Improvements

Street improvements include the half section collector (2-lane collector). Street trees, tree lawns, landscape buffers and other landscape elements required per the City of Aurora’s landscape standards shall be included as part of roadway development and construction.

Water Improvements

Waterline from the half section collector along the northern portion of PA-8 to the eastern boundary of PA-7 provides looping for the collector roads’ required fire hydrants.

Planning Area #9 – PA-9:

Planning Area #9 is approximately 1.8 acres in size and is located along the northern boundary of the Jamaso site. The land use is identified as open space / landscape buffer. Street trees, tree lawns, landscape buffers and other landscape elements required per the City of Aurora's landscape standards shall be included. PA-9's development will be triggered by the development of PA-5.

Planning Area #10 – PA-10:

Planning Area #10 is approximately 1.5 acres in size and is located along the eastern boundary of the Jamaso site. The land use is identified as open space / landscape buffer. Street trees, tree lawns, landscape buffers and other landscape elements required per the City of Aurora's landscape standards shall be included. PA-10's development will be triggered by the development of PA-5.

Planning Area #11 – PA-11:

Planning Area #11 is approximately 0.4 acres in size and is located in the northwest portion of the Jamaso site. The land use is identified as open space / landscape buffer. Street trees, tree lawns, landscape buffers and other landscape elements required per the City of Aurora's landscape standards shall be included as part of roadway development and construction. The existing access to the City of Aurora Prairie Waters Treatment Facility must be maintained at all times. The storm sewer collection system includes the outfall for the City of Aurora Prairie Waters Treatment Facility existing pond routing to N. Powhaton Road. PA-11's development will be triggered by the development of PA-2. The portions of PA-11 adjacent to PA-2 shall be installed at this time.

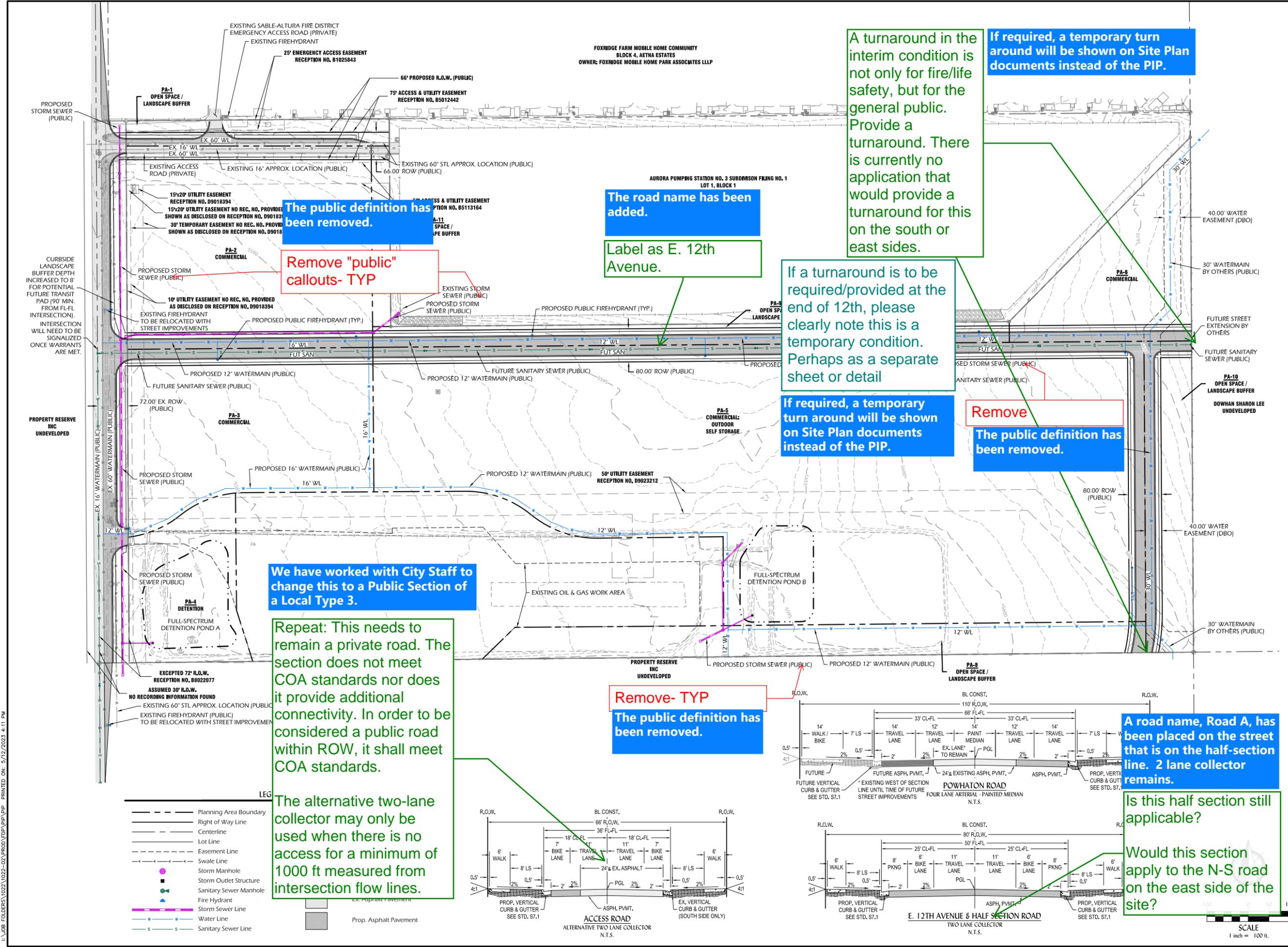
Revision Type:	1 of 1	Sheet:	1022-02	Date:	May 1, 2023
No.	1	Job No.:	1022-02	Scale Horiz:	1" = 100'
Rev. Date:		Designed:	ACS	Scale Vert:	N/A
		Prepared:	TRP	Approved:	

Proj Name: Jamaso
Location: Aurora, Colorado
Plan Set: PIP
Sheet Name: Public Improvement Plan

NOT FOR CONSTRUCTION

Know what's below.
Call before you dig.

No. 1



A turnaround in the interim condition is not only for fire/life safety, but for the general public. Provide a turnaround. There is currently no application that would provide a turnaround for this on the south or east sides.

If required, a temporary turn around will be shown on Site Plan documents instead of the PIP.

The public definition has been removed.

The road name has been added.

Label as E. 12th Avenue.

If a turnaround is to be required/provided at the end of 12th, please clearly note this is a temporary condition. Perhaps as a separate sheet or detail

Remove "public" callouts- TYP

If required, a temporary turn around will be shown on Site Plan documents instead of the PIP.

Remove
The public definition has been removed.

We have worked with City Staff to change this to a Public Section of a Local Type 3.

Repeat: This needs to remain a private road. The section does not meet COA standards nor does it provide additional connectivity. In order to be considered a public road within ROW, it shall meet COA standards.

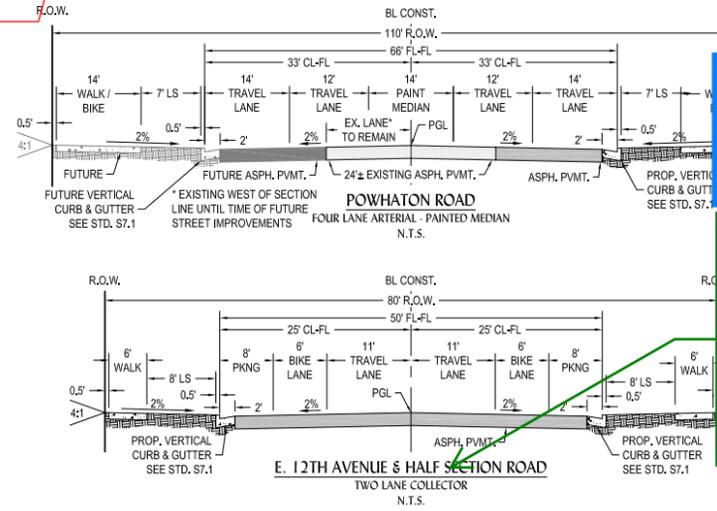
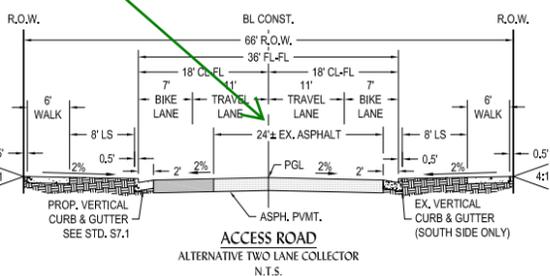
Remove- TYP
The public definition has been removed.

A road name, Road A, has been placed on the street that is on the half-section line. 2 lane collector remains.

The alternative two-lane collector may only be used when there is no access for a minimum of 1000 ft measured from intersection flow lines.

Is this half section still applicable?
Would this section apply to the N-S road on the east side of the site?

- LEG
- Planning Area Boundary
 - Right of Way Line
 - Centerline
 - Lot Line
 - Easement Line
 - Swale Line
 - Storm Manhole
 - Storm Outlet Structure
 - Sanitary Sewer Manhole
 - Fire Hydrant
 - Storm Sewer Line
 - Water Line
 - Sanitary Sewer Line
 - Prop. Asphalt Pavement



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